Original Article

How Do Age and Tooth Loss Affect Oral Health Impacts and Quality of Life? A Study Comparing Two State Samples of Gujarat and Rajasthan

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Abstract

Objective: Age and tooth loss are expected to have a complex relationship with oral health-related quality of life. So the purpose of this study was to explain the impact of age and tooth loss on oral health-related quality of life using the short form 14-item oral health impact profile (OHIP-14) among two population samples of Gujarat and Rajasthan.

Materials and Methods: A cross-sectional questionnaire-based survey was conducted among 1441 subjects collected from two major cities of Gujarat and Rajasthan. Both questionnaire approaches using OHIP-14 scale and clinical examination were conducted in accordance with WHO criteria using type III procedure on the same day. Chi square test, ANOVA and stepwise multiple regression analysis were applied using SPSS software version 15.0.

Results: With the increase of age, OHIP mean score in both states increased, but that among Rajasthan state was higher, depicting poor oral health. Whereas, in the remaining 23-27 number of teeth both states showed higher OHIP mean, however again the score was much higher among Rajasthan subjects showing worse oral hygiene. Hence, overall all mean OHIP score for Gujarat was lower indicating good oral health; whereas, that among Rajasthan was higher indicating poor oral health-related quality of life.

Conclusion: Both age and tooth loss are associated with each other, but they have an independent effect on the oral health-related quality of life. Thus, all studied populations with complete natural dentition showed good oral health-related quality of life.

Key Words : Age Distribution; Tooth Loss; Oral Health; Quality of Life

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INTRODUCTION

The impact of health on the quality of life has lately received increased attention in medicine and dentistry [1,2]. Different diseases affect life in different ways and in particular oral diseases seriously impair the quality of life in a

large number of individuals and they may affect various aspects of life, including function, appearance, interpersonal relationships and even career opportunities [3].

Allison defined the quality of life as a dynamic construct that is the function of a number of variables such as stress, depression, appraisal and coping [4]; whereas, oral health-related quality of life is defined as a part of the quality of life that is affected particularly by the person's oral health.

This term captures how oral health affects the person's ability to function (e.g. in bite chew and speech), psychology states such as self esteem and satisfaction with one's appearance, social factors and pain or discomfort related to oral health [5].

There are many variables affecting the quality of life out of which tooth loss is one of the premier factors.The loss of one or more teeth can have profound effects on an individual's oral health and quality of life [6]. One concept that has received particular attention when setting health targets is that of a minimum threshold for the number of teeth below which oral function and health diminish rapidly. Such concepts originally arose with the work of Agerberg and Carlson [7] and Kayser [8] two decades ago. Subsequent population-based oral health studies have frequently referred to the presence of a minimum of 20 teeth or sometimes a certain number of contacting posterior pairs of teeth as a simple way of defining satisfactory oral health. In some cases, these have been enshrined into formal targets or policy [9,10]. Besides, the foremost factor age and tooth loss both have their variable effects on different age groups affecting the quality of life. For example, in case of infants and small children, tooth loss hampers speech and sucking ,while in teenagers aesthetics is of major concern and in older people chewing or mastication is a matter of concern which affects the quality of life while performing day to day tasks. In addition, along with the teeth, several other factors affect the oral health-related quality of life, the most important among which is personal habit which includes tobacco usage both in smoking and non-smoking forms and also alcohol consumption.

Table 1A. Demographic Characteristics of Dentate Subjects in Each State

	Gujarat State	Rajasthan State	Chi-Square Value	P value
Gender				
1. Male	380(53%)	452(62.4%)		
2. Female	337(47%)	272(37.6%)	13.135	0.000
Total	717(100%)	724(100%)		
Materials used for Brushing				
1.Tooth Brush	601(83.8%)	448(61.9%)		
2. Finger	116(16.2%)	177(24.4%)	133.984	0.000
3.Datun	0(0%)	99(13.7%)		
Visit to a Dentist				
1. Visited within 12 months	405(56.5%)	256(35.4%)		
2. Never visited	303(42.3%)	468(64.6%)	77.866	0.000

Oral health-related quality of life can be measured using a questionable approach. The assessment of the quality of life has become an integral part in the evaluation of health programmes [11].

