

Change in Nutrition among Patients with Temporomandibular Disorder after Removable Partial Denture Wear

Daisy Supandi¹, Ira Tanti^{2*}, Nina Ariani²

1. Prosthodontics Residency Program, Department of Prosthodontics, Faculty of Dentistry, Universitas Indonesia, Jakarta, Indonesia.
2. Department of Prosthodontics, Faculty of Dentistry, Universitas Indonesia, Jakarta Indonesia.

Abstract

Posterior tooth loss can lead to masticatory difficulties and can affect nutrition intake and thus the nutritional status of patients. Denture replacement may improve mastication and nutritional intake. Previous studies examining the nutrition intake and nutritional status of denture wearing patients have shown inconclusive results. In this observational study, we analyzed the relationship between temporomandibular disorder (TMD), denture wear, and nutrition intake. We enrolled 28 patients (aged ≥ 45 years) with missing posterior teeth treated with dentures at the Dental Hospital, Faculty of Dentistry, Universitas Indonesia. TMD was diagnosed through oral examination. The semi-quantitative Food Frequency Questionnaire (FFQ) was used to measure nutrition intake (Kcal) at baseline and after 4, 8, and 12 weeks of denture wear. A significant difference was seen in nutrient intake between the TMD and non-TMD groups before and after denture wear. At baseline, nutrition intake of the TMD group was $1,330.45 \pm 141.29$ Kcal, whereas that of the non-TMD group was $1,416.41 \pm 143.27$ Kcal. A repeated-measures analysis of variance showed a significant difference in nutrition intake among both the groups before and after wearing the dentures ($P \leq 0.05$). Denture wear improves nutrition intake among pre-elderly and elderly TMD patients.

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Introduction

With aging, the risk of health problems such as oral disease increases. A study reported that the prevalence of caries among participants was 90.9%, with an average decayed, missing, and filled teeth (DMFT) score of 6.4. The prevalence of caries and DMFT score were higher in elderly people, those with less education, and those with a low economic status. The highest DMFT scores were seen among those aged ≥ 65 years, with only 30.4% of this population having a normally functioning dentition.¹ Ikebe et al. reported that occlusal forces and masticatory ability are significantly associated with posterior occlusion. Masticatory ability is reduced with an increase in the loss of occlusion. This finding indicates that occlusal force has a strong correlation with posterior teeth,

primarily via premolar occlusion.² Nguyen et al. suggested that missing posterior teeth leading to a loss of occlusal support on either or both sides of the dental arch is a risk factor for temporomandibular disorder (TMD) development.³

There are several complex and multifactorial etiologies of TMD, such as occlusal condition, trauma, emotional stress, deep pain input, and parafunctional activity. The symptoms comprise pain in the masticatory muscles and temporomandibular joint, ear pain, headache, limited or deviation in mandibular movement, and a clicking sound.⁴ One of the predisposing etiologies of TMD is malocclusion. The literature shows that in individuals with the absence of the posterior teeth, the possibility of degenerative changes and TMD development increases. The absence of posterior occlusion causes masticatory difficulties, leading to an increased tenderness of the masticatory muscles and reduced performance of the temporomandibular joint (TMJ). An inadequate occlusal contact may also overload TMJ and increase the risk of TMD development.³⁻⁵ The association between the loss of posterior teeth and TMD lies in the fact

*Corresponding author:

Ira Tanti,
Department of Prosthodontics
Faculty of Dentistry, Universitas Indonesia
Email: iratanti@ymail.com

that patients lose the occlusal stability and the vertical dimension of occlusion, which is followed by the appearance of changes in TMJ.⁶

Elderly people with a poor oral health status tend to complain more about masticatory difficulties, leading them to choose softer food; however, it is questionable whether the choice of food will provide balanced nutrition.⁷ Chewing correlates with dysfunction in patients with TMD, who may reduce mastication to avoid aggravation of facial pain by reducing dietary fiber intake.⁸ A study by Iwasaki et al. concluded that the intake of multiple nutrients was significantly lower in patient groups with fewer posterior occluding teeth.⁹ However, to our knowledge, no study has examined the relationship of tooth replacement and the duration of wearing dentures with nutrition intake among pre-elderly and elderly TMD patients.

In this study, we analyzed nutrition intake of TMD patients with posterior tooth loss using the Food Frequency Questionnaire (FFQ), a nutrition survey that has been widely adopted to evaluate the intake of food and nutrients. It is considered a useful tool and is frequently applied to different populations. FFQ can be adjusted to increase the accuracy of nutrition research studies.¹⁰

Materials and methods

This study was approved by the ethical committee of the Faculty of Dentistry, Universitas Indonesia (No. 3/Ethical Approval/FKG/I/2019). A total of 28 patients at our dental hospital provided informed consent for study participation. We included patients with missing posterior teeth with a maximum of two posterior occlusal contact points, those aged ≥ 45 years, those with the ability to communicate verbally, and those with no systemic disease.

Tooth loss was classified based on the presence or absence of occlusal contact in the posterior area, a maximum of two support zones and no support zone. Meanwhile, the diagnosis of TMD was made on the basis of patients' signs and symptoms using the Diagnostic Criteria for Temporomandibular Disorders (DC/TMD) form and clinical examination. Initially, each patient was questioned whether he/she was aware of any of the specific signs associated with TMD such as TMJ tenderness, limitation or deviation of mandibular movement, joint sounds (e.g.,

clicking or crepitus), and masticatory muscle tenderness.¹¹

The questionnaire used for nutrition intake was the semi-quantitative FFQ, which comprises three components: food list, eating frequency, and food portion. This questionnaire was adopted to calculate the amount of energy intake in Kcal. Study groups were provided the questionnaire and asked about their daily food portion. Images of 100 g of food listed in the semi-quantitative FFQ were used to facilitate data collection.^{10,12} Each food intake amount was calculated and then summed to determine the total energy intake.

