

## Analysis of the effects of removable dentures on the psychological status, quality of life, and masticatory function of the elderly

R Dyas<sup>1</sup>, M Nathanael<sup>1</sup>, M Indrasari<sup>1</sup>, C Masulili<sup>1\*</sup>, T B Rahardjo<sup>2</sup>, D Agustin<sup>2</sup>, E Hogervorst<sup>3</sup> and L Kusdhany<sup>1,2</sup>,

<sup>1</sup>Prosthodontics Department, Faculty of Dentistry, Universitas Indonesia, Jakarta, Indonesia

<sup>2</sup>Center for Ageing Studies Universitas Indonesia, Jakarta, Indonesia

<sup>3</sup>Department of Human Sciences, Loughborough University, United Kingdom

\*E-mail: chaidar.masulili@yahoo.com

**Abstract.** Older age is a major risk factor for diseases of the teeth and mouth and dementia. Diseases of the teeth and mouth can lead to tooth loss. The use of removable dentures can help the elderly to replace lost teeth; therefore, dentures are expected to improve the masticatory function, quality of life, and psychological status of the elderly. The aim of this study was to analyze the effects of removable denture usage on the improvement of the psychological status, quality of life, and masticatory function of elderly people. The data was obtained from 30 respondents. The patients answered questionnaires before they used the dentures, 2 weeks after they began using dentures, and 2 months after they started wearing dentures. Four different questionnaires were used: EuroQol Five Dimensions questionnaire (EQ-5D) and Geriatric Depression Scale (GDS), to measure psychological status; a mastication questionnaire to measure masticatory function; and a validated quality of life questionnaire. Based on the results of this study, it is clear that after 2 months of denture usage, removable dentures in the elderly can significantly improve their quality of life, masticatory function, and psychological status ( $p < 0.05$ ).

### 1. Introduction

The aging population continues to increase over time; this is the case globally, including in Indonesia. In 1971, the elderly population in Indonesia reached 5.3 million; in 1990, the elderly population increased to 11.3 million; and it is estimated to reach 28.8 million in 2020. Age is a major risk factor for diseases of the teeth and mouth, plus dementia. Dental and oral diseases maybe associated with dementia. From the above explanation, it is clear that many dependencies and costs are higher in people with dementia, and there is no treatment for the disease of dementia [1]. This is correlated by previous study that shown there were large differences appeared in dementia prevalence between elderly in urban (3%) and rural sites (7-16%) which related to their education level in general [2]. Improving oral health, psychological status, and the quality of life of the elderly can be done so that the risk of dementia can be decreased in elderly individuals. According to the World Health Organization, improving oral health will improve quality of life. In Indonesia, only 41% of the elderly have good oral and dental health [1].



Dental and oral diseases are usually caused by caries and periodontal disease. Two of these conditions cause problems in the quality of life [3]. Saintrain *et al.* found that 84.7% of the elderly in Brazil had visited a dentist for dental extractions. Most of them (81.9%) complained of difficulty in eating and decreased socialization when they had tooth loss. Loss of teeth can lead to decreased quality of life, especially those teeth that cause a loss of chewing function and worsened appearance [3]. Previous study found that individuals who have less than 10 teeth run the risk of dementia threefold. Less education leads to less dental health education about maintaining oral health, thereby increasing caries, periodontal disease, and dementia. The masticatory function is reduced so that there is a reduced intake of nutrients, which causes dementia. Foods with high folate and cobalamin levels, such as green vegetables, nuts, meat, and others are difficult to digest with dental and oral diseases [4].

Good oral hygiene should be accompanied by the absence of facial pain and leads to the ability to chew and digest food properly. Good oral hygiene also improves communication, speaking, and expression, increasing social factors. Therefore, by increasing the masticatory function and oral health, mental health and the quality of life can be improved in old age. This study analyzed whether using removable dentures improved the quality of life, masticatory function, and psychological status of an older person. The use of dentures can have a positive impact on oral health.

## 2. Materials and Methods

This study was a clinical trial with 30 subjects. The subjects were edentulous patients 60 years old and above who were attending the Prosthodontics Clinic at the Universitas Indonesia Teaching Hospital in Jakarta. They had more than 10 missing teeth and used dentures, undergone clinical examinations, and answered the questionnaire for psychological factors. The study's design used repeated measurements; each subject completed a series of tests at baseline and at follow-up sessions that were 1 and 2 months after using dentures. The inclusion criteria were men or women  $\geq 60$  years old, who were willing to have denture treatment, were able to communicate with people, and were missing more than 10 teeth with the loss of occlusion.

