

# Oral health-related quality of life among diabetic patients: A cross-sectional controlled study

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## ABSTRACT

**Introduction:** Diabetes is a widespread chronic metabolic condition that has a significant negative influence on a person's sociopsychological, physical, and economic well-being. This study was designed to (1) measure the impact of oral health on quality of life (QoL) using the Oral Health Impact Profile-14 (OHIP-14) in association with other factors (age, gender, years of diabetes, level of education, smoking, presence of other conditions, oral complaints, and glycemic control) and (2) validate the Arabic version of the OHIP-14. **Materials and Methods:** Diabetic and healthy participants completed a two-part survey including demographic characteristics OHIP-14 questionnaire. **Results:** The sample consisted of 121 patients with type 2 diabetes mellitus and 146 healthy controls. Sociodemographic data, OHIP-14 questionnaires, and glycemic control data were collected. The data were statistically analyzed. The results showed that OHIP-14 was found to have sufficient reliability and validity in measuring life quality. Our study documented the effects of oral health complications on QoL among diabetics compared to controls. The type of diabetes had no effect on life quality. The highest OHIP-14 domain affected was functional limitation, while the lowest one was social handicap. **Conclusion:** It was concluded that diabetes has a negative effect on life quality. Diabetic patients have unsatisfactory oral health, which affects their QoL. The OHIP-14 is a reliable and valuable instrument to measure life quality.

**Keywords:** Diabetes, diabetics' oral health-related, OHIP-14, oral diseases, quality of life

## Clinical Significance

Health and medicine place a great deal of emphasis on quality of life (QoL). A patient's QoL is a complex concept that encompasses many aspects. Diabetics' oral health negatively impacts their QoL and requires assessing and intervening. As well as implementing holistic approaches, it is necessary for doctors and dentists to work together as a team.

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## Introduction

Quality of life (QoL) is an old concept that has grown in popularity in recent years. It was first introduced in 1920; later, in 1970, it was extended to include the medical field.<sup>[1]</sup> Many definitions of the term have been proposed in the literature. In 1974, the World Health Organization (WHO) defined QoL as "a complete state of well-being, physically, mentally, and socially and not only the absence of disease or infirmity."<sup>[1,2]</sup> In 1995, the WHO modified its QoL definition to "an individual's perception of their position in life in the context of the culture and value system where they live and in relation to their goals, expectations, standards, and concerns."<sup>[1]</sup>

Diabetes is a common chronic metabolic disease associated with a considerable impact on an individual's financial, physical,

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and sociopsychological well-being. In other words, diabetes affects the person's QoL.<sup>[3]</sup> Studies have shown that individuals with diabetes have compromised life quality, but not as much as those with serious chronic diseases.<sup>[4-8]</sup> Most diabetics have poor QoL in all its dimensions.<sup>[8]</sup> In this context, the factors that harm life quality are glycemic control, complications, and insulin treatment versus hypoglycemic drugs.<sup>[4-6]</sup> In contrast, improving health through education, exercises, and stress management can enhance both glucose levels and QoL.<sup>[7,9-11]</sup> QoL has been reported to be an essential part of diabetes management in the primary care centers.<sup>[12]</sup> OHIP-14 is short and effective in measuring life quality.

Oral health is an essential part of general health; it affects emotional, psychological, and social well-being as well as physical function. Thus, it is an important factor in QoL. As a result of the need to assess the impact of oral health on individuals' life quality, instruments for evaluating oral health-related QoL (OHRQoL) have been developed since the early 1980s.<sup>[13-15]</sup> Oral diseases have negative impacts on physical function, psychosocial factors, esteem, and finances.<sup>[16]</sup> People evaluate their OHRQoL by comparing their expectations to their actual experiences.<sup>[17]</sup> The most widely used instrument to measure OHRQoL is the Oral Health Impact Profile (OHIP), which captures the effects of oral diseases on individuals' well-being. The OHIP was first developed in 1994 by Slade and Spencer (OHIP-49) and later shortened (OHIP-14).<sup>[18]</sup> Oral diseases can negatively affect physical function and cause pain and discomfort, which impacts the patient's social life.<sup>[18]</sup> The realization of this fact has led to the shift from a biomedical model to a biopsychosocial one. A broader view based on Locker's model of oral health and its influence on life quality has been introduced in the literature.<sup>[18-20]</sup> OHRQoL encompasses seven hypothetical dimensions: functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability, and handicap.<sup>[19,20]</sup>

