



# How Important Is Oral Health in Determining Quality of Life: A Narrative Review

Viswa Chaitanya Chandu<sup>1</sup>, Srinivas Pachava<sup>1</sup>, Viswanath Vadapalli<sup>1</sup>, Srinivas Ravoori<sup>1</sup>, Pavani Madhu Nizampatnam<sup>1</sup>, Nandita Rani Kothia<sup>1</sup>

<sup>1</sup>SIBAR Institute of Dental Sciences, Andhra Pradesh, India

**Corresponding Author:** Viswa Chaitanya Chandu, Public Health Dentistry, Assistant Professor, SIBAR Institute of Dental Sciences, Andhra Pradesh, India. Email: viswachaitanya17@gmail.com

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## Abstract

There have been changes in the perceptions of health and healthcare. The key elements steering this change are the identification of social ramifications of disease and the agreement that healthcare strategies are directed at increasing the length and standard of life. There is a lack of consensus on defining the expression “quality of Life” (QoL). Some believe that QoL is synonymous with health, while others suggest that it is a comprehensive domain inclusive of larger domains relating to human experience. Oral health related quality of life (OHRQoL) is a comparatively recent phenomenon which has emerged over the last couple of decades. A potential reason for the recent emergence of OHRQoL could be the rather limited realization of the ramifications of deteriorated oral health on QoL. This paper attempts to identify various oral conditions and sociodemographics that affect the QoL of people. Since OHRQoL is a subjective measure, it is not exclusively dictated by oral health status. The concept of hierarchy of needs was highlighted to explain the poor utilization of oral health services, and it was concluded that the promotion of health and the creation of a complimentary socioeconomic environment are the only ways to improve people’s QoL.

**Keywords:** Oral Disease Burden, Quality of Life, Socioeconomic Inequalities, Hierarchy of Needs

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## Introduction

Health is a worldwide social goal. The operational definition given by the World Health Organization (WHO) is that health is a condition exhibited by a human organism demonstrating optimum functioning in given genetic or environmental conditions.<sup>1</sup> Having referred to adequate functioning, the role oral health plays in the general health of an individual cannot be overstated. The phrase “Oral health is an important and inclusive component of general health” is in vogue these days, with an abundance of literature emphasizing the same. The theme for World Oral Health Day 2016 highlighted the integral and influencing nature of oral health on the overall health of an individual.<sup>2</sup>

## Quality of Life

There have been changes in the perceptions of health and healthcare. The key elements steering this change are the identification of social ramifications of disease and the agreement that healthcare strategies are directed at increasing the length and standard of life. The principle purpose of any healthcare intervention is to improve people’s standard of life and wellbeing. The immediate question that arises is “What

is quality of life (QoL)?” To define or measure QoL in itself is an elusive enterprise. There is a lack of consensus on the definition of the expression “QoL.” Some believe that QoL is synonymous with health, while others suggest that it is a comprehensive domain inclusive of larger domains relating to human experience.<sup>3</sup>

## Assessment of Quality of Life

An important concern in assessing QoL is that people are frequently asked to complete questionnaires that do not reflect their concerns.<sup>3</sup> Qualitative interviews for obvious reasons, therefore, should form the first step in the development of questionnaires. Researchers must then find a way to identify the set of questions which, on average, best suits the study population. This demands statistical insights together with emphasis on clinical relevance.

## Oral Health-Related Quality of Life

Oral health-related quality of life (OHRQoL) is a comparatively recent phenomenon which has emerged over the last couple of decades. A potential reason for its recent emergence could be the rather limited realization of the ramifications of

deteriorated oral health on QoL.<sup>4</sup> Nevertheless, the scenario has been changing with increasing emphasis being placed on identifying the consequences of poor oral health.<sup>5</sup> OHRQoL is an interplay of oral health conditions, societal and contextual factors<sup>6</sup> with the rest of the body.<sup>7</sup>

Beyond doubt, a clinical examination of one's oral health status does not capture the perceptions of a human being and therefore cannot elicit the social and psychological wellbeing of that individual. This understanding led to the creation of subjective measures of health that do not relying simply on the clinical indicators of disease, which are purely objective in nature.<sup>8</sup> Table 1 shows a list of various OHRQoL measures modified from Baiju et al.<sup>9</sup>

