



Determining the Short-term Effects of Smoking Cessation Using Nicotine Gum on Oral Health-Related Quality of Life: A Pilot Study

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Abstract

Background: Nowadays, the adverse effects of smoking on general, oral, and dental health are reported time and again worldwide. However, evidence to quantify the effects of tobacco smoking and smoking cessation on health-related quality of life (HRQoL) and oral health-related quality of life (OHQoL) is inadequate. Accordingly, this study aimed to assess the effects of nicotine gum on HRQoL and OHQoL of cigarette smokers.

Methods: This pilot study was conducted on 40 smokers, half of whom received nicotine gum. HRQoL and OHQoL were measured twice at the beginning of the study and after three months using standard versions of Short Form Health Survey (SF-12) and Oral Health Impact Profile (OHIP-5) questionnaires. T-test, Fischer's exact test, and Pearson's correlation coefficient were used to compare the participants' scores on the questionnaires.

Findings: The mean age of the participants was 43.39 ± 12.32 years. Using nicotine gum significantly increased the scores of general health ($P=0.046$) and physical functioning ($P=0.021$) domains of HRQoL in comparison with the cigarette smoking group. Moreover, using nicotine gum significantly increased the scores of the two questions about the reduced sense of taste ($P<0.001$) and difficulty doing usual jobs ($P=0.071$).

Conclusion: Using nicotine gum was associated with the improvement of HRQoL and OHQoL to some extent. To better understand the relationship between smoking cessation and improved OHQoL, it is necessary to conduct further studies in this field.

Keywords: Quality of life, Oral health, Smoking cessation, Nicotine gum

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Introduction

Smoking is the act of burning tobacco and inhaling the smoke that is produced through the mouth into the lungs.¹ It is estimated that approximately one billion people are smokers all around the world, accounting for almost 30% of the male and 7% of the female population.² Smoking is the main cause of preventable deaths worldwide. The results of various studies have revealed that the lifespan of people who preserve this habit will be on average 10 years shorter than that of people who have never turned to it.^{1,3}

Quality of life (QoL), which is defined as a measure of the perception of a person about their general health status and the degree of satisfaction or dissatisfaction with the various aspects of the impacts of general health on their lives, has become a major criterion in clinical and research assessments and QoL clearly shows lower

scores in smokers in comparison with non-smokers.⁴⁻⁶

Oral cavity is usually the first area of the body that is exposed to the harmful effects of smoke and its dangerous compounds. Due to the importance of the oral cavity and its function in human life, oral health-related quality of life (OHQoL) has been set as a criterion to determine based on self-evaluation, to what extent functional, psychological, and social factors affect discomfort, inaccuracy, and the experience of pain associated with dental and oral difficulties.⁷ Smoking has an adverse effect on the OHQoL and it is expected that these effects will be eliminated in those who attempt to quit this noxious habit. Nicotine replacement therapy (NRT) is one of the most widely used methods for smoking cessation.⁸ Nicotine supplements are available in various forms, such as pills, skin patches, sprays, and chewing gum.^{8,9}



There have been no studies investigating the relationship between OHQoL and smoking cessation methods so far. Therefore, this study aimed to investigate the effects of NRT (nicotine-containing chewing gum) on health-related quality of life (HRQoL) and OHQoL.

Methods

Participants

This was a pilot study and the participants were divided into two groups. The first group comprised smokers who wanted to quit smoking and sought treatment at a smoking cessation clinic. The second group included daily smokers who have smoked for more than a year. The smokers were selected from among the patients who visited the Faculty of Dentistry in Kerman and the members of the cessation group were selected from the visitors to the smoking cessation clinic using convenience sampling method.

All participants took part in the study voluntarily after the objectives were explained, and they were free to leave the study at any time in case of any side effects (such as nausea or dizziness) due to the consumption of nicotine-containing gum. Written consent was completed for members of the group wishing to quit smoking. Nicotine gum was provided free of charge to the smoking cessation group. All personal details of the participants were kept confidential and their names were not mentioned in the data collection forms. The proposal for the research was approved by the Ethics Committee of Kerman University of Medical Sciences under the code IR.KMU.REC.1399.443.