Diabetes (particularly if uncontrolled) has been linked to many oral disorders, such as xerostomia, taste impairment, oral candidiasis, periodontal disease, and lichen planus.<sup>[17,21-23]</sup> These complications may affect diabetics' life quality. In the literature, there is some uncertainty about the effect of diabetes in terms of OHRQoL. Some studies have indicated that the disorder has an impact on OHRQoL.<sup>[24,25]</sup> Among older adults, diabetes is reported to have a negative effect on OHRQoL.<sup>[26]</sup> Scholars have also demonstrated that physical and environmental domains have lower scores compared to social and psychological aspects.<sup>[25]</sup> Thus, psychological therapy and lifestyle changes have been recommended for patients.<sup>[24,25,27]</sup> In contrast, many studies maintain that diabetes has no effect on OHRQoL; rather, it is a complication for oral health.<sup>[17,24,25,28-32]</sup> In a matched case-controlled investigation of diabetics and non-diabetics, no significant differences in OHIP scores were found in the presence of oral disease.<sup>[16,27]</sup> Other contributing factors are oral health dissatisfaction, xerostomia, presence of oral complications, gingivitis, periodontitis, age, low income,

rural area residency, comorbidity, poor diet, and glycemic control.<sup>[17,24,25,28-32]</sup> Providing effective dental and medical support and increasing knowledge of oral complications, along with adherence to treatment with antidiabetic medications, can improve diabetic OHRQoL.<sup>[23,33-35]</sup> Periodontal, and oral disease management, number of natural posterior teeth, restoring occlusion, and preventive dental therapy may also contribute to better OHRQoL.<sup>[24,26,28,30,36-38]</sup> In contrast, Kakoei *et al.* reported no association between decayed, missing, filled teeth and OHRQoL among diabetics.<sup>[39]</sup> Assessment of the patient's socioeconomic status and continuous monitoring of OHRQoL as part of dental health management have also been suggested.<sup>[25,39]</sup>

As people have become aware of the interaction between psychosocial factors and health, there has been an increasing interest in health-related QoL. This includes the measurement of the impact of oral health on QoL, particularly among patients with chronic diseases that may affect this type of health. The aim of this study was to (1) measure the impact of oral health on QoL using the OHIP-14 in association with other factors (age, gender, years of diabetes, level of education, smoking, presence of other conditions, oral complaints, and glycemic control) and (2) validate the Arabic version of the OHIP-14.

## Materials and Methods

### Sample

The study participants were diabetic and healthy individuals who differed in terms of glycemic control, age, and gender. They were volunteers and agreed to complete the questionnaire after giving consent. Each participant answered the questionnaire independently.

### Instrument

The participants completed a two-part survey. The first part collected information on demographic characteristics, years of diabetes, level of education, smoking, presence of other conditions, oral complaints, glycemic control, and frequency of dental visits; the second part consisted of the OHIP-14 questionnaire.

The OHIP-14 is a self-report, 14-item questionnaire that evaluates speech difficulties due to oral health-related problems, taste alterations, pain linked to oral health issues, and distress while eating due to oral health problems. It also collects information on stress, emotional disturbance, dietary changes, effect on social life, career performance, and general life satisfaction—all from the perspective of oral health problems—for the previous six months. The responses are scaled as follows: 1 = never; 2 = hardly ever; 3 = occasionally; 4 = fairly often; and 5 = very often. The OHIP-14 questionnaire has been used in several studies and has shown good reliability and validity. It was chosen for these reasons.

### Translating the questionnaire

The English version of the OHIP-14 was translated into Arabic, the native language for this study, by a proficient translator. Regarding the forward translation, the initial translation (from the original language to the target language) was made by two translators (author and translator) independently. To ensure accuracy, the initial translation was then back-translated, and a committee of experts reviewed this version. Finally, the questionnaire was tested in a pilot study.

### Statistical analysis

The data were collected, coded, and entered for analysis. All the statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS) (IBM SPSS Statistics for Windows, version 22.0, Armonk, NY: IBM Corp). The internal consistency of the OHIP-14 scale was measured using Cronbach’s alpha. The following descriptive statistics were performed: frequency distribution tables, one-way analysis of variance (ANOVA), and *P* values. A *P* value equal to or less than 0.05 was considered statistically significant.

## Results

The demographic data of the sample are summarized in Table 1. The sample’s oral complaint data are shown in Figure 1.