### Oral Disease Burden and Impact on OHRQoL

Oral health problems impose a substantial burden not only on a country's population, but also on the healthcare system. In 2007, private spending on healthcare in India constituted nearly 74% of the total spending on health. Nearly 90% of this private expenditure in India was in the form of out-of-pocket expenditures on health by households, increasing the financial burden on poorer sections of the population and thus affecting their QoL.<sup>21</sup> Although these figures do not equate to the out-of-pocket expenditures on oral healthcare, they do throw light on the healthcare delivery systems in India, especially in view of the lack of consolidated data on spending on oral healthcare. From an individual perspective, dental diseases have a profound impact on QoL.<sup>22</sup> Oral diseases were recognized as one of the conditions deserving prime concern in a study by National Council on Macroeconomics and Health.<sup>23</sup>

Though the effects of oral conditions on the QoL of an individual are not comprehensively documented in India, the following description aims at providing an overall picture of the oral disease burden and the probable impact it makes on the QoL.

### Dental Caries and Quality of Life

Dental caries is a very prevalent oral condition in India, with 50%-85% of the population affected by it.<sup>24</sup> It was projected that 600 million citizens of India were affected by dental caries by 2015.<sup>23</sup> It was suggested that dental caries experience has a

serious bearing on the QoL, with an increased likelihood of experiencing pain, having intricacies in chewing, and missing school/work owing to the consequences of dental caries.<sup>25,26</sup>

Caries status is significantly correlated with most of the subdomains of the Oral Health Impact Profile -14 as is evident from studies conducted in different parts of India.<sup>27,28</sup> In a study conducted in Shimla, it was observed that subjects with dental caries were 1.19 times more likely to have reported often/fairly often for OHIP questions compared to those without dental caries.<sup>29</sup> Though none of the above-mentioned studies can be considered as true reflections of the existing perceptions in the whole of India, the fact that these studies were conducted in geographically diverse regions of India allows the findings to be generalized to some extent.

### Periodontal Diseases and Quality of Life

The prevalence of periodontal disease is high universally, and it is a substantial public health problem in some countries. Periodontal disease contributes to the global burden of chronic disease and is a problem of profound importance that has to be addressed.<sup>30</sup> In the first ever national level epidemiological survey on oral health conducted by the Dental Council of India (DCI), it was determined that the prevalence of periodontal disease was 89.6% in the 35-44 years age group.<sup>24</sup> It navigates the perception of poor OHRQoL, as periodontal conditions are often characterized with recognizable signs and symptoms such as difficulty in chewing as a result of mobility of teeth and disparaging gingival changes leading to poor aesthetics.

Periodontal status has a significant impact on the domains of functional limitation, physical pain, psychological discomfort, physical and psychological disabilities in OHIP-14.<sup>31</sup> Studies conducted among an Indian population also revealed the negative influence that periodontal diseases have on QoL.<sup>27,29</sup>

### Edentulism and Quality of Life

The debilitating nature of oral problems left a considerable segment of Indian adults edentulous. Edentulism imposes functional limitations on individuals besides interfering with their social participation, affecting their psychological wellbeing, and causing aesthetic degradation.<sup>32,33</sup> Periodontitis

**Table 1.** Various Commonly Used OHRQoL Measures

| Name of the Measure                                      | Authors                                   |
|--|---|
| Social Impacts of Dental Disease                         | Cushing et al, <sup>10</sup> 1986         |
| General (Geriatric) Oral Health Assessment Index (GOHAI) | Atchison and Dolan, <sup>11</sup> 1990    |
| Oral Health Impact Profile (OHIP)                        | Slade and Spencer, <sup>12</sup> 1994     |
| Oral Impacts on Daily Performances (OIDP)                | Adulyanon and Sheiham, <sup>13</sup> 1997 |
| Oral Health-Related QoL Measure                          | Kressin, <sup>14</sup> 1997               |
| Dental Impact on Daily Living (DIDLS)                    | Leao and Sheiham, <sup>15</sup> 1997      |
| Oral Health QoL Inventory                                | Cornell et al, <sup>16</sup> 1997         |
| OHIP   | Locker and Allen, <sup>17</sup> 2002      |
| Child Oral Health QoL Questionnaire (COHQoL)             | Jokovic et al, <sup>18</sup> 2002         |
| Child OIDP   | Gherunpong et al, <sup>19</sup> 2004      |
| Child OHIP   | Broder, <sup>20</sup> 2007                |

and dental caries remain the prime causes for the extraction of teeth.<sup>34</sup> Thus, edentulism is most often an extension of poor OHRQoL with different frequency and severity rates.