A number of quality of life measures now exist in the field of dentistry such as the original 49-item OHIP (Oral Health Impact Profile) which was developed by Locker and Slade [12] and was based on Locker's conceptual model of oral health [13] including seven domains; namely, functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability and handicapping. Currently, the best known of these measures is OHIP-14.

Results can serve as an outcome measure; they allow insight into how the patient's oral health affects this person's well-being and quality of life at a given point in time.

To date, some studies [14-16] have compared the cultural equivalence of the OHIP.

Thus, this study was performed to explain how age and tooth-loss relate to the impact of oral health on everyday life in two populations.

MATERIALS AND METHODS

A cross-sectional questionnaire-based survey was conducted among 1475 subjects collected from two major cities of Gujarat and Rajasthan. Baroda and Ahmadabad from Gujarat (a state in India known for trade and commerce) and Udaipur and Jaipur were taken as center from Rajasthan (a state situated in the western part of India famous for historic battles and monuments).

The subjects were randomly selected from dental clinics, hospitals and also from dental camps which were organized for the general population and people were encouraged for check up.

So a total of 34 subjects who did not complete the questionnaire and were uncooperative were excluded from the study, yielding a final study sample of 1441 individuals, out of which 724 subjects were from Gujarat and 717 were from Rajasthan.

The questionnaire approach was administered to people, using pretested English version OHIP-14 questionnaire scale and on the same day oral examination was performed.

Table 1B. DMFT Score and Number of Teeth in the Oral Cavity in Each State

	Gujarat	Rajasthan	Chi Square value	P value
Remaining teeth in the oral cavity				
18-22	16(2.2%)	9(1.2%)		
23-27	88(12.3%)	81(11.2%)	2.570	0.277
28-32	634(87.6%)	613(85.5%)		
DMFT Score				
0-4	339(47.3%)	415(57.3%)		
5-9	230(32.1%)	274(37.8%)	89.818	0.000
10-14	140(19.5%)	26(3.6%)		
15-19	8(1.1%)	9(1.2%)		

The questionnaire included questions concerning the respondents' sociodemographic background (age, education, habits regarding dental visits and professional situation), their coping style and their OHRQoL (Oral Health Related Quality of Life). OHRQoL was measured using the 14-item short version of the OHIP and items were scored on 5-point scales ranging from '1' - 'never' to '5' - 'very often'. Thus, higher scores indicate worse OHRQoL. The dimensions and the subjects of the questions were "functional limitation", trouble pronouncing words, worsened taste; "physical pain", ache in the mouth, discomfort eating food; "psychological discomfort", feeling self-conscious or feeling tense; "physical disability", interrupted meals or poor diet; "psychological disability", difficulty in relaxing, embarrassment; "social disability", irritability, difficulty in doing usual jobs; "handicap", life less satisfying, inability to function.

Responses to the items were recorded in a five-point scale: 0, never; 1, hardly ever; 2, occasionally; 3, fairly often; 4, very often. All 14 ordinary responses were summed to produce an overall OHIP score that could range from 0 to 56, with higher scores indicating poorer health-related quality of life.

For a better approach and accuracy, clinical examination was conducted and subjects were examined using plane mouth mirror and CPI probe which were in accordance with WHO criteria for diagnosis of dental caries [17]. Dental caries were recorded using DMFT index.

All instruments were sterilized and examination was performed using a mouth mirror, probe under good illumination called type III examination Several tooth-sites were excluded from the examination: impacted teeth, retained roots, grossly broken down teeth, teeth which were too inaccessible to examine satisfactorily and those teeth in which the cemento-enamel junction (CEJ) was at an indeterminable attachment level.

The patient's personal habits were also recorded including smoking, chewing tobacco and consumption of alcohol, their frequency and duration and also whether they visited a dental clinic for regular dental check-up was assessed.