The translated scale’s reliability and validity were assessed. Cronbach’s alpha was 0.950, and McDonald’s omega was 0.953, which indicates excellent internal consistency [Tables 2 and 3].

Regarding face validity, the experts looked at the questionnaire items in terms of feasibility, readability, consistency of style

and formatting, cultural adaptation, and clarity of the language used. A pilot study was performed to test the scale’s reliability and validity. Two types of construct validity were tested. Discriminant validity was tested by examining the associations between the OHIP-14 scores, the domain scores, the total scores, and the other variables. Internal consistency was further assessed by convergent validity with an inter-item correlation matrix; a positive significance was found between all the items and the seven subscales [Tables 4 and 5]. The coefficients ranged from 0.317 (between item 1 and item 10) to 0.898 (between item 10 and item 11); the variations were not great enough to produce redundancy, which indicates item homogeneity/internal consistency. Also, the item-total correlation analysis showed that the coefficients of all the items were above the critical value for Pearson’s *r* (0.17).

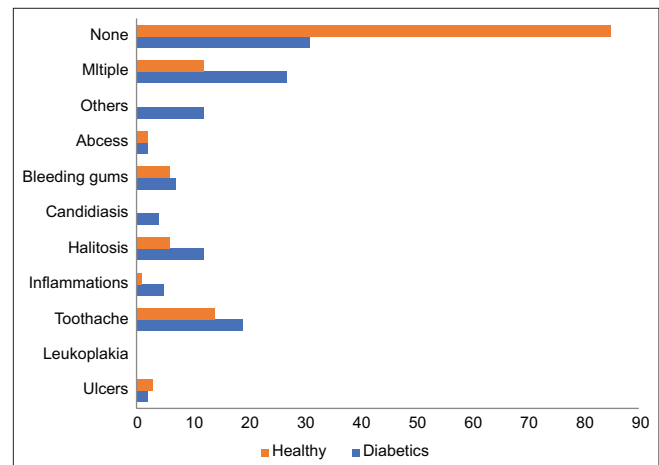
Statistically significant score differences were found between diabetic and healthy individuals [Table 6]. Having diabetes had a significant effect (*M* = 1.48; *SD* = 0.502) compared to the healthy condition (*M* = 1.33; *SD* = 0.470), at *P* = 0.013; *t* (248) = 2.501. The average QoL of the diabetics (*M* = 3.69; *SD* = 1.70) was significantly lower than that of the controls (*M* = 3.01; *SD* = 1.268), at *P* = 0000; *t* (284) = -6.244.

Diabetic individuals above 51 years of age had their QoL affected more than others in most of the OHIP-14 domains. The functional, discomfort, disability, psychological, social, and handicap domains were all significant at *P* = 0.014, *P* = 0.010, *P* = 0.001, *P* = 0.03, *P* = 0.004, and *P* = 0.008, respectively.

Oral lesions were more common among diabetics at a statistically significant level [Figure 1]. Mean QoL was affected by the presence of lesions (*M* = 3.66; *SD* = 1.49) compared to the mean QoL of those who did not have such lesions (*M* = 2.75; *SD* = 1.03), at *P* = 0.0000; *t* (127) = -4.074. Hemoglobin A1C (HbA1c) was significantly related to disability among type 2 diabetes (*M* = 4.14; *SD* = 2.37) compared to type 1 diabetes (*M* = 3.29; *SD* = 1.92), at *P* = 0.032; *t* (117.63) = -2.18. Smoking, gender, and years of diabetes were not statistically related to OHRQoL.

**Table 1: Characteristics of study participants**

Variable		Diabetic (n=121) n (%)	Non-diabetic (n=129) n (%)
Gender	Male	20 (16.5)	12 (9.3)
	female	101 (83.5)	117 (90.7)
Age	18-25	10 (8.3)	71 (55)
	26-30	4 (3.3)	22 (17.1)
	31-35	3 (2.5)	9 (7.0)
	36-40	5 (4.1)	8 (6.2)
	41-50	29 (24)	10 (7.8)
	51 and above	70 (57.9)	9 (7)
Education	High school and below	52 (43)	16 (12.4)
	Bachelor’s degree	50 (41.3)	105 (81.4)
	Postgraduate degree	15 (12.4)	8 (6.2)
	Illiterate	4 (3.3)	0 (0.0)
Oral complaint	No	63 (52.1)	87 (67.4)
	Yes	58 (47.9)	42 (32.6)
Smoking	No	117 (96.7)	119 (92.2)
	Yes	4 (3.3)	8 (6.2)
	Sometimes	0 (0.0)	2 (1.6)
Type of diabetes	Type 1 diabetes	58 (47.9)	
	Type 2 diabetes	63 (52.1)	
HbA1c	1-6.99		
	7-10		
	>10		
	Do not know		



