Denture Stomatitis and its Predisposing Factors in Denture Wearers

Ruchadaporn Kaomongkolgit[1], Adjabhak Wongviriya[1], Pissacha Daroonpan[1], Ronnayut Chansamat[2], Weeraya Tantanapornkul[1], Jadesada Palasuk[3]

1. Department of Oral Diagnosis, Faculty of Dentistry, Naresuan University, Phitsanulok 65000, Thailand.
2. Department of Preventive Dentistry, Faculty of Dentistry, Naresuan University, Phitsanulok 65000, Thailand.
3. Department of Restorative Dentistry, Faculty of Dentistry, Naresuan University, Phitsanulok 65000, Thailand.

Abstract

The purpose of this study was to determine the prevalence of denture stomatitis in denture wearers and to correlate the prevalence with local, systemic and denture factors.

Three hundred and five removable denture wearers were interviewed and examined. The association between denture stomatitis and studied variables including gender, age, systemic diseases, medication usage, smoking, type of denture, method of denture cleaning, and nocturnal denture wearing was analyzed using Chi-square test. The correlation between variables was then determined by using logistic regression analysis. Statistical significance was defined as $p < 0.05$.

The prevalence of denture stomatitis in denture wearers was 33.4% (Type I or pinpoint hyperemia: 12.8%, Type II or diffuse erythema: 7.5%, Type III or papillary hyperplasia: 13.1%). Chi-square tests showed significant associations between denture stomatitis and gender, age, type of denture and nocturnal denture wearing ($p< 0.01$). Type III denture stomatitis was more common in the partial denture wearers than the other types ($p = 0.043$). Logistic regression analyses revealed that the prevalence of denture stomatitis was independently associated with age, gender, denture type, and nocturnal denture wearing.

The prevalence of denture stomatitis was high in denture wearers. The univariate analysis and logistic regression analysis revealed that the denture stomatitis were significantly associated with females, aged below 60 years old, partial denture wearer and nocturnal denture wearing.

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Introduction

Denture stomatitis is a very common disease affecting denture wearers. It occurs up to 70% of denture wearers.[1] Several studies suggest that up to two-thirds or more of individuals who wear removable complete dentures can suffer from denture stomatitis.[1,2] Despite its frequency, denture stomatitis is usually asymptomatic. It is clinically diagnosed as inflammatory lesion which illustrates redness and edema of oral mucosa that contact with the fitting surface of a removable denture.[3] Despite its commonality, the etiology of denture stomatitis is poorly understood. Associations of denture stomatitis have been reported with *Candida* and bacterial infection, medical conditions, nutritional status, smoking, denture status, denture hygiene habits and nocturnal wearing of dentures.[4-10] However, there is no clear picture of its etiology. The current thinking is that the etiology of denture stomatitis is elaborate and multifactorial which related to local, systemic, and denture factors. Several studies published its etiologies and prevalence, however, the conclusion is still controversial due to the variations in the research methodology.[11-16] Moreover, predisposing factors of the denture stomatitis should be studied with multivariable analysis to assess the influence of these factors. To the best of our knowledge, there are few epidemiological studies in Thailand that focus on denture stomatitis. Previous studies reported that the prevalence of denture stomatitis was 14.3% of 252 Thai elderly dental patients[15] and 18.1% of 380 Thai denture wearers.[16] Therefore, the aim of this study was to identify the prevalence of denture stomatitis in

Corresponding author:
Associate Professor Ruchadaporn Kaomongkolgit
Department of Oral Diagnosis, Faculty of Dentistry,
Naresuan University, Phitsanulok 65000, Thailand.
E-mail: ruchadapornk@nu.ac.th

denture wearers and to identify the relationship between its prevalence and age, gender, systemic diseases, medications, smoking, type of denture, method of denture cleaning and nocturnal denture wearing.