Inclusion and exclusion criteria

The participants who met the inclusion criteria entered the study. The inclusion criteria were age over 18 years, having no history of systemic diseases (especially cardiovascular conditions) or mental disorders, receiving no regular medication or other forms of home remedies, not using alcohol, drugs, and any type of tobacco, including cigars, pipes, hookahs, etc. Those who currently or before quitting smoked at least 20 cigarettes (one pack) per day were included in the study. Pregnant women and people with temporomandibular joint disorder symptoms were excluded from the study.

Instruments

Two questionnaires assessing QoL and OHQoL were completed for both groups twice, with an interval of three months. Individuals in the smoking cessation group used nicotine-containing chewing gum (Nicolife- Kimia Afarinan Alborz Co., Iran) daily for three months (with a minimum of a 2-mg chewing gum, a maximum of 24 gums, and an average of 9 gums per day). The consumption of these gums is different from normal chewing gums and its rapid chewing causes rapid absorption of nicotine,

constipation, and sore throat.¹⁰

Short Form Health Survey (SF-12) was used to evaluate the QoL. This questionnaire includes one or two questions for each of the eight scales: General health (Q1), Physical functioning (Qs 2 and 3), Role limitations due to physical health (Qs 4 and 5), Role limitations due to mental health (Qs 6 and 7), Social functioning (Q8), Bodily pain (Q9), Vitality (energy and fatigue) (Qs 10 and 11), and Emotional well-being (Q12).

There are various answers to these questions, hence to evaluate the answers, a six-point Likert scale was used. The corresponding options vary from 2 (Yes/No) to 6 (Very Often, Fairly Often, Occasionally/Sometimes, Hardly ever, Never);

The scoring procedure is as follows:

- For questions 1, 8, 9, 10, and 11, the first item is given a score of 100, the second item a score of 75, the third item a score of 50, the fourth item a score of 25, and the fifth item is given a score of 0.
- For questions 2, 3, 4, 5, 6, 7, and 12, the first item is given a score of 0, the second item a score of 50, and the third item a score of 100.

To calculate the scores of the eight scales, the scores related to each scale are added up and divided by the number of questions, and the scores for each scale range from 0 to 100.¹¹ A lower score indicates a lower QoL. The Persian version of the questionnaire was validated by Montazeri et al.¹¹

The ultrashort version of the Oral Health Impact Profile (OHIP-5) was used to measure OHQoL. The Persian version of this tool has been validated by Nazeri et al.¹² This scale assesses OHQoL through questions about dental or oral complications based on one's experience in the previous 12 months. The answers to the questions are scored from 0 to 4 for never, hardly ever, occasionally, often, and always, respectively. The total score ranges from 0 to 20, and the higher the score, the poorer the OHQoL.

A structured researcher-made checklist was also used to evaluate participants' age, sex, duration of smoking, and the average number of consumed cigarettes per day. The questionnaires were completed by the interviewer twice, at the beginning and the end of the study.

Sample size and statistics

Based on a previous study¹⁰ and considering an alpha value of 0.05 and a test power of 85%, the sample size in this study was determined as 40 (each group with 20 members). Independent samples t-test and paired samples t-test were used to compare the two groups at each turn and between time intervals. Besides, Fischer's exact test was used to compare the mean total scores of the questionnaires at the beginning and end of the assessment, and Pearson's correlation coefficient was used to examine the correlation between the two questionnaires. Data

were statistically analyzed using SPSS software.

Results

The majority of the participants were male (77.5%), self-employed (46.2%), and married (77.5%) with a high school diploma (44.7%). The mean age of the participants was 43.39 ± 12.32 years with a range of 23 to 73. There were no specific side effects associated with the use of nicotine gum (Table 1).

The mean scores of the two groups in eight scales of the SF-12 were compared within two time periods. As it can be seen, the paired samples t-test showed there was a significant difference in energy and fatigue ($P=0.017$). After 3 months and following the consumption of nicotine gum by the first group, significant differences were observed in not only energy and fatigue ($P<0.001$) but also in general health ($P=0.046$) and physical functioning ($P=0.021$) (Table 2). A significant difference was seen in general health ($P=0.029$), physical functioning ($P=0.001$), social functioning ($P=0.002$), and pain ($P=0.083$) which indicates that using nicotine gum has improved the QoL of these people compared to themselves in these four scales ($P<0.05$: significant) (Table 2).

