Development and Initial Validation of an Oral Health-Related Quality of Life Scale for Older Adolescents

Abstract

Background: Oral health-related quality of life (OHRQoL) perception is age-dependent and therefore different for children, adolescents, and adults. Adolescents are a critical age group with specific oral health needs. Oral health needs assessment is not complete without the estimation of OHRQoL.

Objective: To develop and validate an OHRQoL scale for older adolescents considering their functional, social, emotional, academic, and economic situation. Methods: All steps in psychometric tool development including face, content, and translational validity, pretesting, piloting, and factor analysis were followed. Construct validity was further tested using a cross-sectional study on 400 senior secondary students. Sociodemographic data, Decayed Missing Filled Teeth, Dental Aesthetic Index, and Community Periodontal Index were used to test construct validity. Results: A 20-item tool with five domains (intraclass correlation of 0.857, Cronbach’s alpha of 0.811, variance of 64.25%) was developed. Convergent validity was established with a single-item global question and discriminant validity with clinical indices. In the multivariate logistic regression model, malocclusion emerged as the most significant predictor for poor OHRQoL adjusting for socioeconomic status, dental caries, gingival bleeding, and last dental visit. Dental caries and last dental visit also significantly predicted poor OHRQoL in the adjusted regression model. Conclusion: The new tool has sound psychometric properties, is relatively short, culturally equivalent, age-specific, and can assess both positive and negative aspects of adolescent oral health. Further testing in longitudinal studies is required to determine its usefulness as an outcome measure.

Keywords: Adolescent, dental caries, malocclusion, oral health-related quality of life, patient-reported outcome

Introduction

Traditional ways to measure oral health are based on clinical standards that seldom reflect the functional or psychosocial aspects of the individual. Oral health-related quality of life (OHRQoL) is a dynamic construct about the subjective perception of oral health impacts on the daily life activities of an individual.[1] Estimation of OHRQoL has become a vital adjunct to normative clinical data in epidemiological and clinical research.

Literature search reveals that there are more than 20 OHRQoL instruments validated in various countries and most of them are meant for either adults or children.[1,2] Oral health perceptions are dynamic and they change as individuals grow up and mature.[1] Perception of oral health impacts are age-dependent; it varies with continuous cognitive, intellectual, emotional, and social development of the child and therefore is different for preschool children, adolescents, adults, and elderly.[4] Adolescence, the transition phase from childhood to adulthood acquiring biological and psychosocial maturity, represents a critical stage in human development.

General and oral healthcare of adolescents is a priority in health administration for many governments. Clinical and OHRQoL data acquired during surveys enable a needs assessment to prioritize oral healthcare and preventive services. The established OHRQoL scales for children and adolescents cover only up to 15 years, and currently there are no OHRQoL scales specifically meant for older adolescents above 15 years of age.[3] Older adolescents have an improved awareness of body image, looks, appearance and a changing perception of social role.[6] The published data about the self-perception of oral health and its impact on the quality of life (QoL)
of this age group is not substantial. It is ideal to have a specific OHRQoL scale for the 15–18 age group, as this is a crucial phase in the biologic, personal, and psychosocial development of an individual.

Among the determinants of OHRQoL in adolescents, psychosocial domain is more significant than clinical or sociodemographic factors. Baker et al. analyzed the psychosocial factors associated with adolescent oral health based on Wilson and Cleary’s conceptual model. The findings emphasize the role of sense of coherence, self-esteem, and oral health beliefs in influencing the self-perception and QoL related to their oral health. The environmental influence, that is, the socioeconomic status of families including family income and parental education, affects the OHRQoL of adolescents. These evidences contributed to the theoretical concept for this article. The objective of this study was development and initial validation of a scale to estimate the OHRQoL of older adolescent students (15–18 years) considering their functional, social, emotional, economic, and academic requirements. The new scale is a set of questions assessing oral health impacts and positive aspects of oral health intended to be self-administered and discriminatory in nature so that it can be used in clinical studies and in large oral health surveys.

Methods

The study was in full accordance with the World Medical Association Declaration of Helsinki. The institutional ethics committee approval was obtained from Government Dental College, Kottayam, Kerala, India (IEC No. M/02/2011/DCK). The study was conducted in schools with prior permission from the school authorities. Written informed consent was obtained from the parents and verbal consent from participants which was approved by the ethics committee. All the steps involved in the iterative process of psychometric tool development were meticulously followed.

