

# Effect of tooth loss and denture status on oral health-related quality of life of older individuals from Sri Lanka

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**Objective** To determine the effect of tooth loss and denture status on oral health-related quality of life of older individuals. **Basic research design** A cross-sectional study where the data were collected by means of an interviewer administered questionnaire and a clinical oral examination. **Participants** The sample consisted of 630 free-living older individuals who were 60 years and above. The present analysis is limited to 619 individuals who had at least one missing tooth. **Main outcome measures** The impact of tooth loss and denture status on oral health related quality of life was assessed using a Sinhalese translation of the Oral Health Impact profile-14 (OHIP-14). **Results** In the edentate group, overall prevalence of oral impacts was significantly higher in non-denture wearers (53%) compared to denture wearers (32%). In both dentate and edentate groups, the most commonly reported impact item was “uncomfortable to eat”. According to the logistic regression analysis having 25-31 missing teeth with an odds ratio of 4.21 had the strongest association with the OHIP score. Those with anterior dental spaces were 2.76 times more likely to have an impact score of >2 than those without such spaces. Compared to denture wearers, non-denture wearers were 2.81 times more likely to have an impact score of >2. **Conclusions** Oral health-related quality of life of older individuals was significantly affected by tooth loss, position of missing teeth and denture status.

**Key words:** Denture status, older individuals, oral health related quality of life, tooth loss.

## Introduction

Advances in medicine and public health measures have extended the life expectancy resulting in a shift in the age distribution of the global population. This in turn has led to an increase in the proportion of the elderly worldwide. Nations therefore are faced with the major challenge of maintaining the quality of life of this increasing elderly population. Moreover, the demographic transition has given rise to changes in disease patterns with non-communicable diseases becoming the major cause of disability and mortality particularly among the elderly.

Among the oral cavity related health complications, loss of teeth constitutes an important health issue in old age. Tooth loss can have a considerable impact on the quality of life of the elderly (Srisilpanan and Sheiham, 2001; Steele *et al.*, 2004; Tsakos *et al.*, 2004) particularly by affecting the ability to eat (Sheiham *et al.*, 2001). Based on the assumption that the use of dentures could improve the quality of life that is compromised as a result of loss of teeth, dentures are often recommended for individuals with missing teeth. However, existing evidence on the effect of denture status on oral health-related quality of life is not consistent. According to some studies oral health-related quality of life improved significantly with the use of conventional dentures (Heydecke *et al.*, 2003) whereas others indicate that when compared to non-denture wearers, the oral health-related quality of life is poorer in denture wears (John *et al.*, 2004a). In a recent study it has been concluded that both tooth loss and denture wearing did not have a major impact on oral

health-related quality of life of elderly Chinese (Wong and McMillan, 2005). It is noteworthy that studies on denture status and oral health-related quality of life have been mainly limited to populations from western countries. As oral health-related quality of life has a cultural dimension (Steele *et al.*, 2004), it is of interest to assess the impact of tooth loss and denture status on quality of life in populations such as the Sri Lankans who are culturally different to those of the west.

Therefore the aim of the present study is to assess the effect of tooth loss and denture status on oral health-related quality of life of the elderly in Sri Lanka.

## Method

The sample for the present study was selected from free living elders who were  $\geq 60$  years residing in the Divisional Director of Health Services (DDHS) area of Negambo within the Gampha district of Sri Lanka. This DDHS area consists of 31 sub-divisions known as public health midwife areas (PHM area) and has a total population of 143,256. Those who were bed ridden and mentally disoriented were excluded from the study.

The prevalence of edentulousness reported in the second National Oral Health survey (Ministry of Health, 1994) for 65-74 year olds in the district of Gampaha (46%) was used to calculate the sample size. Thus, the minimum sample size required for the present study using this prevalence estimate at 95% level of confidence and accepting a sampling error of 5% was 381. A cluster sampling combined with probability proportionate to size

technique was adopted to select the sample. As the cluster sampling technique was used adjustments were made for the design effect which was considered as 1.5. After adjusting for the design effect and compensating for non-respondents (10%), the minimum sample size required was 610. However, for convenience a total sample of 630 was targeted. As it was planned to include 30 individuals in a cluster, 21 clusters were required to select the 630 individuals ( $630/30=21$ ). The sample was selected in two stages. The 21 clusters were identified from the 31 PHM areas according to probability proportionate to size technique in the first stage of sampling. In the second stage, 30 individuals who satisfied the inclusion criteria were selected from each cluster. All 630 subjects selected for the sample volunteered to participate in the study.