Materials and methods

Three hundred and five removable denture wearers who participated in oral examination and treatment planning procedures at the Oral Diagnosis and Oral Medicine Clinic of the Dental Hospital, Naresuan University, Thailand were interviewed and examined. The study protocol was approved by the Naresuan University Institutional Review Board (COA No.221/2015). All participants were examined by the dentists who were specialized in oral medicine. The diagnosis of denture stomatitis was made according to the World Health Organization's Guide to Epidemiology and Diagnosis of Oral Mucosal Diseases and Conditions.[17]

This guideline is based on the clinical appearance of the inflamed palatal mucosa, regardless of the presence of *Candida albicans* in cytological smears obtained from the affected area. Denture stomatitis were classified into three clinical types as follows: type I, characterized by a localized inflammation and/or pinpoint hyperaemia; type II, characterized by diffuse erythema and type III, characterized by papillary hyperplasia(Figure 1). Data related to gender, age, systemic diseases, medications, smoking, type of denture, method of denture cleaning, and nocturnal denture wearing were recorded. Denture wearers were divided into subgroups according to age (< 60 years old and ≥ 60 years old), type of denture (complete denture wearer/CDW and partial denture wearer/PDW), and cleaning methods (mechanical cleaning and a combined mechanical and chemical cleaning). The data were submitted to a descriptive analysis. The association between denture stomatitis and studied variables including gender, age, systemic diseases, medication usage, smoking, type of denture, method of denture cleaning, and nocturnal denture wearing was analyzed using Chi-square test.

The correlation between variables was then determined using logistic regression analysis. Statistical analysis was performed using SPSS for Windows software (version 17.0; SPSS Inc., Chicago, IL, USA). Statistical significance was defined as $p < 0.05$.