Item generation

Based on the information gathered from the qualitative methods [Table 1], an initial 45-item pool was developed comprising 24 new items and 21 items from existing scales (one each from Social Impact of Dental disease (SIDD), Geriatric/General Oral Health Assessment Index (GOHAI), and Dental Impact on Daily Performance; three items from Subjective Oral Health Status Index; 13 items from Oral Health Impact Profile (OHIP); one item common to SIDD, GOHAI, and OHIP; one item common to SIDD and OHIP) which were modified according to local sociocultural requirements.

Face and content validity

Expert paneling

A panel of 10 subject experts (6 periodontists, 3 endodontists, and 1 pedodontist) reviewed the item pool and ranked them based on their preference. Experts rated each item based on relevance as “most relevant,” “relevant,” “can be avoided,” and “not relevant.” The expert rating was quantified as a content validity index (CVI). Three items with CVI less than 0.8 were deleted resulting in 42 items in the draft tool. Consensus on wording, sequencing, and formatting of each item was arrived upon. Items were in the form of questions and responses, and their scores were in a 5-point rating scale format (always = 4, most of the time = 3, sometimes = 2, rarely = 1, never = 0).

Translational validity

The item pool was initially developed in English and later translated to the local language Malayalam. A panel of three members (two subject experts and a linguistic expert with good proficiency in both English and Malayalam) did independent translations, and the final Malayalam version was decided after discussion in the panel. A set of three different experts did back-translation to English and compared with the original English version. The two teams assessed the semantic and conceptual equivalence of both language versions and after discussion came out with the final Malayalam version of draft tool in a simple language understandable to a 15-year-old student.

Pretesting

The draft tool was pretested on one class of students, to assess ambiguity, clarity, and acceptability of the items among the age group. Three items needed to be reworded and these were subjected again to expert review, translation,
and back-translation, and pretest was repeated with another class of students.

**Piloting**

Draft tool was initially administered to 57 students (26 urban and 31 rural) to assess the time required and the overall feasibility of self-administration. The tool was again administered after 14 days to the same group. The data obtained (from 50 students who were present on both occasions and did not report any significant change in their oral health status during the interval) was used to assess test–retest reliability. Five items, with intraclass correlation (ICC) score below 0.7, were deleted. A 37-item tool was finalized for further testing.

**Final administration of the draft tool**

Since the new scale development was part of a larger cross-sectional study among students (15–18 years) studying in classes 10, 11, and 12, a stratified cluster sampling was employed. The list of higher secondary schools in Kuttayam and Thrissur districts of the state of Kerala was obtained from the Department of Higher Secondary Education. The schools were stratified as public sector (government and aided) and private sector (self-financing) and the location into urban (corporation and municipality) and rural (villages) to ensure a homogeneous representation. Two schools were selected randomly from each stratum making a total of 16 schools from both districts. A sample of 400 (no. of items × 10) is appropriate for construct validation of a 37-item draft tool.[19] One class of students from each school formed a cluster making a total sample of 423. Exclusion criteria were as follows: children with mental disability/learning disorder, scaling within 3 months, current or previous fixed orthodontic treatment, and not knowing Malayalam. Following uniform verbal instructions by the principal investigator, students individually filled up the questionnaire. Then two dentists recorded sociodemographic, dietary, and oral hygiene data. Decayed Missing Filled Teeth (DMFT), Community Periodontal Index (CPI) – WHO modified criteria (WHO 2013), and Dental Aesthetic Index (DAI) were recorded.

**Scoring**

All the items except one assessed impacts. The positively worded item *(happy with smile)* underwent score reversal. The higher the impact, the higher the score and the poorer the QoL.

**Missing data**

Questionnaires with missing response to even one item was not considered for analysis as it affects summary score computation. The scores of the items in a domain were added to get the domain score. All the domain scores were added to get the total scale (Oral Health Impact in Adolescents – OHIA) score.

Along with OHIA, a single-item self-rating global question (GQ) was administered. The GQ *(How do you rate your present quality of life based on your oral condition?)* scores ranged from 0 (poor QoL) to 4 (excellent QoL).

Statistical Package for Social Sciences (SPSS for Windows, 16.0; SPSS Inc., Chicago, IL, USA) was used for data analysis. Kolmogorov–Smirnov test was done to check the normality of distribution of OHIA and GQ. Item-wise distribution of responses was also done to check for skewness.

**Reliability**

The two dentists who performed the oral examination were trained, and reliability in their measurements was established in a separate pilot study on 40 adolescents. The interrater agreement and intrarater agreement (Cohen’s *kappa* 0.68–0.90) were good. Domain-wise correlation matrices were performed, and internal consistency reliability was assessed using Cronbach’s alpha.