A questionnaire was used to collect the data and it was administered to the participants by a trained interviewer. The questionnaire consisted of two parts: Part A included questions on socio-demographic information, dental visiting patterns, whether wearing dentures, perceived need for dentures and reasons for not wearing dentures. Part B included the Sinhalese translation of the Oral Health Impact Profile-14 (OHIP-14) scale (Slade, 1997) which was used to assess the psycho-social impact of oral disorders on quality of life. The Sinhalese translation of the OHIP-14 scale has been shown to be a valid and reliable method to assess oral health related quality of life among the elderly in Sri Lanka (Ekanayake and Perera, 2003). The OHIP-14 scale consists of 14 questions or items about impacts that could arise as a result of problems in teeth, mouth or dentures and is grouped into seven dimensions. The respondents are asked to indicate the frequency of experiencing each impact item due to problems with their teeth, mouth or dentures in the preceding 12 months. The responses are coded on a 5-point Likert type scale: 0=never, 1=hardly ever, 2=occasionally, 3=fairly often and 4=very often. However, to minimize the recall bias, a recall period of six months was used in this study. The questionnaire was pre-tested among 15 older individuals. An oral examination was carried out indoors while the subject was seated on an ordinary chair, immediately following the interview. The purpose of the oral examination was to record the number and the type of missing teeth, denture status and the teeth that were replaced by dentures. Denture status was recorded according to the type of denture worn. Three investigators who had been trained previously on recording of missing teeth took part in the study. Intra- and inter examiner variability were assessed by re-examining and re-interviewing five subjects at the end of each day.

Stata version 6.0 statistical package (1999) was used to analyse the data. The prevalence of an impact item was determined calculating the percentage of subjects reporting that particular impact item on a fairly often or very often basis. The OHIP score for an individual was calculated by summing the coded response for each of the 14 items of the OHIP scale. Thus the OHIP scale for an individual would range from 0-56. The higher the impact score the poorer the oral health-related quality of life.

As the OHIP scores were not normally distributed non-parametric tests were used for analysis of data. Mann-Whitney and Kruskal Wallis tests were used to assess the associations between OHIP scores and categori-

cal variables. The associations between two categorical variables were determined using the chi-square test. A logistic regression analysis was carried out to determine the influence of tooth loss and denture status on OHIP scores. All independent variables which showed a significant association with the OHIP scores (dependent variable) at a significant level of  $P < 0.10$  were entered into a logistic regression model. The dependent variable-OHIP score was dichotomized using the sample median as the cut-off point. Accordingly OHIP score of  $\leq 2$  was coded as 0 and OHIP score of  $>2$  was coded as 1.

## Results

The total sample consisted of 630 subjects of which, 54% were females. The mean age of the sample was  $68.9 \pm 7.1$  years and 54% were aged between 60-69 years. The present analysis is limited to 619 subjects who had at least one missing tooth.

The prevalence of oral impacts is presented in Table 1. The overall prevalence of impacts was 37% and 46% in the dentate and edentate subjects respectively. The difference between the two groups was not statistically significant. Compared to those wearing dentures, a higher percentage of impacts were reported by those not wearing dentures in both dentate and edentate groups. However the difference in the overall prevalence of oral impacts between denture wearers and non-denture wearers was significant only among the edentate. In all groups, the most commonly reported impact was "uncomfortable to eat". Nearly 16% of the denture wearers and 49% of the non-denture wearers in the edentate group had reported this impact and the difference between the two groups was statistically significant. A significantly higher percentage of denture wearers (9%) in the dentate group had reported that their taste was affected compared to non-denture wearer (4%) in the same group. Also in the dentate group, those who reported that they felt self-conscious were significantly higher among non-denture wearers than denture wearers.

Table 2 shows the relationship between median impact scores, tooth loss and denture status in dentate subjects. There was a statistically significant difference in the median scores and the number of missing teeth in non-denture wearers. In this group, subjects with 1-8 missing teeth had a median impact score of 0 whilst those subjects with 25-31 missing teeth had a median impact score of 6. In non-denture wearers, the median impact scores were significantly higher in those with missing anterior teeth compared to those without missing anterior teeth and also those with 13-20 missing posterior teeth compared to those with 1-12 missing posterior teeth.

The logistic regression analysis for impact scores controlling for gender is given in Table 3. The number of missing teeth had a significant influence on the impact scores. Having 25-31 missing teeth with an odds ratio of 4.21 had the strongest association with the OHIP score. Those with missing anterior spaces were 2.76 times more likely to have an impact score of  $>2$  compared to those without anterior spaces. Compared to denture wearers, non-denture wearers were 2.81 times more likely to have an OHIP-score of  $>2$ . The number of missing posterior teeth was not associated with the impact scores.