**Figure 1: Oral complaints among diabetic and healthy individuals**

**Table 2: Reliability analysis of the scale based on the corrected item-total correlation and on Cronbach’s alpha if item deleted**

Impact item	Corrected item-total correlation	Cronbach’s alpha if item deleted	Corrected item-total correlation	Cronbach’s alpha if item deleted				
					Diabetics		Controls	
In the past six months, have you had trouble pronouncing any words because of problems with your teeth, mouth, or dentures?	0.506	0.951	0.498	0.920				
In the past six months, have you felt that your sense of taste has worsened because of problems with your teeth, mouth, or dentures?	0.385	0.953	0.421	0.922				
In the past six months, have you had painful aching in your mouth?	0.694	0.947	0.610	0.918				
In the past six months, have you found it uncomfortable to eat any foods because of problems with your teeth, mouth, or dentures?	0.775	0.945	0.658	0.916				
In the past six months, have you been disturbed by dental problems?	0.745	0.946	0.679	0.916				
In the past six months, have you felt tense because of problems with your teeth, mouth, or dentures?	0.776	0.945	0.712	0.914				
In the past six months, has your diet been unsatisfactory because of problems with your teeth, mouth, or dentures?	0.815	0.944	0.731	0.913				
In the past six months, have you had to interrupt meals because of problems with your teeth, mouth, or dentures?	0.764	0.945	0.674	0.915				
In the past six months, have you found it difficult to relax because of problems with your teeth, mouth, or dentures?	0.842	0.943	0.701	0.914				
In the past six months, have you been a bit embarrassed because of problems with your teeth, mouth, or dentures?	0.838	0.943	0.717	0.913				
In the past six months, have you been a bit irritable with other people because of problems with your teeth, mouth, or dentures?	0.839	0.944	0.706	0.914				
In the past six months, have you had difficulty doing your usual “activities” because of problems with your teeth, mouth, or dentures?	0.786	0.945	0.701	0.915				
In the past six months, have you felt that life in general was less satisfying because of problems with your teeth, mouth, or dentures?	0.823	0.944	0.714	0.914				
In the past six months, have you been totally unable to function because of problems with your teeth, mouth, or dentures?	0.713	0.947	0.675	0.915				

**Table 3: Reliability analysis of the subscale based on the corrected item-total correlation and Cronbach’s alpha coefficient if item deleted**

Domain	Cronbach’s alpha if item deleted	Cronbach’s alpha if item deleted	Item		
				Diabetics	Controls
1	Functional limitation	0.938	0.891	1. Trouble pronouncing words.	
2	Physical pain	0.915	0.881	2. Sense of taste worse	
3	Psychological discomfort	0.919	0.887	3. Painful aching in mouth	
4	Physical disability	0.915	0.872	4. Uncomfortable to eat	
5	Psychological disability	0.906	0.864	5. Self-conscious	
6	Social disability	0.909	0.869	6. Felt tense	
7	Handicap	0.914	0.874	7. Unsatisfactory diet	
				8. Had to interrupt meals	
				9. Difficult to relax.	
				10. Embarrassed	
				11. Irritability with others	
				12. Difficulty doing usual jobs	
				13. Felt life less satisfying.	
				14. Totally unable to function	

### Discussion

There is a growing interest in QoL, and experts have become

aware of its multidimensional nature. In this context, it is essential to measure the impact of oral health on QoL, particularly among patients with chronic diseases that can affect this type of health.