#### Malocclusion and Quality of Life

The relationship between malocclusion and OHRQoL can be discerned from different perspectives. People with disregarded malocclusion for prolonged periods of time could develop temporomandibular joint disorders and also find themselves at increased risk for experiencing facial trauma.<sup>35</sup> Malocclusion can affect individuals' QoL by imposing restrictions on function, speech, masticatory abilities, and, consequently, on their choice of food.<sup>36</sup>

More than one-third of the pediatric population in India suffers from improper alignment of teeth and jaws, crippling the operating abilities of the dentofacial mechanism. Malocclusion was found to have a profound negative influence on OHRQoL with children having malocclusion demonstrating poorer QoL compared to their counterparts.<sup>37</sup>

#### Dental Fluorosis and Quality of Life

Fluoride in increased quantities renders teeth vulnerable for derogatory changes in enamel like discoloration, high porosity, and pitting resulting in decreased wear resistance and fracture-prone nature. Confluent areas of pitting lead to larger enamel defects in severe conditions. The association between fluorosis and OHRQoL could be comprehended better from an aesthetic viewpoint.<sup>38</sup> More than half of the Indian states were observed to be endemic zones for fluorosis with five of them being considered under category III, which implies that more than 50% of the districts in those states are affected. Lower OHRQoL was found among 12-year-old children with dental fluorosis in a study conducted by Prabhu et al in Tamilnadu, India.<sup>39</sup>

#### Oral Cancer and Quality of Life

Oral cancer is one of the most common cancers in India, contributing 30% towards the cancer prevalence in the nation.<sup>40</sup> Even in cases where care was sought, conventional interventions for cancers have subsequent bearing on the OHRQoL, and these individuals would require oral healthcare provision throughout life.<sup>25</sup>

#### Socioeconomic Status and Gender Influences on OHRQoL

Lower socio-economic status was found to have a significant association with poor OHRQoL.<sup>41</sup> Irrespective of the severity of the oral health problems experienced, Indian females have poor OHRQoL compared to their counterparts.<sup>28,29</sup> Finding answers for gender differences in OHRQoL demands the deciphering of different life course influences for each gender together with oral health status.

#### Oral Diseases and Global Disability Adjusted Life Years

Global disability adjusted life year (DALY) for the year 2010 for dental caries was 4.98 million years, 5.41 million years for periodontal diseases, and 4.62 million years for edentulism.<sup>42</sup> While separate data for the Indian population is not available,

the high prevalence rates of the above-mentioned oral conditions suggest more DALYs.

#### Oral Diseases on Systemic Health

Unattended dental problems not only impose functional limitations on individuals and restrict their choice of food leading to nutritional deficiencies, but also influence the systemic health. The scope of spread of oral infections to other parts of the body is especially high with periodontal diseases and dental caries. Pulpal infections have the potential to spread to underlying reinforcing tissues and facial apparatus. Severe periodontal infections serve as a basis for infection of various body parts.<sup>43</sup>

Thus, there are a multitude of oral health problems prevalent in the Indian population which significantly affect their QoL. This scenario would not be very different in other low- and middle-income countries. The immediate question that arises is, with a disease burden this big making a significant negative impact on people's QoL, what is the rate of utilization of dental services? Unfortunately, only a few people utilize oral healthcare services in India, despite the universal distribution of oral diseases.<sup>44-55</sup>

Reaching out to communities and setting up reasonably priced rural oral health centers, to some extent, negotiate the accessibility and financial barriers of utilization, but it does not ensure utilization, since it cannot be assumed that dental care will be a priority for people who suffer from chronic hunger. Seeking dental care, however reasonable the prices may be, costs them too much not only in terms of money, but also in the number of work hours lost, which could affect their QoL. Thus, the provision of more basic needs must be seen as a prerequisite for the oral health-related QoL of the population to improve. Table 2 shows international experiences relating to OHRQoL.