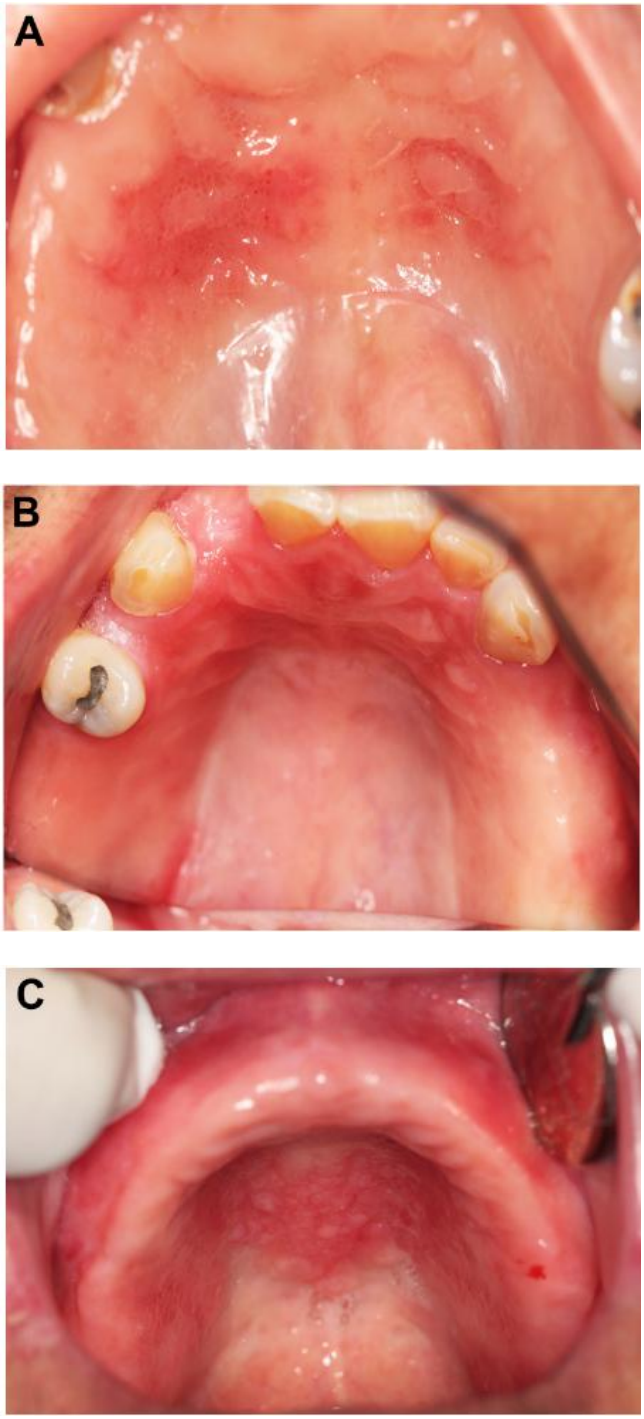

Figure 1. The clinical appearance of denture stomatitis. (A) Type I denture stomatitis, characterized by a localized inflammation and/or pinpoint hyperaemia. (B) Type II denture stomatitis, characterized by diffuse erythema. (C) Type III denture stomatitis, characterized by papillary hyperplasia.

Results

The distribution of denture wearers in relation to gender and type of denture worn is listed in Table 1.

Type of denture	Number of denture wearers (%)		
	Male	Female	Total
CD in both jaws	24 (7.9)	41 (13.4)	65 (21.3)
CD in upper jaw only	7 (2.3)	12 (3.9)	19 (6.2)
CD in lower jaw only	1 (0.3)	0 (0)	1 (0.3)
CD in upper jaw with PD in lower jaw	7 (2.3)	12 (3.9)	19 (6.2)
PD in upper jaw with CD in lower jaw	2 (0.7)	10 (3.2)	12 (3.9)
PD in both jaws	24 (7.9)	35 (11.5)	59 (19.4)
PD in upper jaw only	34 (11.2)	83 (26.8)	117 (38.4)
PD in lower jaw only	4 (1.3)	9 (3.0)	13 (4.3)

Table 1. The distribution of denture wearers in relation to gender and type of denture worn.
CD, complete dentures, PD, partial dentures.

Factors	Presenting of denture stomatitis			
	Absent (n=203) n (%)	Present (n=102) n (%)	*p*-value	Odd Ratio
Age*				
Below 60	84 (41.4)	69 (67.6)	< 0.01	2.962
60 or above	119 (58.6)	33 (32.4)		0.338
Gender*				
Male	83 (40.9)	20 (19.6)	< 0.01	0.017
Female	120 (59.1)	82 (80.4)		2.648
Systemic disease				
Have	124 (61.1)	53 (52.0)	0.128	
Do not have	79 (38.9)	49 (48.0)		
Current medication				
Use	114 (56.2)	46 (45.1)	0.068	
Do not use	89 (43.8)	56 (54.9)		
Smoking				
Yes	17 (8.4)	4 (3.9)	0.147	
No	186 (91.6)	98 (96.1)		
Type of denture †*				
Complete denture	84 (44.4)	19 (18.6)	< 0.01	0.28
Partial denture	105 (55.6)	83 (81.4)		3.49
Denture cleaning ††				
Mechanical	172 (90.5)	90 (94.7)	0.219	
Mechanical and chemical	18 (9.5)	5 (5.3)		
Nocturnal denture wearing †*				
Yes	80 (42.3)	72 (70.6)	< 0.01	3.27
No	109 (57.7)	30 (29.4)		0.31

Table 2. Characteristics of the studied sample in respect to the prevalence of denture stomatitis.
*by Chi-square test, * p< 0.01.*
† Only those who have denture stomatitis: Total n= 291.
†† Those who clean denture mechanically: Total n=285.

Of the 305 removable denture wearers, 103 (33.8%) were men and 202 (66.2%) were women. Their age ranged from 17-99 years old (59.0 ± 14.3 years old). The mean ages of men and women were not significantly different (61.6 ± 15.7 and 57.7 ± 13.3 years, respectively).