**Table 4: Inter-item correlation matrix for the 14 questions**

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total
1	1														
2	0.377**	1													
3	0.478**	0.357**	1												
4	0.427**	0.368**	0.656**	1											
5	0.393**	0.292**	0.636**	0.738**	1										
6	0.406**	0.222*	0.603**	0.721**	0.809**	1									
7	0.422**	0.302**	0.539**	0.675**	0.652**	0.716**	1								
8	0.431**	0.250**	0.446**	0.583**	0.571**	0.656**	0.847**	1							
9	0.465**	0.181*	0.646**	0.666**	0.633**	0.685**	0.698**	0.703**	1						
10	0.435**	0.301**	0.493**	0.613**	0.574**	0.599**	0.706**	0.717**	0.787**	1					
11	0.357**	0.315**	0.552**	0.651**	0.602**	0.589**	0.692**	0.646**	0.777**	0.898**	1				
12	0.317**	0.366**	0.539**	0.594**	0.537**	0.561**	0.616**	0.606**	0.716**	0.753**	0.769**	1			
13	0.405**	0.401**	0.605**	0.587**	0.569**	0.603**	0.668**	0.635**	0.725**	0.769**	0.817**	0.764**	1		
14	0.303**	0.360**	0.470**	0.443**	0.395**	0.527**	0.549**	0.546**	0.694**	0.745**	0.699**	0.772**	0.733**	1	
Total	0.596**	0.442**	0.758**	0.848**	0.834**	0.851**	0.861**	0.813**	0.849**	0.814**	0.798**	0.733**	0.776**	0.655**	1

\*\* Correlation is significant at the 0.01 level (two-tailed). \* Correlation is significant at the 0.05 level (two-tailed)

**Table 5: Inter-item correlation matrix for the seven subscales**

	Functional	Pain	Discomfort	Disability	Psychological	Social	Handicap
Functional	1						
Pain	0.535**	1					
Discomfort	0.411**	0.784**	1				
Disability	0.435**	0.646**	0.709**	1			
Psychological	0.434**	0.705**	0.692**	0.777**	1		
Social	0.433**	0.686**	0.641**	0.710**	0.888**	1	
Handicap	0.482**	0.632**	0.601**	0.678**	0.834**	0.874**	1

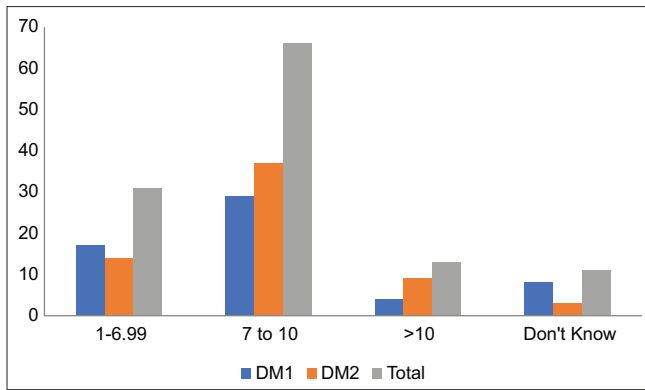
\*\* Correlation is significant at the 0.01 level (two-tailed).

**Table 6: Mean, standard deviation (SD), confidence interval, Mann–Whitney *U*-test, and *P* value**

Domain	Item	Diabetic (n=121)	Non-diabetic (n=129)	Mann–Whitney <i>U</i> -test	<i>P</i>
Functional limitation	1. Trouble pronouncing words.	Mean 2.8760	Mean 2.53	6776.500	0.029
	2. Sense of taste worse	SD 1.35136	SD 1.04		
		95% CI 2.6328-3.1193	95% CI 2.36-2.72		
Physical pain	3. Painful aching in mouth	Mean 4.1818	Mean 3.75	6912.500	---
	4. Uncomfortable to eat	SD 2.11739	SD 1.916		
		95% CI 3.8007-4.5629	95% CI 3.49-4.13		
Psychological discomfort	5. Self-conscious	Mean 4.7603	Mean 3.88	6041.000	0.002
	6. Felt tense	SD 2.39104	SD 2.189		
		95% CI 4.3300-5.1907	95% CI 3.62-4.34		
Physical disability	7. Unsatisfactory diet	Mean 3.7355	Mean 2.76	5751.000	0.000
	8. Had to interrupt meals	SD 2.19761	SD 1.396		
		95% CI 3.3400-4.1311	95% CI 2.55-3.03		
Psychological disability	9. Difficult to relax.	Mean 3.6198	Mean 2.95	6608.000	0.021
	10. Embarrassed	SD 2.18043	SD 1.525		
		95% CI 3.2274-4.0123	95% CI 2.73-3.23		
Social disability	11. Irritability with others	Mean 3.4298	Mean 2.74	6343.000	0.003
	12. Difficulty doing usual jobs	SD 1.96988	SD 1.427		
		95% CI 3.0752-3.7843	95% CI 2.52-2.98		
Handicap	13. Felt life less satisfying.	Mean 3.1983	Mean 2.69	6625.500	0.015
	14. Totally unable to function	SD 1.84219	SD 1.419		
		95% CI 2.8668-3.5299	95% CI 2.46-2.92		

Our study was designed to validate the Arabic version of the OHIP-14 and assess the impact of oral health on QoL among diabetics. This is the first study to validate the OHIP-14 for diabetics.