#### Recommendations for the Future

- OHRQoL can be used in advocacy with policymakers, since it is a better tool to communicate with them than the objective clinical indicators. Administrators may more readily comprehend the significance of high DMFT scores from the perspective of impaired QoL measures than traditional mean scores with standard deviations.
- OHRQoL can form a better basis for needs assessment compared to the estimation of normative needs, particularly in view of current economic conditions and curtailing healthcare expenditures.
- OHRQoL can be used as an evaluation tool in performing cost effectiveness analyses which may give directions for planning future oral health programs.
- OHRQoL for all the aforementioned reasons must be incorporated in National Oral Health Surveys.
- There is a dire need to gain a conceptual understanding of oral health effects on peoples' QoL in countries where OHRQoL research is in its nascent stage. The basis for estimating OHRQoL in many countries has been instruments developed in developed countries which are usually socially and economically advanced. This could

**Table 2.** International Experiences Relating to OHRQoL

| Country  | Authors                             | Study Population                             | Study Outcome   |
|----------|-------------------------------------|--|---|
| Brazil   | Ulinski et al <sup>56</sup>         | Brazilian elderly                            | Lower class females with at least one untreated caries and poor self-rated oral health status were found to have significantly poor OHRQoL. |
| Canada   | Kotzer et al <sup>57</sup>          | Aging Canadian population                    | Physical pain and psychological discomfort were the most common domains affecting OHRQoL.   |
| China    | Zhang et al <sup>58</sup>           | Chinese population aged >40 years            | A strong association was found between OHRQoL and the presence of more than or equal to 10 teeth in each of the jaws.                       |
| Iran     | Mozafari et al <sup>59</sup>        | Iranian geriatric population                 | Ill-fitting dentures, mobile teeth, and oral ulcers were major conditions affecting OHRQoL.   |
| Japan    | Yamane-Takeuchi et al <sup>60</sup> | Japanese university students                 | Self-rated oral health status, caries experience, malocclusion, and orofacial pain were associated with OHRQoL.                             |
| Tanzania | Mbawalla et al <sup>61</sup>        | Northern Tanzanian secondary school children | Unaffordability of dental care, smoking experience, and lack of dental visits were found to have independent associations with OHRQoL.      |

lead to the inaccurate estimation of OHRQoL and may also lead to inconsistencies in understanding utilization patterns and manpower estimations.<sup>4</sup>

### Conclusion

Human needs follow a hierarchy. It is only when the basic needs are met that the next level of needs in the hierarchical order comes into play. Though oral diseases affect the QoL of an individual as discussed above, what is the position of oral health in the hierarchical order of needs for an average person in India? Being ardent supporters of the “oral health as an inclusive part of overall health” campaign, we must also be firm believers that this campaign holds value and goes into the public only when the people are provided with more basic needs like food, security, shelter, and access to basic healthcare. The target should not only be to make people aware of the importance of oral health and how it affects their QoL, but also to provide a social and economic environment that supports their realization of this. Thus, it becomes the responsibility of every citizen to rationally work towards the aim of “QoL of people equitably to improve.”

### Authors' Contributions

All authors contributed equally to this research.

### Conflict of Interest Disclosures

The authors declare they have no conflicts of interest.

### Ethical Approval

Ethical approval was obtained from the Institutional Ethical Committee of Sibar Institute of Dental Sciences, Andhra Pradesh, India.