The data collected were entered into spreadsheets and were subjected to statistical analysis by SPSS (statistical package social sciences), version 15.0. Means and standard deviations were assessed and one way ANOVA was executed for comparing the means under various categories. Step-wise multiple linear regression analysis was executed to estimate the linear relationship between dependent variables OHIP and various independent variables (age, gender, materials used for brushing and brushing frequency, dental visit and tobacco frequency). Chi-square test was also applied to test the difference in frequencies.

Ethical clearance was obtained prior to the survey from the Ethical Committee of Darshan Dental College and Hospital. The informed consent of each patient was taken prior to recording oral health.

RESULTS

Table 1A illustrates the demographic data for the subjects in two different states. There were some differences between the states that reflect the underlying demography of the states and the sampling strategies. It shows that the maximum number of subjects who participated were from Rajasthan and among them male individuals who participated were more (62.4%) as compared to the participation of males from Gujarat (53%). Subjects who visited dental clinics within 12 months were higher in the state of Gujarat (56.5%) and subjects who never visited dental clinics were higher in the state of Rajasthan (64.6%).

Table 1B shows that subjects from Gujarat had the maximum number of remaining teeth (87.6%) in comparison to Rajasthan (range, 28-32%).

Table 2. Unadjusted Mean Summed OHIP Scores by Demographic Variables

Independent Variables	Gujarat Mean(S.D.)	Rajasthan Mean (S.D.)	P-value
OHIP	7.05(4.15)	10.40(6.42)	
Functional Limitation	0.43(0.45)	0.49(0.50)	
Physical Pain	1.35(0.70)*	1.05(0.61)	P< 0.005
Psychological Discomfort	0.67(0.59)*	0.93(0.78)	P< 0.005
Physical Disability	0.42(0.43)*	0.88(0.84)	P< 0.005
Psychological Disability	0.27(0.46)*	0.66(0.84)	P< 0.005
Social Disability	0.21(0.37)*	0.65(0.80)	P< 0.005
Handicap	0.18(0.33)*	0.52(0.80)	P< 0.005
Age in Years			
25-34 years	5.59(4.10)	9.86(7.16)	
35-44years	7.98(3.43)	10.29(6.00)	
45-54years	8.89(3.94)	11.21(7.08)	
Significance	F=49.738, P=0.000	F=1.605, P=0.202	
Gender			
Male	6.97(3.77)	11.11(6.96)	
Female	7.14(4.55)	9.22(5.91)	
Significance	F=0.570,P= 0.568	F=3.865, P=0.000	
Occupation			
Professional	7.23(4.21)	9.73(5.73)	
Skilled	7.18(4.16)	10.65(6.89)	
Partly/Unskilled	6.66(4.29)	11.60(7.40)	
Non Working	6.90(4.03)	10.49(6.27)	
Significance	F=0.563,P=0.640	F=2.06,P=0.104	
Brushing Frequency			
Once	7.63(3.94)	6.42(2.10)	
Twice	4.83(4.21)	11.33(7.76)	
Significance	F=7.62, P=0.000	F=7.96,P=0.000	
Dental Visit Duration			
12 Months	4.75(2.90)	10.25(6.25)	
12-36 Months	7.60(4.34)	10.62(6.61)	
Never Been	9.01(4.03)	10.93(7.43)	
Significance	F=109.685,P=0.000	F=0.370.P=0.69*	
Remaining Teeth			
18-22	12.00(5.16)	17.11(2.14)	
23-27	8.68(3.522)	10.56(7.396)	
28-32	6.69(4.07)	10.29(6.28)	
Significance	F=21.67,P=0.000	F=5.083,P=0.000	
DMFT			
0-4	5.13(4.24)	10.36(6.15)	
5-9	8.11(2.32)	9.62(5.70)	
10-14	9.38(3.78)	17.04(11.908)	
15-19	17.00(0.01)	17.11(2.14)	
Significance	F=78.173,P=0.000	F=14.642,P=0.000	

Where * means P< 0.005 (Significant)

It also shows that DMFT score is significantly different between the states.

Table 2 shows mean OHIP scores of the subjects from the two states. Higher scores indicate worse oral conditions and lower OHIP scores show a better oral health-related quality of life. OHIP scores were seen worse among Rajasthan subjects compared to Gujarat state subjects.