The mean total scores of SF-12 for the two groups were compared at the beginning and end of the study using Fisher's exact test, and a significant difference was observed between the nicotine-gum consumers and the smoking group ($P=0.071$) concerning question 5 ("Have you had difficulty doing your usual jobs because of dental problems?"). In addition, there was a significant difference regarding the third question ("Have you found it uncomfortable to eat any foods because of problems with your teeth or mouth?") in the 3-month interval

($P<0.001$) ($P<0.05$: significant) (Table 3).

The mean total scores for the OHIP-5 did not show any significant relationship between the two groups at the beginning ($P=0.246$) and at the end of the study ($P=0.783$).

Discussion

This study investigated the effects of nicotine gum on HRQoL and OHQoL in smokers. The results showed that consumption of nicotine gum can improve some aspects of HRQoL and OHQoL. The present study was the first to assess the effects of chewing gum on OHQoL. A relatively similar clinical trial conducted by Rungruanghiranya et al¹⁰ showed using nicotine gum has a significant effect on HRQoL which is similar to the results of the present study.

The current study revealed OHQoL was improved following the consumption of nicotine gum concerning the two questions: "Have you found it uncomfortable to eat any foods because of problems with your teeth or mouth?" and "Have you had difficulty doing your usual jobs because of dental problems?" related to the functional limitation and social disability domains of OHQoL. The results of Sagtani and colleagues study also showed that the level of OHQoL of non-smokers in these two domains is higher than that of smokers, which is similar to the findings of the present study. However, Sagtani et al also reported higher levels of OHQoL in non-smokers in mental disability and physical pain,¹³ which was not observed in the present study. It should be noted that in the study by Sagtani et al, comparisons were only made between smoker and non-smoker groups, and smoking cessation was not raised as an issue as in the present study. Bakri et al also stated that low OHQoL

Table 1. Demographic characteristics of the participants

	Gender			Occupation				Education			Marital status		
	Male	Female	Housewife	Self-employed	Employed	Retired	Unemployed	Student	Undergraduate	Diploma	Academic degree	Single	Married
Cessation Group (A%)	13 (65)	7 (35)	2 (10)	9 (45)	5 (25)	2 (10)	2 (10)	0 (0)	3 (15)	12 (60)	5 (25)	5 (25)	15 (75)
Smoking Group (B%)	18 (90)	2 (10)	3 (15.8)	9 (47.4)	3 (15.8)	2 (10.5)	1 (5.3)	1 (5.3)	7 (38.9)	5 (27.8)	6 (33.3)	4 (20)	16 (80)
Total	31 (77.5)	9 (22.5)	5 (12.8)	18 (46.2)	8 (20.5)	4 (10.3)	3 (7.7)	1 (2.6)	10 (26.3)	17 (44.7)	11 (28.9)	9 (22.5)	31 (77.5)

Table 2. Comparison of the mean scores of the two groups in two intervals measured by SF-12

Scales	A1	B1	P value A1 vs. B1	A ₂	B2	P value A2 vs. B2
General health	67.5 ± 16.42	51.25 ± 33.9	0.064	55 ± 21.54	42.1 ± 14.55	0.046
Physical functioning	120 ± 61.55	70 ± 100.71	0.346	152.5 ± 61.71	102.5 ± 69.72	0.021
Physical health	135 ± 81.27	90 ± 78.8	0.083	155 ± 75.91	140 ± 75.39	0.534
Mental health	130 ± 80.13	115 ± 81.27	0.56	155.55 ± 51.13	145 ± 68.63	0.598
Social functioning	47.5 ± 30.24	50 ± 33.44	0.802	26.25 ± 24.96	26.25 ± 24.47	1
Bodily pain	36.25 ± 33.9	50 ± 35.35	0.217	25 ± 25.64	32.5 ± 31.51	0.414
Vitality	79 ± 44.7	113.68 ± 41.66	0.017	87.77 ± 29.21	152.63 ± 19.1	0.0001
Emotional well-being	45 ± 25.85	39 ± 31.43	0.514	54.44 ± 26.39	48.42 ± 29.29	0.516

A: cessation group; B: smoking group.