### References

1. Measurement of Levels of Health. Technical Reports Series, No.137. Geneva: WHO; 1957.
2. Healthy mouth. Healthy body. World Oral Health Day, FDI World Dental Federation 2016. <http://www.fdiworlddental.org/resources/annual-reports/annual-report-2016>. Accessed August 20, 2017.
3. Locker D, Allen F. What do measures of 'oral health-related quality of life' measure? *Community Dent Oral Epidemiol.* 2007;35(6):401-411. doi:10.1111/j.1600-0528.2007.00418.x.
4. Bennadi D, Reddy CV. Oral health related quality of life. *J Int Soc Prev Community Dent.* 2013;3(1):1-6. doi:10.4103/2231-0762.115700.
5. Hodacova L, Smejkalova J, Cermakova E, Slezak R, Jacob V, Hlavackova E. Oral health-related quality of life in Czech population. *Cent Eur J Public Health.* 2010;18(2):76-80.
6. Locker D, Jokovic A, Tompson B. Health-related quality of life of children aged 11 to 14 years with orofacial conditions. *Cleft Palate Craniofac J.* 2005;42(3):260-266. doi:10.1597/03-077.1.
7. Atchison KA, Shetty V, Belin TR, et al. Using patient self-report data to evaluate orofacial surgical outcomes. *Community Dent Oral Epidemiol.* 2006;34(2):93-102. doi:10.1111/j.1600-0528.2006.00260.x.
8. Al Shamrany M. Oral health-related quality of life: a broader perspective. *East Mediterr Health J.* 2006;12(6):894-901.
9. Baiju RM, Peter E, Varghese NO, Sivaram R. Oral Health and Quality of Life: Current Concepts. *J Clin Diagn Res.* 2017;11(6):Ze21-ze26. doi:10.7860/jcdr/2017/25866.10110.
10. Cushing AM, Sheiham A, Maizels J. Developing socio-dental indicators – the social impact of dental disease. *Community Dent Health.* 1986;3:3-17.
11. Atchison KA, Dolan TA. Development of the Geriatric Oral Health Assessment Index. *J Dent Educ.* 1990;54:680-687.
12. Slade DG, Spencer AJ. Development and evaluation of the Oral Health Impact Profile. *Community Dent Health.* 1994;11:3-11.
13. Adulyanon S, Sheiham A. Oral impacts on daily performances. In: Slade GD, ed. *Measuring Oral Health and Quality of Life.* Chapel Hill: University of North Carolina, Dental Ecology; 1997:152-160.
14. Kressin NR. The Oral Health Related Quality of Life Measure (OHQOL). In: Slade GD, ed. *Measuring Oral Health and Quality of Life.* Chapel Hill: University of North Carolina, Dental Ecology; 1997:114-119.
15. Leao A, Sheiham A. The development of a sociodental measure of dental impacts on daily living. *Community Dent Health.* 1994;13:22-26.
16. Cornell JE, Saunders MJ, Paunovich ED, Frisch MB. Oral Health Quality of Life Inventory (OH-QoL). In: Slade GD, ed. *Measuring Oral Health and Quality of Life.* Chapel Hill: University of North Carolina, Dental Ecology; 1997:136-149.
17. Slade GD. Derivation and validation of a shortform oral health impact profile. *Community Dent Oral Epidemiol.* 1997;25:284-290.
18. Jokovic A, Locker D, Stephens M, Kenny D, Tompson B. Validity and reliability of a measure of child oral health-related quality of life. *J Dent Res.* 2002;81:459-463.
19. Gherunpong S, Tsakos G, Sheiham A. Developing and evaluating an oral health related quality of life index for children: The Child-OIDP. *Community Dent Health.* 2004;21:161-169.