There were 153 denture wearers whose age was below 60 (50.2%) and 152 denture wearers who were 60 years old or above (49.8%). There were 116 (37.9%) CDWs and 189 (62.1%) PDWs. Three most common types of denture were maxillary partial denture (single denture, 38.4%), maxillary and mandibular complete dentures (21.3%), and maxillary and mandibular partial dentures (19.4%). Regarding to the age, the CDW group was significantly older than the PDW group (61.6 ± 15.7 vs. 57.7±13.3 years, $p< 0.05$).

Characteristics of the studied sample in respect to the prevalence of denture stomatitis are shown in Table 2. There were 102 (33.4%) cases of denture stomatitis and all of them were located on maxillary arch. Chi-square test revealed significant associations between denture stomatitis and studied variables including age, gender, type of denture and nocturnal denture wearing ($p< 0.01$). 177 participants had systemic disease (58.0%). The maximum number per case and the average number of systemic disease were 2 and 0.70 ± 0.673, respectively. 160 participants had current medication usage (52.5%).

The maximum numbers per case and the average medication usage were 3 and 0.54 ± 0.531, respectively. There were 21 smokers (6.9%) and 284 were nonsmokers (93.1%). 288 participants cleaned their dentures (99.7%): 262 cleaned mechanically (85.9%), 3 cleaned chemically (1.0%) and 23 cleaned both mechanically and chemically (7.5%). Only 1 participant did not clean denture (0.3%) and 16 participants cleaned denture by soaking in the water (5.2%).

	Types of denture stomatitis			
	Type I (n=39) n (%)	Type II (n=23) n (%)	Type III (n=40) n (%)	*p*-value
Age				
Below 60	22	18	29	0.145
60 or above	17	5	11	
Gender				
Male	11	3	6	0.224
Female	28	20	34	
Type of denture*				
Complete denture	12	2	5	0.043
Partial denture	27	21	35	
Nocturnal denture wearing				
Yes	30	13	29	0.221
No	9	10	11	

Table 3. Association between types of denture stomatitis and factors; age, gender, type of denture and nocturnal denture wearing.
*by Chi-square test, * p< 0.05.*

The distributions of different types of denture stomatitis in relation to age, gender, type of denture and nocturnal denture wearing are listed in Table 3.The most common type of denture stomatitis observed in this study, sorted descendingly, was type III (13.1%), followed by type I (12.8%) and type II (7.5%). Type III denture stomatitis was more common in the partial denture wearers than other types (p = 0.043).

Factors		Denture stomatitis presentation				
		N	OR	95% CI		*p*-value
				Lower	Upper	
Age group	Below 60 years old	145	1.85	1.04	3.30	0.037
	60 years old or above (Ref)	146				
Gender	Male (Ref)	98	2.66	1.44	4.90	0.002
	Female	193				
Denture type	Complete denture (Ref)	103	2.83	1.48	5.39	0.002
	Partial denture	188				
Nocturnal denture wearing	No (Ref)	139	3.20	1.85	5.56	< 0.001
	Yes	152				

Table 4. Logistic regression analysis between the presence of denture stomatitis and factors; age, gender, denture type and nocturnal denture wearing.

Results of the logistic regression analyses are shown in Table 4. Crude and adjusted odds ratios with corresponding 95% confidence intervals are shown. Prevalence of denture stomatitis was significantly related to age, gender, denture type and nocturnal denture wearing (p < 0.05).