Regarding the independent variables including all the seven domains, low scores were found among Rajasthan subjects affecting the quality of life; while, better scores were seen among Gujarat state subjects.

In addition, with the increase of age, the quality of life deteriorates in both states; however, less satisfactory quality of life was seen among subjects of Rajasthan. Among the 45-54 years age group, OHIP scores were 8.89 (13.94) and 11.21 (7.08) for Gujarat and Rajasthan subjects, respectively.

The remaining number of teeth had a significant impact on OHIP scores. Subjects having 18-22 remaining teeth showed the highest OHIP score, 12.00 (5.16) and 17.11 (2.14) for states of Gujarat and Rajasthan, respectively.

The minimum mean OHIP score was detected in subjects having a remaining number of teeth ranged from 28 to 32 and the score was 6.69 (4.07) and 10.29 (6.28) for Rajasthan and Gujarat subjects, respectively.

DMFT scores showed significant results. The subjects having DMFT scores between 15 and 19 had a high mean OHIP in both Gujarat and Rajasthan states; 17.00 (0.01) and 17.11(2.14), respectively indicating poor oral hygiene. Whereas, scores between 0 and 4 show great variation. Gujarat subjects had a score of 5.13 (4.24) indicating comparative good oral hygiene; whereas, that of Rajasthan was 10.36 (6.15) indicateing poor oral hygiene.

Table 3 shows the result of step-wise multiple regression analysis, in which OHIP was the dependent variable; whereas, sex, age, material frequency, brushing habit, tobacco chewing and smoking habits were independent health related variables. OHIP shows the amount of variation 7.9% for place, similarly 6.4%, 2.6% and 2.1 % for tobacco users, and non tobacco users and a dental visit within 12 months and for materials used for brushing respectively ($P<0.0001$).

Table 3. Step-Wise Multiple Linear Regression Analysis with OHIP as a Dependent Variable

Model	R	R^2	Adjusted R^2	Std. Error of the estimate	F Value	Significant Value (P)
1	0.281(a)	0.079	0.073	5.35	13.837	0.000(a)
2	0.367(b)	0.135	0.124	5.21	12.476	0.000(b)
3	0.401(c)	0.161	0.145	5.14	10.170	0.000(c)
4	0.427(d)	0.182	0.161	5.09	8.796	0.000(d)

a Predictors: (Constant), Place
b Predictors:(Constant), Place, Tobacco user/Non-user.
c Predictors:(Constant), Place, Tobacco user/Non-user, Dental visit duration
d Predictors:(Constant), Place, Tobacco user/Non user, Dental visit duration, Material used for brushing

DISCUTION

This study is the first that has evaluated the relationship between age, tooth loss and the adverse impacts of oral conditions among adults of all ages in two different states of the country. As expected, the number of the remaining natural teeth played a central role as a determinant of subjective oral health.

The quality of life is increasingly acknowledged as a valid, appropriate and significant indicator of service need and intervention outcome in contemporary public health research and practice [18]. We have no reasons to believe that the associations between tooth loss and OHIP scores in each state would be biased within these randomly selected subjects from both Gujarat and Rajasthan state and the analysis provides a valid contrast of association between Gujarat state and Rajasthan state.

OHIP has now been used in a number of age and cultural contexts to measure the oral health-related quality of life [19,20]. The quality of life includes social, psychological as well as functional aspects. For this, the oral health impact profile (OHIP) is one of the numbers of self-reported measurements of the adverse impacts of oral condition on daily life. The short form version (OHIP-14) consists of 14 items organized in seven sub-scales, which address aspects of oral health that may compromise someone's physical, psychological and social well-being [21]. The OHIP scale is concerned with the behavioral and psychosocial aspects of the impact and does not include measures of 'Disease' and 'Impairment', which are depicted in the model on which it is based. Their relationship with the other dimensions is retained in the empirical model, but it is not supported by empirical evidence [22].

It is impossible to understand the impact of tooth loss without understanding the independent effect of age and vice versa. Data from both states demonstrate that the impact of oral health problems on the quality of life reduces with the increase of age, which is independent from the effect of tooth loss. The current generations of older adults in both states had the lowest scores, but in the rapidly changing health environment, they may also have had the lowest expectations historically.

