Prevalence and Factors Associated with the Use of Denture Adhesives by Older Complete Denture Wearers

ABSTRACT

This study investigated the prevalence and the factors affecting the use of denture adhesives (DA) by older complete denture wearers. One hundred patients were interviewed and clinically examined for dentures' retention, stability and occlusion. A total of 31% used DA on a regular basis or sometimes: 14% used DA on both dentures, 19% on the maxillary denture and 26% on the mandibular one. DA use on the maxillary denture was significantly associated with younger age ($p=0.026$) and lower frequency of dentures' use ($p<0.005$), while their use on the mandibular denture was associated with the lower frequency of dentures' use ($p<0.05$) and good retention and stability of the maxillary denture ($p=0.007$). Multiple logistic regression analyses revealed that the DA use on maxillary dentures was significantly associated with younger age (odds ratio=0.938, $p=0.026$), while their use on the mandibular one was associated with good retention and stability of maxillary denture (odds ratio=1.451, $p=0.007$). These findings suggested that patient-driven factors, such as patients' age and denture's use habits had more significant effect on DA use than the denture's technical characteristics. Those factors should be further investigated to guide dentists in personalised recommendations on DA use to improve denture patients' quality of life.

INTRODUCTION

Denture adhesives (DA) are used to improve denture function, enhance adaptation to new dentures, and provide psychologic comfort to edentulous patients,[1] but there is still limited information on the prevalence of their use or the attitudes of dentists toward them. Previous studies in dental school patients have shown that the prevalence of DA use varies significantly between different populations,[2-5] ranging from 8% in Turkey[3] to 32.9% in Australia.[2] However, it has been speculated that their use may increase in the near future because of positive changes in the attitudes of dentists, and integration of related information within undergraduate dental education.[6]

DA products have been shown to improve denture's retention, stability, biting force, and masticatory ability,[7-13] and enhance patients' satisfaction by improved fit, comfort, chewing ability, confidence and oral health related quality of life.[2,14-16] Guidelines on the proper use of DA have been published based on the existing evidence.[17] However, a few publications reported that some edentulous patients stopped using DA after some time, for various reasons, including limited improvement in retention, function, comfort, and confidence, unpleasant taste, or getting used to a new denture.[2,3,5,12]

Keywords

Denture Adhesives
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There is currently limited information on the factors associated with DA use among complete denture wearers. Moreover, it is not clear whether similar factors affect DA use on the maxillary and mandibular dentures. Therefore, the aim of this study was: a) to investigate the prevalence and the factors affecting DA use by complete denture wearers, and b) to identify if there are any differences in the factors affecting DA use between maxillary and mandibular dentures.

MATERIALS AND METHODS

The study participants were a convenient sample of edentulous persons, wearing a set of complete dentures for at least 6 months, visiting the clinics of the Athens dental school for new dentures' fabrication or for a denture check-up. The patients were recruited, on two specific days of the week, based solely on their time availability, and were informed about the objectives and methodology of the study before providing informed consent to participate. The dentures had been previously fabricated in various private or public dental offices. The patients were interviewed and the dentures were clinically examined by the same experienced dental examiner, eliminating any inter-examiner variation.

A structured interview recorded demographic data including age, gender and level of education. The patients were also asked about the age of their dentures, the frequency of dentures' use (how often do you use your denture? a. Always, b. In daytime, c. Only on social occasions/ rarely), the prevalence of xerostomia complaints (do you feel your mouth dry? a. Yes, very often b. Yes, sometimes, c. No), and the use of DA (do you use denture adhesives? a. Yes, on a regular basis, b. Yes, sometimes, c. No). The frequency of dentures' use and DA use were investigated separately for the maxillary and mandibular dentures. Information on whether DA was prescribed by the dentist was not recorded in this study.

The maxillary and mandibular dentures were clinically examined for retention and stability using the methodology described by Kapur.[18] Good retention was recorded when a denture offered maximum resistance to vertical pull and sufficient resistance to lateral force. Sufficient stability was recorded when a denture base demonstrated slight or no rocking on its supporting structures under pressure. Each denture was considered as clinically good when the sum score was >4. The dentures' occlusion was examined by asking the patients to close and record if their posterior teeth met in occlusion. The study was approved by the Athens Dental School Ethics and Research Committee (228A/ 2014).