**Construct validity**

Factor analysis was done for item reduction and as a test of construct validity using principal component analysis by varimax rotation. The eigen value criterion (greater than 1.0) and the “scree test” determined the factor formation. A factor loading of 0.45 was fixed for considering an item. Items were deleted one at a time based on factor loading and after repeating Cronbach’s alpha each time. Construct validity was also tested by examining measures of discriminant and convergent validity. Convergent validity of OHIA was assessed with GQ using Pearson’s product moment correlation as GQ is a measure having similar construct. Discriminant validity, the ability of OHIA to differentiate between diseased and healthy based on the clinical indices DMFT, DAI, and CPI, was tested using independent samples *t*-test. For analytical purpose, the students were dichotomized based on index scores.

OHRQoL score for dentally healthy students was calculated by computing mean OHIA scale score of those with index scores – DMFT = 0, DAI <25, CPI bleeding = 0, CPI pockets = 0, and LOA = 0. For all the analyses, a probability level of *P* < 0.05 was kept as significant.

**Results**

Data of 400 students (191 boys and 209 girls) were analyzed, and the rest avoided due to missing response in QoL questionnaire. Demographic characteristics of the sample are given in Table 2. The mean OHIA score was 18.12 ± 9.778 and mean GQ score was 1.90 ± 1.03. The maximum possible score of OHIA is 80, and maximum reported was 48.

The full range of response choices was used by the participants. Items were skewed toward less impact scores. Items having more than 90% endorsement on any two responses on either side were avoided. The scale
demonstrated good dispersion of scores with little floor or ceiling effect.

**Reliability**

Test–retest reliability (average ICC) was 0.834, 95% confidence interval (0.760–0.893). Interitem and item total correlation were done and the items with positive correlations >0.2 were retained. Internal consistency was high (Cronbach’s alpha = 0.811). Domain-wise alpha ranged from 0.66 to 0.84 [Table 2].

**Construct validation by factor analysis**

Sampling adequacy and factorizability of data were ensured by Kaiser–Meyer–Olkin value of 0.718 and a significant Chi-square value on Bartlett’s test of sphericity. The number of items was reduced to 20 with five factors (physical, psychological, social, role affection, and socioeconomic).

The item reduction process is illustrated in Figure 1. The cumulative variance of the 20-item tool was 64.256 and communality ranged from 0.361 to 0.865 [Table 3].

**Convergent validity**

There was a significant correlation between OHIA and GQ (Pearson’s value = 0.687). The correlation was strongly negative as OHIA assessed impacts and GQ (your present quality of life based on oral health) positive aspects of health, establishing the convergent validity. OHIA and its domains correlated well with DMFT, DAI, and CPI [Table 4].

**Construct validation by hypothesis testing**

Convergent and discriminant validity testing of OHIA with the clinical indices is summarized in Table 5. There was a significant difference in mean OHIA scores between the dichotomized categories of DMFT, DAI, and CPI bleeding, but the mean OHIA score could not significantly differentiate between periodontal pockets and no-pocket categories (P = 0.794).

| Table 2: Sociodemographic data of the adolescent student participants (n=400) |
| Category | Frequency, n (%) |
|-----------|-----------------|
| Gender    |                 |
| Male      | 191 (47.8)      |
| Female    | 209 (52.2)      |
| School    |                 |
| Govt/aided| 243 (60.8)      |
| Private   | 157 (39.2)      |
| Locality  |                 |
| Urban     | 195 (48.8)      |
| Rural     | 205 (51.2)      |
| SES       |                 |
| BPL       | 174 (43.5)      |
| APL       | 226 (56.5)      |
| Age (years)|              |
| 15        | 18 (4.5)        |
| 16        | 157 (39.2)      |
| 17        | 201 (50.2)      |
| 18        | 22 (5.5)        |
| 19        | 2 (0.5)         |

SES=Socioeconomic status; BPL=Below poverty line; APL=Above poverty line (government of Kerala criteria)

OHIA domain scores were compared with clinical index scores. Dental caries was significantly associated with physical and role affection domains. All domains except socioeconomic showed significant association with malocclusion. Both social and role affection domains showed significant association with gingival bleeding.