Discussion

Epidemiological studies are a prime principle in order to better understand the distribution and aetiology of oral diseases. Furthermore, they are key elements in providing fundamental data, establishing needs and facilitating public health planning. Epidemiological studies report the prevalence of denture stomatitis among denture wearers, ranging from 15% to over 70%.[1] Different diagnostic and inclusion criteria of participants could explain the variation among studies. The prevalence of denture stomatitis among denture wearers reported in the present study was 33.4% which were similar to other studies.[18-20] However, when comparing to the studies that were done in Thailand, this study showed a higher prevalence of denture stomatitis. It was reported that the prevalence of denture stomatitis was 14.3% of 252 Thai dental school patients who were 60 years old or elder[15] and 18.1% of 380 Thai denture wearers.[16] In addition, the most common type of denture stomatitis observed in this study was type III and denture stomatitis was detected only in the maxilla mucosa. The same findings were also found in the previous reports.[14,16,21]

This study found a gender preference in respect to the prevalence of denture stomatitis. Female displayed the disorder more frequently than male. This results are in agreement with several studies showing that women are likely to have denture stomatitis.[18-22] However, this association lacks consistency in the literature since some studies supported an association between male and denture stomatitis[23-25] while others showed no gender-related effects.[15,26,27]

Unexpectedly, denture wearers whose age was below 60 years were significantly related to the presence of denture stomatitis. This finding is contradicted with most studies that reported a higher prevalence of denture stomatitis in elderly.[1,13,15,21] Furthermore, age was not related to the presence of denture stomatitis in several studies[14,24] and others reported lower prevalence with increasing age.[18,22]

With respect to types of dentures, a significantly higher prevalence of denture stomatitis in PDWs than that found in CDWs (81.4% vs. 18.6%) was observed. This finding is similar to that reported by Emami et al[28] and Jainkittivong et al.[15] Additionally, this study also found that type III denture stomatitis was more common in PDWs. However, some investigators reported more denture stomatitis in CDWs than that found in PDWs,[13,29] and no significant differences in the prevalence rate of denture stomatitis in the two denture wearing groups were also found.[14]

In the present study, nocturnal denture wearing was significantly associated with denture stomatitis. The same finding is supported by several researches.[14,24,28,30] Despite the causes of denture stomatitis that seem to be multifactorial, there are some primary risk factors involved. These factors include, denture trauma and candida infection which are both associated with nocturnal denture wearing.[4-6] Nocturnal denture wearing increases the duration of local trauma, markedly in the case of ill-fitting dentures. Moreover, it also increases the mucosal exposure to microorganism located on the fitting surface of the dentures.[24] Nocturnal wearing of the dentures can reduce the protective effect of

saliva, cleaning of the tongue and good oxygenation of the oral mucosa, which prevents the mucosa from microbial aggregation and prenetration.[28] Nevertheless, there is contradicting report on nocturnal denture wearing since Da Silva et al[13] reported no association between nocturnal denture wearing and denture stomatitis.

In this study, the association between denture stomatitis and smoking, systemic diseases or current medications was not observed. The role of these factors is still debating. For example, Martoti et al[23] and Celic et al[31] supported the role of smoking but others were not.[14,21,32] Furthermore, Dundar and Ilhan Kal[29] reported diabetes mellitus as a risk factor for denture stomatitis. However, Shulman et al[14] and Jainkittivong et al[16] showed no association between systemic diseases and denture stomatitis.

Even though, this study provides useful information regarding the prevalence of denture stomatitis and its related factors, the limitation of this study includes the lack of data concerning socioeconomic status, the use of dental services, denture biofilm accumulation, retention and stability of denture, alcohol consumption, hyposalivation and decrease of salivary pH. Therefore, it would be beneficial to address these limitation in the future study.

Conclusions

The prevalence of denture stomatitis in denture wearers was 33.4%.The most common type of denture stomatitis observed in this study was type III (papillary hyperplasia). The univariate and logistic regression analysis revealed that the denture wearers who had denture stomatitis were significantly associated with females, age below 60 years old, PDWs and nocturnal denture wearing. Type III denture stomatitis was more common in the PDWs than the other types. To reduce the risk of denture stomatitis, clear instructions on how to clean and not to wear denture at night is necessary.

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Declaration of Interest

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