The exclusion criteria were people who had a severe systemic illness, cardiovascular diseases, diabetes mellitus, and neurological illnesses or psychiatric disorders that could cause cognitive deficits and mood disorders. Screening took place once the subjects had consented to take part in the study. The screening procedure involved obtaining information about the current and past health of the subject and indicated whether there was a medical reason for why they should not complete the study. The subjects were also asked questions relating to the exclusion criteria outlined above. Screening criteria was generally assessed by self-report; however, any advice from the dentist or any other healthcare staff involved in the recruitment for this study was also taken into account.

The subject's scores on cognitive tests were assessed. These tests are used as markers for neurological decline because they are sensitive to changes in cognitive function. These tests took up to 30 minutes to complete in total. The tests used to assess the cognitive functions of the subjects were as follows: a questionnaire for psychological factors (EQ-5D, and the GDS); the Quality of Masticatory Function; and the Quality of Life. All of the data will be subjected to standard parametric statistical analyses using SPSS V.20. The general linear model repeated measures analysis will be employed. The subjects were examined three times: first, before using the denture; second, 30 days after inserting the denture; and third, 60 days after insertion. The study was approved by the Ethical Committee Faculty of Dentistry at Universitas Indonesia.

## 3. Results and Discussion

### 3.1 Results

The ethical commission of the Faculty of Dentistry at Universitas Indonesia approved this study. Thirty elderly subjects answered the questionnaires. The subjects received denture treatment and then used dentures (Table 1). Most of the subjects were women 60-70 years old who were using partial removable dentures. The education level of the subjects varied from elementary education to university graduates, but most of them had high school degrees. Table 2 shows that the use of dentures

after the third examination showed significance ( $p \leq 0.000$ ) in terms of the GD. It also shows that the use of dentures after the third meeting had significant results ( $p \leq 0.000$ ) on the subject of health conditions. The results showed that after the third visit, the use of dentures had significant results ( $p \leq 0.000$ ) on the subject's mastication ability. Further analysis showed that after the third meeting, the use of dentures had significant results ( $p \leq 0.000$ ) on the patient's quality of life.

**Table 1.** Characteristics of the study subjects

Characteristics	n	%
Sex		
Men	18	45
Women	22	55
Education		
Elementary	8	20
Junior High School	10	25
Senior High School	17	42.5
University	5	12.5
Age		
60-70 years old	26	65
>70 years old	14	35
Type of Denture		
Removable partial denture	27	67.5
Full denture/Single complete denture	13	32.5

**Table 2.** Analysis of the GDS, Health Condition, and their effects on the psychological status of the patient

	Mean±SD	p-value
GDS		0.000
examination 1	6.17 ± 2.93	
examination 2	4.17 ± 2.24	
examination 3	2.57 ± 1.61	
Health condition		0.000
examination 1	56.60±14.28	
examination 2	63.20±13.60	
examination 3	68.87±12.87	
Mastication capabilities		0.000
examination 1	4.23±1.57	
examination 2	9.40±1.77	
examination 3	13.20±1.32	
Quality of life		0.000
examination 1	50.07±12.95	
examination 2	25.77±8.70	
examination 3	12.57±6.00	

Table 3 showed that age, gender, education level, location of tooth loss, and the type of prosthesis do not have significant influences on the GDS ( $p \geq 0.005$ ). Further, age, gender, education level, location of tooth loss, and the type of prosthesis do not have a significant impact on mastication ability ( $p \geq 0.005$ ). The results also showed that age, gender, and education level do not have a significant

impact on the quality of life ( $p \geq 0.05$ ). The location of tooth loss and the type of prosthesis provide significant effects on quality of life ( $p \leq 0.05$ ).

**Table 3.** The influence of various variables on the GDS, mastication ability, and Quality of life

	p-value
<b>GDS</b>	
Age	0.766
Gender	0.547
Education level	0.251
Location of tooth loss	0.495
Type of prosthesis	0.912
<b>Mastication ability</b>	
Age	0.898
Gender	0.117
Education level	0.261
Location of tooth loss	0.093
Type of prosthesis	0.061
<b>Quality of life</b>	
Age	0.226
Gender	0.064
Education level	0.086
Location of tooth loss	0.040
Type of prosthesis	0.026

### 3.2 Discussion

The elderly population in Indonesia has increased to 11.3 million, and is estimated to reach 28.8 million in 2020. Age is a major risk factor for diseases of the teeth and mouth and a declining psychological status. Dental and oral diseases maybe associated with dementia [1]. This study found a significant influence on the psychological status, masticatory ability, and quality of life of the respondents when wearing a removable denture with 2 months of use. This can be seen from the value of  $p \leq 0.000$  shown in the analysis of the influence of age, gender, education level, location of tooth loss, and the type of prosthesis on the psychological status, mastication ability, and the quality of life of the subject.