Table 3. Comparison of changes in the mean total scores of SF-12 in two intervals between the two groups

Scale	P value A1 vs. A2	P value B1 vs. B2
General health	0.029	0.269
Physical functioning	0.001	0.874
Physical health	0.214	0.038
Mental health	0.288	0.209
Social functioning	0.002	0.011
Bodily pain	0.083	0.095
Vitality	0.529	0.006
Emotional well-being	0.227	0.323

A: cessation group; B: smoking group.

levels were associated with smoking although they did not mention the communication domains of OHQoL.¹⁴ In another study, Morin et al examined the relationship between smoking and one's overall perception of his/her dental health status and concluded that smokers' self-report of poor dental health was kind of evidence for their poor QoL. However, not using specific questionnaires to assess OHQoL levels makes it impossible to compare the results of studies such as the one by Morin et al with those of the present study.¹⁵ Smoking cessation helps to increase OHQoL levels by improving the ability to eat and reducing the progression of periodontal diseases. A systematic review by Fiorini et al showed that smoking cessation has positive effects on restraining periodontitis and improving periodontal tissue health.¹⁶

The present study also showed using nicotine gum improved HRQoL among participants in four domains including general health, physical functioning, social functioning, and bodily pain. Levy et al also found that in terms of general health, HRQoL levels were higher in participants who quit smoking compared to heavy smokers,¹⁷ while Mangan et al confirmed mental health improvement following the cessation of smoking is more sensible than the physical health aspect of HRQoL.¹⁸ The results of Bloom and colleagues' study were also similar to those of the present study, confirming the improvement of physical health after smoking cessation, but it should be noted that in the study by Bloom et al, initiating exercise methods were used instead of nicotine supplements.¹⁹ The studies by Levy et al and Mangan et al did not mention the method of cigarette cessation.^{17,18} Evidently, quitting smoking leads to a return to the health of vital organs of the cardiovascular and respiratory systems, thereby improving general health and physical functioning.

In the present study, no relationship was observed between the number of cigarettes smoked per day and duration of smoking with OHQoL and HRQoL, while Mangan and colleagues study indicated that the higher the number of cigarettes smoked by smokers, the greater the difference between their QoL and that of non-

smokers.¹⁸ Tomioka et al also showed that daily smoking rates (before quitting) could be a predictor of improving the QoL following smoking cessation,²⁰ which is not consistent with the results of the present study. Bellido Casado et al and Laaksonen et al also reported that increasing the number of consumed cigarettes per day could weaken HRQoL.^{21,22}

OHIP-5 and SF-12 were used in the present study to measure OHQoL and HRQoL. In similar studies, Bakri et al and Sagtani et al used OHIP-14 to measure OHQoL.^{23,24} It should be noted that OHIP-5 and SF-12 are short form versions of SF-36 and OHIP-14. As these questionnaires were shortened using standard methods and their validity and reliability were measured and approved, using the short versions made the measurements much easier.

The mean age of the participants in this study was 43 and the minimum age was 23 years old. The age of the onset of smoking is declining, and the tendency to start smoking can be seen even in adolescents. In the study by Rungruanghiranya et al, which is the most similar to the present study in terms of methodology, the mean age of the participants was 45 years old in the nicotine gum group and 43 in the placebo group (similar to the present study).¹⁰ Gasperini et al stated that the lower the age at which people successfully quit smoking, the more pronounced their QoL will improve.²³

The follow-up period in this study was three months, which was based on similar studies.²⁴ However, Mangan et al and Levy et al indicated that the apparent differences in QoL among individuals become more considerable over time, even up to 10 years.^{17,18} Contrary to the present study, Bolliger et al examined the effects of smoking cessation on long-term improvement in QoL and demonstrated a reduction of at least 50% of daily smoking had positive effects on QoL within two years.²⁵

One of the limitations of the present study was not considering the basic oral health status of the participants, which could affect the differences in OHQoL levels of the two groups from the beginning. Future studies are recommended to match the study groups as much as possible in terms of dental and systemic health, or oral health by calculating dental caries and periodontal disease indicators along with measuring the QoL of smokers and those who tend to quit. Because of this limitation, this study was considered a pilot study. It is also suggested that in future studies, the effects of other existing methods of smoking cessation, such as behavioral methods, be compared with those of nicotine replacement methods, and the effects of smoking cessation on OHQoL be monitored and evaluated over longer periods (more than a year).

Conclusion

The results of the present study showed that smoking cessation using nicotine gum can improve HRQoL and

OHQoL. More specifically it influences the physical health domain of HRQoL and the comfort of eating in OHQoL. It should be noted that determining the exact effects of smoking cessation using nicotine supplements on OHQoL requires long-term research.

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Competing Interests

The authors declared no conflict of interest.

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