20. Broder HL. Children's Oral health-related quality of life questionnaire. *Community Dent Oral Epidemiol.* 2007;35(suppl 1):5-7.
21. VijayaKumar K, Narendra Saini. White Paper: Healthcare Reforms and Investments, 2013. New Delhi: Indian Medical Association; 2013. <http://www.ima-india.org/ima/Healthcare%20Reforms%20&%20Investments.pdf>. Accessed September 10, 2017.
22. Goldman AS, Yee R, Holmgren CJ, Benzian H. Global affordability of fluoride toothpaste. *Global Health.* 2008;4:7. doi:10.1186/1744-8603-4-7.
23. Report of the National commission on Macroeconomics and health, Ministry of Health and Family Welfare, Government of India 2005. <http://www.who.int/macrohealth/action/Report%20of%20the%20National%20Commission.pdf?ua=1>. Accessed September 16, 2017.
24. Bali RK, Mathur VB, Talwar PP, Chanana HB. National Oral Health Survey and Fluoride Mapping, India. 2002-2003. Delhi: Dental Council of India; 2004.
25. Manchanda K, Sampath N, Sarkar De A, Bhardwaj VK, Fotedar S. Oral health-related quality of life- A changing revolution in dental practice. *Journal of Cranio-Maxillary Diseases.* 2014;3(2):124-132. doi:10.4103/2278-9588.138230.
26. Shah N. Oral and dental diseases: Causes, prevention and treatment strategies. Burden of disease, National Commission on Macroeconomics and Health; 2005:275-298.
27. Acharya S. Oral health-related quality of life and its associated factors in an Indian adult population. *Oral Health Prev Dent.* 2008;6(3):175-184.
28. Ingle NA, Chaly PE, Charania ZK. Oral health related QoL in adult population attending the outpatient department of a hospital in Chennai, India. *J Int Oral Health.* 2010;2(4):45-56.
29. Fotedar S, Sharma KR, Fotedar V, Bhardwaj V, Chauhan A, Manchanda K. Relationship between oral health status and oral health related quality of life in adults attending H.P Government Dental College, Shimla, Himachal Pradesh--India. *Oral Health Dent Manag.* 2014;13(3):661-665.
30. Petersen PE, Ogawa H. The global burden of periodontal disease: towards integration with chronic disease prevention and control. *Periodontol* 2000. 2012;60(1):15-39. doi:10.1111/j.1600-0757.2011.00425.x.
31. Ng SK, Leung WK. Oral health-related quality of life and periodontal status. *Community Dent Oral Epidemiol.* 2006;34(2):114-122. doi:10.1111/j.1600-0528.2006.00267.x.
32. Dable RA, Yashwante BJ, Marathe SS, Gaikwad BS, Patil PB, Momin AA. Tooth loss--how emotional it is for the elderly in India? *Oral Health Dent Manag.* 2014;13(2):305-310.
33. Gerritsen AE, Allen PF, Witter DJ, Bronkhorst EM, Creugers NH. Tooth loss and oral health-related quality of life: a systematic review and meta-analysis. *Health Qual Life Outcomes.* 2010;8:126. doi:10.1186/1477-7525-8-126.
34. Petersen PE, Yamamoto T. Improving the oral health of older people: the approach of the WHO Global Oral Health Programme. *Community Dent Oral Epidemiol.* 2005;33(2):81-92. doi:10.1111/j.1600-0528.2004.00219.x.
35. Zhang M, McGrath C, Hagg U. The impact of malocclusion and its treatment on quality of life: a literature review. *Int J Paediatr Dent.* 2006;16(6):381-387. doi:10.1111/j.1365-263X.2006.00768.x.
36. English JD, Buschang PH, Throckmorton GS. Does malocclusion affect masticatory performance? *Angle Orthod.* 2002;72(1):21-27. doi:10.1043/0003-3219(2002)072<0021:dmamp>2.0.co;2.
37. Kragt L, Dharmo B, Wolvius EB, Ongkosuwito EM. The impact of malocclusions on oral health-related quality of life in children-a systematic review and meta-analysis. *Clin Oral Investig.* 2016;20(8):1881-1894. doi:10.1007/s00784-015-1681-3.
38. Aguilar-Diaz FC, Irigoyen-Camacho ME, Borges-Yanez SA. Oral-health-related quality of life in schoolchildren in an endemic fluorosis area of Mexico. *Qual Life Res.* 2011;20(10):1699-1706. doi:10.1007/s11136-011-9897-4.
39. Prabhu S, Saravanan S, John J. Impact of Dental Caries and Dental Fluorosis on the QoL of 12- year old Children in Tamil Nadu, India. *Chettinad Health City Medical Journal.* 2013;2(3):74-79.
40. Shah SP, Praveen BN. Awareness of oral cancer in rural Bangalore population: A questionnaire based study. *Int J Sci Stud.* 2014;1(6):14-16.
41. Goyal A, Sharma A, Gaur T, et al. Impact of dental fear on oral health-related quality of life among school going and non-school going children in Udaipur city: A cross-sectional study. *Contemp Clin Dent.* 2014;5(1):42-48. doi:10.4103/0976-237x.128662.
42. Murray CJ, Vos T, Lozano R, et al. Disability-adjusted life years (DALYs) for 291 diseases and injuries in 21 regions, 1990-2010: a systematic analysis for the Global Burden of Disease Study 2010. *Lancet.* 2012;380(9859):2197-2223. doi:10.1016/s0140-6736(12)61689-4.
43. Shawn Lin, Allison Mauk. Oral health: addressing dental diseases in rural India, Implementing public health interventions in developing countries. St. Louis: Washington University. p. 105-133.
44. Kulkarni S, Jain M, Mathur A, et al. A relation between dental anxiety, the parental family and regularity of dental attendance in India. *J Oral Health Comm Dent.* 2009;3(2):29-33.
45. Garcha V, Shetiya SH, Kakodkar P. Barriers to oral health care amongst different social classes in India. *Community Dent Health.* 2010;27(3):158-162.
46. Poudyal S, Rao A, Shenoy R, Priya H. Utilization of dental services in a field practice area in mangalore, karnataka. *Indian J Community Med.* 2010;35(3):424-425. doi:10.4103/0970-0218.69278.
47. Parlani S, Tripathi A, Singh SV. Increasing the prosthodontic awareness of an aging Indian rural population. *Indian J Dent Res.* 2011;22(3):367-370. doi:10.4103/0970-9290.87054.
48. Devaraj CG, Eswar P. Association Between Socio-demographic Factors and Dental Service Utilization Among People Visiting a Dental College Hospital in India- A Descriptive Cross-sectional Study. *Indian Journal of Stomatology.* 2011;2(4):212-215.
49. Bommireddy VS, Koka KM, Pachava S, Sanikommu S, Ravoori S, Chandu VC. Dental Service Utilization: Patterns and Barriers among Rural Elderly in Guntur District, Andhra Pradesh. *J Clin Diagn Res.* 2016;10(3):Zc43-47. doi:10.7860/jcdr/2016/17834.7456.
50. Gambhir RS, Brar P, Singh G, Sofat A, Kakar H. Utilization of dental care: An Indian outlook. *J Nat Sci Biol Med.* 2013;4(2):292-297. doi:10.4103/0976-9668.116972.
51. Nagarjuna P, Reddy V, Sudhir K, Kumar RVS, Gomasani S. Utilization of dental health-care services and its barriers among the patients visiting community health centers in Nellore District, Andhra Pradesh: A cross-sectional, questionnaire study. *Journal of Indian Association of Public Health Dentistry.* 2016;14(4):451-455. doi:10.4103/2319-5932.195844.
52. Gupta S, Ranjan V, Rai S, Mathur H, Solanki J, Koppula S. Oral health services utilization among the rural population of western Rajasthan, India. *Journal of Indian Academy of Oral Medicine and Radiology.* 2014;26(4):410-413. doi:10.4103/0972-1363.155688.
53. Gill M, Pal K, Gambhir R. Oral hygiene practices, attitude, and access barriers to oral health among patients visiting a rural dental college in North India. *J Dent Res Rev.* 2014;1(3):114-117. doi:10.4103/2348-2915.146486.
54. Bharti R, Chandra A, Tikku AP, Arya D, Gupta R. Oral care needs, barriers and challenges among elderly in India. *J Indian Prosthodont Soc.* 2015;15(1):17-22. doi:10.4103/0972-4052.155044.
55. Chandu VC, Pachava S, Viswanath V. Strategies for improving accessibility to oral health care services in rural India: an insight. *Int J Oral Health Med Res.* 2017;4(2):44-46.
56. Ulinski KG, do Nascimento MA, Lima AM, et al. Factors related to oral health-related quality of life of independent brazilian elderly. *Int J Dent.* 2013;2013:705047. doi:10.1155/2013/705047.
57. Kotzer RD, Lawrence HP, Clovis JB, Matthews DC. Oral health-related quality of life in an aging Canadian population. *Health*