The mean values of GDS factors decreased, indicating that the scale of depression decreased in the third data retrieval after wearing dentures. This shows that the use of dentures can reduce the level of depression in the elderly. The EQ-5D visual analogue scale (VAS) increased. The patients felt that they had better body conditions on the third visit. Another study also showed results that indicated that wearing complete dentures may be an effective aid for maintaining and improving balance and control in elderly people, which improves the psychological factors of the patient [5]. On the third sampling of EQ-5D, there were improvements in the values of the score. This shows the improvement of the psychological status of the research subjects after using dentures for 2 months that were controlled regularly so that the patients felt comfortable wearing their dentures.

Previous studies have shown that perceived chewing ability was related to patients' satisfaction with complete dentures [6-8]. After the third data retrieval, mastication ability improved significantly, as seen in the increased values of mastication ability. Dentures are good; they can provide direct effects on a person's mastication ability [9-11]. Quality of life also improved, as seen from the results of this research. With a better diet, better aesthetics, and the ability to communicate better, quality of life improved [12-18]. According to this study's multivariate analysis, age, gender, education level,

location of tooth loss, and the type of prosthesis do not have significant influences on the GDS, measuring masticatory function ( $p \geq 0.005$ ). In this study, there was a significant influence of the location of tooth loss and the type of denture on the quality of life of the elderly. Our aging seniors will experience a lot of tooth loss. When the location of tooth loss covers the anterior and posterior, the use of complete dentures is required [19,20]. When the elderly experience the loss of all teeth, their quality of life may be affected by their chewing ability [21,22]. Another study also revealed similar statement that the number of missing teeth and oral health-related quality of life has a weak but significant correlation [23]. Therefore, the use of a stable removable partial denture might increase their oral health related quality of life [6].

#### 4. Conclusion

This study shows that the use of removable dentures in elderly patients who have lost more than 10 teeth can improve their psychological status, masticatory function, and quality of life. Age, gender, education level, location of tooth loss, and the type of denture had no effect on the subjects' psychological status and masticatory function. But the kind of denture and tooth loss location did impact the quality of life of the elderly.

#### Acknowledgement

This research was funded by an International Collaboration Grant from the Directorate of Research and Community Engagement University of Indonesia. We thank the staff and residents of the prosthodontics institution who participated in the study.

#### References

- [1] Hogervorst E, Combrinck M, Lapuerta P, Rue J, Swales K and Budge M 2002 The Hopkins verbal learning test and screening for dementia. *Dement. Geriatr. Cogn. Disord.* **13** 13–20. Available from: doi:10.1159/000048628.
- [2] Hogervorst E, Mursjid F, Ismail RI, Prasetyo S, Nasrun M, Mochtar, Ninuk T, Bandelow S, Subarkah S, Kusdhany L, Rahardjo TBW 2011 *Validation of two short dementia screening tests in Indonesia* Vascular Dementia: Risk Factors, Diagnosis and Treatment (Hauppauge, NY: Nova Science)p. 235-56.
- [3] Saintrain M V and de Souza E H 2012 Impact of tooth loss on the quality of life. *Gerodontol.* **29** e632-6. Available from: doi: 10.1111/j.1741-2358.2011.00535.x.
- [4] Hogervorst E, Rahardjo T B, Jolles J, Brayne C and Henderson V W 2012 Gender differences in verbal learning in older participants. *Aging Health.* **8** 493–507. Available from: doi:10.2217/ahe.12.56.
- [5] Okubo M, Fujinami Y, Minakuchi S 2010 Effect of complete dentures on body balance during standing and walking in elderly people. *J. Prosthodont. Res.* **54** 42-7. Available from: doi:10.1016/j.jpor.2009.09.002.
- [6] Yamaga E, Sato Y and Minakuchi S 2013 A Structural Equation Model Relating Oral Condition, Denture Quality, Chewing Ability, Satisfaction, and Oral Health-Related Quality of Life in Complete Denture Wearers. *J. Dent.* **41** 710–17. Available from: doi:10.1016/j.jdent.2013.05.015.
- [7] Razak P A, Richard K M, Thankachan R P, Hafiz K A, Kumar K N and Sameer K M 2014 Geriatric oral health: a review article. *J. Int. Oral Health.* **6** 110-6.
- [8] Mello A L S F and Padilha D M P 2000 Instituições Geriátricas e Negligência Odontológica / Geriatric institutions and neglecting dental care. *Rev. Fac. Odontol. Porto Alegre.* **41** 44-8.
- [9] Aripin M S 2010 *Hubungan Fungsi Kognitif Lanjut Usia dengan Permintaan Penggunaan Gigi Tiruan.* (Jakarta : Penerbit Universitas Indonesia).
- [10] Chen X and Clark J J J 2013 Assessment of Dentally Related Functional Competency for Older Adults with Cognitive Impairment - A Survey for Special-Care Dental Professionals. *Spec. Care. Dent.* **33** 48–55. Available from: doi:10.1111/scd.12005.