The results were analyzed using descriptive statistics, chi-square tests, Fisher Exact tests and t-tests. When the assumption of normality was rejected, Mann-Whitney Rank Sum tests were performed. All variables with significant associations with the use of DA of $p \leq 0.05$ were included in a multiple logistic regression analysis (1= DA use on a regular basis or sometimes, 0=no use of DA). The level of statistical significance was set at $p \leq 0.05$.

RESULTS

One hundred persons, 67 women and 33 men, with a mean age of 69.1±9.7 years (range 55-90) participated in the study. The response rate was 100%. The age of the dentures was 11.5±8.5 years (range: 6 months-34 years). Thirty one percent of the participants used DA on a regular basis or sometimes. Fourteen percent used DA on both dentures, 12% only on the mandibular one and 5% only on the maxillary one. Nineteen percent of the participants used DA on the maxillary denture and 26% on the mandibular one.

Table 1 presents the demographic and oral factors affecting DA use separately on the maxillary and mandibular dentures. Although more women than men used DA, this difference was not statistically significant when the maxillary and mandibular dentures were separately examined. However, when both dentures were included in the analysis, the female gender predominated to a significant level; 26.0% of women used DA on any of their dentures compared to 5% of men (chi-square test, p=0.03). The use of DA on the maxillary denture was significantly associated with younger patient's age (p=0.026). The frequency of denture's use significantly affected the use of DA on both dentures. More than half of the patients who rarely or "only on social occasions" used their dentures, used DA ($p<0.05$). It should be noted that the clinical characteristics of the dentures were not related to the frequency of their use (chi-square test, $p>0.05$). Xerostomia complaints were common (38.5%), but they were not associated with DA use (chi-square tests, $p>0.05$). The retention and stability of the dentures did not have any significant effect on DA use on the maxillary dentures, but the good retention and stability of the maxillary denture was related to more frequent DA use on the mandibular one (p=0.007). Dentures' occlusion did not affect the use of DA (chi-square tests, $p>0.05$).

When multiple logistic regression analyses were performed, DA use on the maxillary denture was significantly associated only with younger patients' age, while DA use on the mandibular denture was associated with the maxillary denture's good retention and stability *(Tables 2 and 3)*.

DISCUSSION

The findings in the present study revealed that 31% of the participants used DA on a regular basis or sometimes, while more patients used them on the mandibular denture (26%) compared to the maxillary one (19%). The prevalence of DA use in the present study was higher compared to the values reported in previous publications.[2,3,5] A steady increase in DA use has been recorded in consecutive studies in Athens dental school, over the past 30 years. The prevalence was 8% in 1985,[19] 14% between 1993 and 2002,[4] 26% in 2012,[5] and 31% in the present study. One of the reasons for the increased DA use may be the positive changes in the attitudes of local dentists; 60.3% of them recommended DA use to patients wearing old or recently fabricated dentures.[6]

Table 1. Factors affecting the use of denture adhesives (DA) on maxillary and mandibular dentures

Variable	Use of DA on maxillary denture (mean±SD or %)	P	Use of DA on mandibular denture (mean±SD or %)	P
Sex		P=0.133[a]		P=0.135[a]
Women	23.9		31.3	
Men	9.1		15.2	
Age		P=0.026[b]		P=0.712[c]
Yes	64.6±9.5		67.7±12.2	
No	70.1±9.5		69.6±8.7	
Education		P=0.843[a]		P=0.062[a]
>6 years	18.5		14.8	
≤6 years	23.4		38.3	
Age of dentures		P=0.139[c]		P=0.216[c]
Yes	8.7±6.7		9.8±8.3	
No	12.1±8.8		12.1±8.5	
Use of maxillary denture		P=0.003[a]		P=0.017[a]
Always	26.9		34.6	
Daytime	4.8		11.9	
On social occasions/rarely	50.0		50.0	
Use of mandibular denture		P=0.002[a]		P=0.013[a]
Always	28.5		31.0	
Daytime	6.0		16.0	
On social occasions/rarely	50.0		62.5	
Retention and stability of maxillary dentures		P=0.350[d]		P=0.007[d]
Good	26.3		52.6	
Poor	17.3		19.8	
Retention and stability of mandibular dentures		P=1.000[d]		P=0.889[a]
Good	17.4		21.7	
Poor	17.4		26.1	
Occlusion		P=0.505[a]		P=0.661[a]
Acceptable	23.3		23.3	
Poor	15.7		29.4	
Xerostomia complaints		P=0.983[a]		P=0.860[a]
Yes	20.0		26.7	
No	22.9		31.3	

[a] chi-square test; [b] t-test; [c] Mann-Whitney test, [d] Fisher Exact test

Table 2. Statistically significant associations for the use of denture adhesives (DA) on maxillary dentures, using multiple logistic regression analysis adjusted for patient's age and frequency of maxillary and mandibular dentures' use.