- Qual Life Outcomes. 2012;10:50. doi:[10.1186/1477-7525-10-50](https://doi.org/10.1186/1477-7525-10-50).
58. Zhang Q, Witter DJ, Gerritsen AE, Bronkhorst EM, Creugers NH. Functional dental status and oral health-related quality of life in an over 40 years old Chinese population. *Clin Oral Investig*. 2013;17(6):1471-1480. doi:[10.1007/s00784-012-0834-x](https://doi.org/10.1007/s00784-012-0834-x).
59. Mozafari PM, Amirchaghmaghi M, Moeintaghavi A, et al. Oral Health Related Quality of Life in a Group of Geriatrics. *J Clin Diagn Res*. 2015;9(11):Zc52-55. doi:[10.7860/jcdr/2015/14345.6816](https://doi.org/10.7860/jcdr/2015/14345.6816).
60. Yamane-Takeuchi M, Ekuni D, Mizutani S, et al. Associations among oral health-related quality of life, subjective symptoms, clinical status, and self-rated oral health in Japanese university students: a cross-sectional study. *BMC Oral Health*. 2016;16(1):127. doi:[10.1186/s12903-016-0322-9](https://doi.org/10.1186/s12903-016-0322-9).
61. Mbawalla HS, Masalu JR, Astrom AN. Socio-demographic and behavioural correlates of oral hygiene status and oral health related quality of life, the Limpopo-Arusha school health project (LASH): a cross-sectional study. *BMC Pediatr*. 2010;10:87. doi:[10.1186/1471-2431-10-87](https://doi.org/10.1186/1471-2431-10-87).