Our study aimed to translate and validate the English version of the OHIP-14 into Arabic. The translated version was a valid and reliable multidimensional self-reported instrument for adults that integrates psychological and physical aspects. It



**Figure 2:** Type of diabetes vs HbA1c

measured QoL in terms of function, psychosocial factors, and esteem as related to oral health conditions. Reliability and validity were satisfactory, and each item had a high correlation with the overall score. Moreover, the reliability and validity analyses showed high values, which indicates interrelatedness among the items and heterogeneous constructs. The OHIP-14 has been translated into several languages.<sup>[40-44]</sup> Measuring the QoL of chronic disease sufferers is essential for healthcare practitioners and policymakers.

Our study indicated that having diabetes may negatively affect QoL. It has been reported that as a chronic disease, diabetes harms QoL, especially due to fluctuations in blood sugar levels, complications, monitoring, and dietary modifications.<sup>[4]</sup> Major complications, such as neuropathy, have also been found to affect the life quality of diabetics.<sup>[45]</sup> Our study documented the effect of oral health complications on QoL among these patients. Similar results have been obtained using the QoL scale, which points to the essential need for a holistic approach to this disease.<sup>[46,47]</sup>

In our research, almost all QoL domains were affected by diabetes. A recent study conducted in a general public hospital in West Java found that only the physical, psychological, and handicap domains were affected among type 2 diabetics.<sup>[8]</sup> The findings may assist healthcare workers and policymakers in understanding the risks of chronic diseases and their effects on patients. It also promotes better intervention and education. Improving the health of diabetics may not only prevent or delay complications but also improve their life quality.

Of all the domains, functional limitations had the highest score, and social handicap had the lowest one. One possible explanation for this might be the direct effect of diabetes or oral health as a complication of diabetes especially given that multiple oral complaints and toothache were the most commonly reported issues. In contrast, Aschalew *et al.*<sup>[25]</sup> found a higher impact on social and psychological aspects.

In keeping with the literature, our study demonstrated the impact of age among diabetics but not among healthy participants on

life quality.<sup>[48]</sup> Age may influence blood sugar control and increase complications affecting life quality. Type of diabetes and gender had no effect on life quality. However, Coffey *et al.*<sup>[45]</sup> found a relationship between female gender and lower life quality.

This study revealed that almost half of the diabetic patients had oral complaints. This result is in line with that of a study conducted by Nikbin *et al.*,<sup>[24]</sup> who found that the level of diabetes control (HbA1c) was correlated to some oral conditions. Oral diseases can affect function as well as cause pain and discomfort, which impacts a patient's social life. These results support the shift from the biomedical to the biopsychosocial model in both patient care and research.

The OHIP-14 questionnaire has been shown to possess high discrimination and effectiveness in the diagnosis of oral problems.<sup>[24]</sup> It is short and multidimensional, encompassing significant aspects of life quality. It is easy to use and understand, self-administered, and reliable. It does not require a significant amount of time to complete and thus can be administered during patient visits. Translating the OHIP-14 into different languages is recommended to support holistic patient care and maintain the life quality of diabetic patients. A holistic, comprehensive approach to the management of such patients is highly advisable. Biopsychosocial management strategies should be implemented. Diabetes is a chronic progressive disorder, and forming a team with a physician and a dentist will not only uphold QoL but also assist in controlling the disease.

## Conclusion

Our study has translated and validated the OHIP-14 for adult diabetic patients. The questionnaire showed sufficient reliability and validity, which suggests its appropriateness to assess QoL. The study also documented the negative impact of diabetes mellitus on life quality and the widespread presence of multiple oral lesions among diabetics. A holistic approach and greater collaboration between physicians and dentists are mandatory to support QoL among diabetics.

## Ethics approval and informed consent

Ethical approval was obtained from the Research Ethics Committee, Deanship of Scientific Research, King Saud University, Riyadh, Saudi Arabia (KSU-IRB 017E). Participation was voluntary, and consent was obtained before contribution. All participants were informed about the purpose of the study before contribution. This study was conducted in accordance with the Declaration of Helsinki.

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Nil.

## Conflicts of interest

There are no conflicts of interest.

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