**Table 1.** Distribution of oral impacts according to dentition status and denture status

Impact item	Dentate					Edentate				
	With dentures (n=99)		Without dentures (n=410)		P value	With dentures (n=38)		Without dentures (n=72)		P value
	n	%	n	%		n	%	n	%	
Uncomfortable to eat	24	24.2	139	34.0	0.06	6	15.8	35	48.6	0.001
Taste affected	9	9.1	17	4.2	0.04	6	15.8	7	9.7	0.34
Difficulty in pronouncing words	4	4.0	23	5.6	0.52	0	0.0	2	2.8	0.30
Felt self-conscious	0	0.0	22	5.4	0.018	0	0.0	1	1.4	0.46
Pain	3	3.1	18	4.4	0.54	1	2.6	0	0.0	0.16
Felt tensed	0	0.0	0	0.0		0	0.0	1	1.4	0.46
Diet unsatisfactory	0	0.0	10	2.4	0.11	1	2.6	1	1.4	0.64
Had to interrupt meals	0	0.0	2	0.5	0.48	0	0.0	1	1.4	0.46
Difficulty in relaxing	0	0.0	1	0.2	0.62	1	2.6	0	0.0	0.16
Felt embarrassed	0	0.0	7	1.7	0.19	0	0.0	1	1.4	0.46
Felt irritable	0	0.0	0	0.0		0	0.0	0	0.0	
Difficulty in doing usual jobs	0	0.0	3	0.7	0.39	0	0.0	0	0.0	
Felt that life is less satisfying	0	0.0	0	0.0		0	0.0	0	0.0	
Felt totally unable to function	0	0.0	0	0.2	0.621	0	0.0	0	0.0	
Overall prevalence of oral impacts	32	32.3	157	38.3	0.27	12	31.6	38	52.8	0.034

**Table 2.** Relationship between median impact scores; tooth loss and denture status in partially dentate subjects

	OHIP score		
	denture wearers (n=99)	Non-denture wearers (n=410)	Total (n=509)
	Median (IQR)	Median(IQR)	Median (IQR)
<i>Missing teeth</i>			
1- 8 (141)	0 (0.0, 2.0)	0 (0.0, 2.0)	0 (0.0, 2.0)
9-16 (193)	2 (0.0, 4.5)	2 (0.0, 6.0)	2 (0.0, 6.0)
17-24 (105)	0 (0.0, 7.0)	6 (3.0, 9.0)	5 (0.0, 9.0)
25-31 ( 70)	3 (2.0, 8.0)	6 (3.0, 10.0)	5 (2.0, 9.0)
	P=0.10	P=0.0001	P=0.0001
<i>Presence of anterior spaces</i>			
Yes (358)	2 (0.0, 5.0)	4 (0.0, 8.0)	3 (0.0, 7.0)
No (151)	1 (0.0, 2.0)	0 (0.0, 2.0)	0 (0.0, 2.0)
	P=0.53	P=0.0001	P=0.0001
<i>Missing posterior spaces</i>			
1-12 (325)	1 (0.0, 3.0)	1.5 (0.0, 4.0)	1 (0.0, 4.0)
13-20 (184)	2 (0.0, 7.0)	6.0 (2.0, 9.0)	5 (0.0, 9.0)
	P=0.08	P=0.0001	P=0.0001
Overall impact score	2 (0.0, 5.0)	2 (0.0, 6.0)	2 (0.0, 6.0) P=0.09

IQR –inter quartile range

## Discussion

The results revealed that a considerable proportion of older individuals had experienced oral impacts due to the condition of his/her mouth (>30%) and the overall prevalence of oral impacts did not differ between dentate and edentate subjects. Furthermore, oral health-related quality of life was significantly poorer in edentate non-denture wearers compared to edentate denture wearers. This is indicative of the fact that complete dentures

improve the psychosocial well being of edentate subjects. In fact in a recent study, John *et al.* (2004b) have shown that compared to before prosthetic rehabilitation, oral health-related quality of life improved significantly after obtaining complete dentures. In both dentate and edentate groups the most commonly reported impact was “uncomfortable to eat”. Similar findings have also been reported in other older populations (Srisilpanan and Sheiham, 2001; Sheiham *et al.* 2001). Tooth loss can limit masticatory ability and performance (Carlsson,

**Table 3.** Multiple logistic regression analysis for impact score controlling for gender (partially dentate subjects only n=509)