- [11] Hansson P, Sunnegårdh-Grönberg K, Bergdahl J, Bergdahl M, Nyberg L and Nilsson L G 2013 Relationship between natural teeth and memory in a healthy elderly population. *Eur. J. Oral Sci.* **121** 333-40. Available from: doi: 10.1111/eos.12060.
- [12] Takata Y, Ansai T, Soh I, Akifusa S, Sonoki K, Fujisawa K, Yoshida A, *et al* 2008 Relationship between Chewing Ability and High-Level Functional Capacity in an 80-Year-Old Population in Japan. *Gerodontology*. **25** 147–54. Available from: doi:10.1111/j.1741-2358.2007.00203.x.
- [13] Powell J C, Koroluk L D, Phillips C L and Roberts M W 2013 Relationship between Adjusted Body Mass Index Percentile and Decayed, Missing, and Filled Primary Teeth. *J. Dent. Child.* **80** 115–20.
- [14] Ikebe K, Matsuda K I, Morii K, Nokubi T and Ettinger R L 2006 The Relationship between Oral Function and Body Mass Index among Independently Living Older Japanese People. *Int. J. Prosthodont.* **19** 539–46. Available from: doi:10.1038/bdj.2007.177.
- [15] WHO. BMI Classification. 2006. [last update 2015 Jan 20, cited 2015 Jan 20]. Available from: [http://apps.who.int/bmi/index.jsp?introPage=intro\\_3.html](http://apps.who.int/bmi/index.jsp?introPage=intro_3.html)
- [16] Ono Y, Yamamoto T, Kubo K and Onozuka M 2010 Occlusion and Brain Function: Mastication as a Prevention of Cognitive Dysfunction. *J. Oral Rehab.* **37** 624–40. Available from: doi:10.1038/sj.bdj.2010.649.
- [17] Chandra G, Agarwal S, Bagchi G and Chandra S 2015 New Dentures: Mastication and Post Insertion Phase. Part II. *Int. J. Clin. Dent.* **8** 208–12. Available from: <http://www.scopus.com/inward/record.url?eid=2-s2.0-84957591910&partnerID=40&md5=4baae80627a9811341833b190b7a0951>.
- [18] Woda A, Hennequin M and Peyron M A 2011 Mastication in humans: finding a rationale. *J. Oral Rehab.* **38** (10) 781-4. Available from: doi: 10.1111/j.1365-2842.2011.02235.x.
- [19] Kurihara E, Neves V J, Kitayama V S, Endo M S, Terada R S S and Marcondes F K 2013 Relationship Between Oral Health and Psychological Factors in Institutionalized and Non-Institutionalized Elderly Individuals. *Rev. Gauch. Odontol.* **61** 177–86.
- [20] Whoqol Group 1995 The World Health Organization Quality of Life Assessment (WHOQOL): Position Paper from the World Health Organization. *Soc. Sci. Med.* **41** 1403–9. Available from: doi:10.1016/0277-9536(95)00112-K.
- [21] Zuluaga D J M, Montoya J A G, Contreras C I and Herrera R R 2012 Association between Oral Health, Cognitive Impairment and Oral Health-Related Quality of Life. *Gerodontology*. **29**. Available from: doi:10.1111/j.1741-2358.2011.00542.x.
- [22] Tsakos G, Sheiham A, Iliffe S, Kharicha K, Harari D, Swift C G, Gillman G and Stuck A E 2009 The Impact of Educational Level on Oral Health-Related Quality of Life in Older People in London. *Eur. J. Oral Sci.* **117** 286–92. Available from: doi:10.1111/j.1600-0722.2009.00619.x.
- [23] Kusdhany L, Sundjaja Y, Fardaniah S, Ismail RI 2011 Oral health related quality of life in Indonesian middle-aged and elderly women *Med J Indonesia* **20** 62-5.