Before dispensing removable partial dentures to all patients, we performed clinical examination for TMD and provided questionnaires to the patients; these questionnaires were repeated at 4, 8, and 12 weeks after the insertion of removable partial dentures to assess the change in nutrition intake among TMD patients. One examiner performed all clinical examinations for TMD using a standard operational procedure. Data were analyzed using the Statistical Package for the Social Sciences version 22.0 software program (IBM Corp., Armonk, NY, USA). Univariate analysis was performed to determine the frequency distribution of each variable, and bivariate analysis was performed to determine the relationship between variables.

Results

Of the 28 study participants (13 males and 15 females), 12 (42.9%) had TMD and 16 (57.1%) did not (Table 1).

After measuring the normality of the variables, a repeated-measures analysis of variance (ANOVA) was performed to understand the significance of nutrition intake in TMD patients (Table 2). A significant difference in nutrition intake was noted in both the TMD and non-TMD groups before and after wearing the dentures ($P \leq 0.05$). The mean nutrition intake at baseline was lower in the TMD group than in the non-TMD group ($1,330.45 \pm 141.29$ Kcal vs $1,416.41 \pm 143.27$ Kcal). Nutrition intake in both the groups increased gradually after denture wear, although there was no significant between-group difference in nutrition intake across all time periods ($P > 0.05$).

Variables	n = 28	Percentage (%)
TMD		
TMD	12	42.9
No TMD	16	57.1
Gender		
Male	13	46.4
Female	15	53.6

Table 1. Participants' characteristics.

	Nutrition intake (Kcal)				P-value	
	Mean ± SD					
	Baseline	4 weeks	8 weeks	12 weeks		
TMD (n = 12)	1330.45 ± 141.29	1602.14 ± 127.4	1753.34 ± 118.47	1870.58 ± 107.11	.001*	
Non-TMD (n = 16)	1416.41 ± 143.27	1633.58 ± 117.15	1749.4 ± 83.83	1852.05 ± 85.62	.001*	
P-value	0.13	0.5	0.92	0.62		

Table 2. Nutrition intake of TMD and non-TMD groups at baseline and after denture wear.

Repeated-measures ANOVA test

* P-values were significant at < 0.05.

The mean nutrition intake of the study population at baseline was $1,379.57 \pm 146.33$ Kcal, whereas at 12 weeks of denture wear, it was 1860 ± 94 Kcal (Table 3).

The repeated-measures ANOVA showed significant differences ($P \leq 0.05$) in nutrition intake between baseline and after 4, 8, and 12 weeks of denture wear. Moreover, post hoc analysis revealed significant differences in nutrition intake between all periods of denture wear ($P \leq 0.05$).

Nutrition intake	Mean ± SD (Kcal)	P-value
Baseline	1379.57 ± 146.33	
4 weeks	1620.11 ± 120.37	
8 weeks	1751.09 ± 98.11	.001*
12 weeks	1860 ± 94	

Table 3. Total nutrition intake (TMD and non-TMD groups) before and after denture wear.

Repeated-measures ANOVA test

* P-values were significant at < 0.05.

Discussion

To our knowledge, this is the first study in Indonesia focusing on nutrition intake in TMD patients with posterior tooth loss. Nutrition intake was measured using FFQ, which is considered to be one of the most practical and economical methods for collecting data on dietary intake. The questionnaire is typically self-administered, asking respondents to report their usual frequency of consumption of items from a list of foods for a specific time period. It is quite simple to conduct, and the food list in the questionnaire can be adjusted to include ethnic-specific foods of the population under study.¹³ However, this questionnaire has limitations because it relies on respondents' memory to recall the kinds of food they consume and cannot be used to measure the absolute intake portion for specific nutrients.

In this study, the participants were stratified into the TMD and non-TMD groups with the presence or absence of occlusal contact in the posterior area, a maximum of two support zones and no support zone. An increase in the loss of occlusal contact may reduce the masticatory ability.² This can also lead to an increased tenderness of the masticatory muscles and reduced performance of TMJ. Inadequate occlusal contact may also overload TMJ and increase the risk of TMD development.^{3,6} In an earlier research regarding the etiology index of TMD in Indonesia, it was reported that participants with an abnormal Freeway space had a 1.99-time greater risk of TMD development than those with a normal Freeway space (2–4 mm).¹⁴ The findings of the present study showed that there was improvement in nutrition intake along with denture wear; furthermore, there was a significant improvement in the outcomes regarding nutrition intake among both TMD and non-TMD patients with posterior tooth loss, although there was no difference in nutrition intake between the groups.

Masticatory difficulties due to TMD⁸ may explain why the nutrient intake of the TMD group was lower than that of the non-TMD group at baseline. This finding correlates with that of a study on elderly people in Korea reporting that oral health status influences nutritional intake while dietary imbalances arising from this influence can be a risk factor for the overall health of the elderly.⁷ The mean nutrition intake was also increased along with denture wear and

showed a significant improvement. This may be because the groups adapted well to their dentures and regularly ate softer food containing carbohydrates that was easier to chew. A study conducted on elderly people in Japan concluded that oral health status determined by the posterior occluding teeth and denture fit can influence an individual's food choices and nutrient intake.⁹

The primary limitation of this study is that the research only showed relationships but did not investigate the types of food consumed by the groups before and after denture wear. Moreover, this study did not investigate the etiology of TMD in the patients. Therefore, we must pursue further study regarding the types of food consumed over a period of time and elucidate the etiology of TMD.

Conclusions

There is significant improvement in nutrition intake in pre-elderly and elderly patients with TMD after denture wear.

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Declaration of Interest

The authors report no conflict of interest.

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