<i>Independent variable`</i>	<i>Odds ratio</i>	<i>95% CI</i>	<i>P value</i>
<i>Missing teeth</i>			
1-8	1.00		
9-16	2.13	1.24-3.66	0.006
17-24	3.51	1.51-8.13	0.003
25-31	4.21	1.58-11.19	0.004
<i>Presence of anterior spaces</i>			
No	1.00		
Yes	2.76	1.62-4.72	0.001
<i>Missing posterior spaces</i>			
1-12	1.00		
13-20	1.23	0.64-2.37	0.52
<i>Denture status</i>			
Yes	1.00		
No	2.81	1.71-4.62	0.001

Dependent variable OHIP –14 score dichotomized as 0 if OHIP-14 score  $\leq$  2 and 1 if OHIP-14 score  $>$ 2  
Pseudo  $R^2=0.136$ ;  $\chi^2=95.78$

1984). As tooth loss was high in these subjects (mean number of missing teeth  $17.5 \pm 9.4$ ), many would have experienced difficulties in eating. Reporting of impacts from the psychosocial domains was minimal. This supports the findings of others (McGrath and Bedi, 2001a) and provides further evidence to suggest that oral health mainly influences the physical and functional aspects rather than psychosocial domains of older individuals. Among the dentate group, those reporting that they felt self-conscious due to the condition of their mouth were significantly higher in non-denture wearers compared to denture wearers. Teeth particularly the anteriors play an important role in maintaining a positive self-image (Roessler, 2003). Thus it is possible that the presence of open dental spaces in the anterior region of non-denture wearers is an important factor that has contributed to this difference. This is substantiated by the fact that, 21 of the 22 (95%) non-denture wearers in the dentate group who said that they felt self-conscious had anterior dental spaces.

The number of missing teeth emerged as the most significant predictor of oral health-related quality of life. Independent of the denture status, there was a likelihood of oral health-related quality of life decreasing with the increase in the number of missing teeth. Missing teeth is the main oral impairment that causes oral impacts in older individuals (Srisilpanan and Sheiham, 2001). Thus this finding is to be expected. Several other studies have also shown that the number of missing teeth is an important determinant of oral health-related quality of life (Steele *et al.*, 2004; Tsakos *et al.*, 2004).

In the present study compared to denture wearers, oral health-related quality of life was poorer in non-denture wearers and is in conformity with that of McGrath and Bedi (2001b). This finding suggests that removable dentures restore oral functions that are compromised as

a result of loss of teeth and thereby improve the quality of life of individuals. Similarly Gilbert *et al.* (2004) reported that partial denture wearers were less likely to report chewing difficulty –an important component of oral health-related quality of life compared to non-denture wearers. In a study by Elias and Sheiham (1999), it has been reported that the level of satisfaction with mouth, which is often influenced by oral impacts increased with the replacement of missing teeth with partial dentures. However the literature provides conflicting evidence with regards to the effect of dentures on oral health related quality of life. McGrath and Bedi (2001a) have reported that non-denture wearers had a better oral health-related quality of life compared to those wearing partial or complete dentures. John *et al.* (2004a) in a multivariate analysis that controlled for socio-demographic variables also found a similar result. Ill fitting, defective dentures can compromise oral health-related quality of life of individuals (Tsakos *et al.*, 2004). Also it has been shown that oral health-related quality of life decreases when individuals are not satisfied with their dentures (Wong and McMillan, 2005). Therefore it is possible that the differences in both quality of dentures and levels of denture satisfaction are partly responsible for the observed variations between different studies.

Furthermore, this study highlighted the importance of the position of missing teeth in maintaining oral health-related quality of life of an individual. Compared to missing posterior teeth, the loss of anterior teeth when adjusted for denture status emerged as a strong predictor of poor oral health-related quality of life. This finding suggests that all lost teeth do not have a similar influence in determining oral health-related quality of life. Other investigators have also found that those with anterior dental spaces reported more impacts than those who did not have such spaces (Srisilpanan and Sheiham,

2001; Tsakos *et al.*, 2004). This is due to the fact that anterior teeth when compared to posterior teeth play a prominent role in social interactions, appearance and also satisfaction with the mouth (McGrath and Bedi, 2001b) and these factors have a significant positive effect on oral health-related quality of life.

In conclusion, this study revealed that tooth loss and the position of missing teeth significantly affect the oral health-related quality of life of older individuals and also that wearing removable dentures could improve oral health-related quality of life of these individuals. As tooth loss emerged as one of the strongest predictor of oral health-related quality of life, it is important to educate the public on the importance of preserving their natural teeth and a functional dentition throughout life. It is well known that older individuals have limited access to oral health care. Therefore it is necessary to provide these individuals with affordable oral health care in order to prevent and control oral diseases that compromise their quality of life.

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