The threshold of 20-21 teeth has been widely used as a broad indicator of functional dentition for some years. Although a threshold of 20-21 teeth has been justified using clinical principles, there is also empirical evidence that this threshold is associated with functional and nutritional adequacy [23-25].

Further data from both states show that as the number of teeth decreases or tooth loss occurs, it is associated with a reduction in the oral health-related quality of life, independent from the effect of age. The data also show that the relationship between the increase of tooth loss and more severe impacts on oral health was not a simple one. Instead, there appears to be a plateau in the trend and a point was reached where the least number of teeth remained. This situation showed no effect on oral health-related quality of life. For example, in Gujarat the mean OHIP score was worst for those people with a remaining number of teeth ranged between 18 and 22. In Rajasthan, OHIP scores were also worse for those people with a number of teeth ranged between 18 and 22 teeth, even worse than individuals of Gujarat state. A positive state related to the quality of life was found in both states between group 23-27, but still QHRQoL was worse among Rajasthan state as compared to Gujarat state. In addition, the most striking finding in both groups was that people who had more than 25 natural teeth had a significantly better oral health-related quality of life.

Compared with previous studies, the remaining number of teeth in the range of 28-32 teeth for the UK and Australian samples, the OHIP mean score was 4.9 (0.12) and 6.7 (0.14), respectively, while that among Gujarat state and Rajasthan state was 6.69 (4.07) and 10.29 (6.28), respectively [26]. This may be because

India as a developing country lacks awareness about OHRQoL. The influence of cultural factors on OHIP scores is apparent in the difference between Gujarat state and Rajasthan state, when the pattern of scores according to thenumber of teeth is analysed. The plateau of highest mean OHIP scores is reached at the age group of 23-27 teeth and where the number of teeth drops below 23-17, and certainly below 18, the chance of a person requiring partial denture in order to function increases dramatically [27]. This result is similar to previous studies carried out in Australia and the UK [26]. Although the position of lost teeth is also a key factor [28], one of the possible reasons for the differences in the relationship between the number of teeth and OHIP in the two samples may be the cultural variation.

The overall OHIP mean scores of Gujarat and Rajasthan state was 10.40 (6.42) and 7.05 (14.15), respectively which indicates better OHRQoL in Gujarat state, which is in accordance with previous studies where OHIP mean score for subjects of UK and Australia were 5.1 (0.11) and 7.4 (0.13), respectively where a better quality of life was seen among subjects of the UK [26]. In addition, the present study indicates that mean OHIP scores of subjects complaining about physical pain in Gujarat and Rajasthan was 1.35 (0.70) and 1.05 (0.61), respectively which indicates higher OHIP scores among all seven domains, which is in accordance with previous studies which stated that patients reporting higher OHIP scores were more likely significant to report pain [29]. Previous studies showed that patients with a higher OHIP-14 were also significantly more likely not to drink alcohol, which is in accordance with our study showing mean OHIP scores for alcohol non users in Gujarat and Rajasthan states as 6.81 (4.27) and 9.84 (5.97), respectively as compared to users of Gujarat and Rajasthan having scores 9.24 (1.80) and 12.65 (7.85), respectively [29].

Even previous studies depicted that patients reporting higher OHIP-14 scores (i.e. inferior OHRQoL) at baseline were significantly more likely to have fewer than 25 teeth, have reported trouble with their teeth at their last dental visit, or only visited dental clinics when they had trouble and smokers, which is accordance with our present study[29].

Therefore, besides two factors of age and tooth loss, this illustrates how the perception of oral health-related quality of life may be influenced by cultural dimensions, different oral health habits such as smoking, consuming alcohol, regular dental visits, socioeconomic variation of two different states and different geographical locations. This is demonstrated for the first time in two state samples.

CONCLUSION

Both age and tooth loss are associated with each other, but they have independent effects on the oral health-related quality of life. Tooth loss, which is associated with the increase of age, is associated with more negative impacts, while the increase of age independently results in fewer. Thus, in all populations and subpopulations studied, complete or almost complete natural dentition shows a good oral health-related quality of life.

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