Independent variables	Odds ratio	P
Age	0.938	0.026
Frequency of maxillary dentures' use	0.656	0.502
Frequency of mandibular dentures' use	0.900	0.860

Table 3. Statistically significant associations for use of denture adhesives (DA) on mandibular dentures, using multiple logistic regression analysis adjusted for retention and stability of maxillary dentures, and frequency of maxillary and mandibular dentures' use.

Independent variables	Odds ratio	P
Retention and stability of maxillary dentures	1.451	0.007
Frequency of maxillary dentures' use	0.335	0.074
Frequency of mandibular dentures' use	2.230	0.162

Women used more often DA; this could be related to women being less satisfied with conventional dentures compared to men.[20]

This dental school population group derived from a general population sample, therefore their dentures were not fabricated by the same dentist and dental technician and differences in the fabrication process may be speculated. However, the dentures' evaluation was performed by the same experienced examiner to eliminate any inter-examiner variability.

The most striking finding is that the poor retention and stability of the dentures at the time of the investigation was not related to DA use, against previous concerns about potential masking underlying denture problems;[1] the study participants used DA even in well-fitting dentures. Previous studies revealed that DA use leads to significant improvement in oral health related quality of life in recently constructed dentures[15] and improved performance even in well-fitting ones.[7,9,13] Another possible explanation is that patients who started using DA due to reduced denture quality, may have continued using them even when dentures were later improved or replaced.

The bivariate analyses have shown that more than half of the patients that wore their dentures "only on social occasions" or "rarely" used DA. As DA use may increase self-confidence for social activities,[16] it may also help patients, who were not well adapted to their dentures, to actually use them, at least during social interaction. The finding that DA use on the mandibular denture was more frequent when the maxillary denture had good retention and stability may be explained by the patients' wish to equally improve their mandibular denture's functional characteristics.

The importance of psychological parameters affecting DA use is further stressed by the younger age of patients using them on the maxillary denture. A previous study in denture wearers, aged 46-89 years, has shown that the younger group experienced more psychological and social problems after tooth loss compared to the older ones.[21] In the younger denture wearers, the use of DA may improve self-confidence when using their maxillary dentures.

Persons with hyposalivation face difficulties in using their dentures and DA may improve function. In the present study, DA use was not increased in participants with xerostomia complaints and this may be explained by the potential lack of relevant patients' education or the limited actual hyposalivation present.

A study limitation is that the patients were not asked if they had been previously informed by their dentist regarding DA use. It is more likely that patients who had recently fabricated dentures had received relevant instructions.[6] However statistical analysis didn't record any variation in DA use related to the year of dentures' fabrication. The effect of any previous professional instructions on the proper DA use remains to be further investigated. Another study limitation is that the quality of the alveolar process was not recorded. Moreover, the personality type of the patients was not investigated, although it has been shown to affect patients' satisfaction with their dentures[22] and may had affected DA use.

As the findings in the present study reveal that DA use was not directly related with the dentures' technical characteristics, further studies should be conducted in a larger sample to clarify patient-driven factors that may be implicated, such as age, gender, frequency of denture use, or personality type. Moreover, novel instruments need to be developed and validated to investigate various parameters of DA use, including their effect on patient's satisfaction with the dentures and quality of life. These findings may guide dentists in personalised recommendations to complete denture wearers on the proper use of DA, avoiding at the same time any unnecessary use.

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CONCLUSIONS

A significant proportion of complete denture wearers used DA, particularly on the mandibular denture. Patients used DA even in well-fitting dentures. Younger age was the most important factor affecting the use of DA on the maxillary denture, revealing their psychological benefit to patients, while the good retention and stability of maxillary denture was related to more frequent use of DA on the mandibular one. These findings suggested that patient-driven factors such as age had affected DA use to a greater extent than the denture's technical characteristics (retention, stability and occlusion). These factors should be further investigated and defined as they may guide dentists in personalised recommendations to complete denture wearers on the use of DA to enhance adaptation to dentures and improve patients' satisfaction and quality of life.

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