Multivariate logistic regression model for determining the predictors of poor OHRQoL based on OHIA scores was done. The mean OHIA score (11.47) of dentally healthy students was used to determine the dependent variable (good OHRQoL up to score 11, poor OHRQoL score 12 and above) for the unadjusted and adjusted regression models. Biologically relevant independent variables such as age, gender, socioeconomic status, last dental visit, and clinical index scores were included in the unadjusted analysis. Independent variables such as socioeconomic status, dental caries, malocclusion, gingival bleeding, and last dental visit with a P value <0.25 in the bivariate analysis were included in the adjusted model in ENTER method. Dental caries, malocclusion, and last dental visit emerged as significant in the multivariate model [Table 6]. Goodness of fit of the model, assessed using Hosmer and Lemeshow statistic (Chi-square = 11.926, P = 0.155), proved to be good.
Discussion
To our knowledge, this is the first attempt to develop a new sociodemographically and culturally relevant OHRQoL scale for Indian adolescents. This is the first specific scale for adolescents above 15 years in an Indian language. The development methodology was in accordance with Juniper and Guyatt’s (1991) recommendations. The initial 45-item draft tool was reduced to a parsimonious 20-item scale with five domains without compromising the content validity. The factors in the physical domain had a heterogeneous nature as it deals with signs and symptoms; the items were loaded as two separate factors. Since the items primarily assessed physical or functional aspects and were not cross loaded, they were clubbed together as physical domain. A similar result was reported by Broder et al. in the development of Child Oral Health Impact Profile – COHIP. The first three OHIA domains are common to OHIP, but the items are different. Role affection and socioeconomic domains are entirely new.

OHIA demonstrated good psychometric properties and the five-factor structure with cumulative variance over 64%. Literature suggests that the minimum acceptable value for alpha is 0.7, cumulative variance for retained factors is at least 60%, and cut-off for factor loading is 0.35. Good Pearson’s correlation with GQ established the convergent validity. Establishing convergence of the QoL tool with global self-rating had been reported.

Table 3: OHIA - reliability, rotated component matrix* and variance

| Component | OHIA | 1 Physical | 2 Psychological | 3 Social | 4 Role affection | 5 Socioeconomic |
|-----------|------|------------|----------------|---------|-----------------|----------------|
| Cronbach’s alpha | 0.669 | 0.738 | 0.808 | 0.726 | 0.849 | 0.811 |
| ICC (95% CI) | 0.857 (0.760-0.893) | |

### Abbreviated items

| Component | % variance | Cumulative variance % |
|-----------|------------|-----------------------|
| Pain | 0.496 | |
| Sensitivity | 0.730 | |
| Gum bleeding | 0.878 | |
| Food packing | 0.506 | |
| Difficulty to eat | 0.668 | |
| Difficulty to speak | 0.916 | |
| Chewing only on one side | 0.678 | 19.15 19.15 |
| Happy with smile | 0.782 | |
| Teased by friends | 0.660 | |
| Embarrassed to see photo | 0.777 | |
| A tooth is not right | 0.659 | |
| Breath smelly | 0.529 | |
| Avoid mixing with friends | 0.826 | |
| Uncomfortable to eat in front of others | 0.872 | |
| Uncomfortable to mix with opposite sex | 0.746 | |
| Missed classes due to dental problems | 0.855 | |
| Difficult to concentrate in class | 0.804 | 8.597 52.514 |
| Family income affected dental treatment | 0.854 | |
| Place of living affected dental treatment | 0.828 | |
| Parents education affected dental treatment | 0.892 | 11.742 64.256 |

**OHIA=Oral Health Impact in Adolescents; ICC=Intraclass correlation; CI=Confidence interval. *Extraction method=Principal component analysis; rotation method: varimax with Kaiser normalization**

Table 4: Convergent validity - correlations of OHIA and its domains with global question and clinical indices

| Index | OHIA | OHA domains |
|-------|------|-------------|
|       | Physical | Psychological | Social | Role affection | Socioeconomic |
| DMFT  | 0.193** | 0.364** | −0.034 | −0.030 | 0.251** | 0.046 |
| DAI   | 0.561** | 0.203** | 0.755** | 0.380** | 0.199** | 0.082 |
| CPI bleeding | 0.258** | 0.106** | −0.008 | 0.387** | 0.286** | 0.205** |
| GQ    | −0.687** |             |        |                 |               |       |

**Significant correlation, P<0.05. OHIA: Oral Health Impact in Adolescents; DMFT=Decayed Missing Filled Teeth Index; DAI=Dental Aesthetic Index; CPI bleeding=Community Periodontal Index bleeding score; GQ=global question**
Dental caries is highly prevalent in adolescents and is an important cause of oral impacts in them.\textsuperscript{[7,20]} OHIA score was significantly high in those with dental caries. Physical and role affection domains reported significant impacts with dental caries. This is clinically explainable as simple enamel or dentinal caries or minor restorations does not impact the daily living, but painful caries affects physical functioning and student’s role in schools. Children with high caries experience an increased risk of missing school days.\textsuperscript{[21,22]} This may potentially affect their academic performance.

Evidence suggests that periodontitis does have significant impact on QoL.\textsuperscript{[23,24]} The impacts are due to tooth mobility, gingival recession, and sensitivity that are hallmarks of advanced periodontitis.\textsuperscript{[25]} Adolescents generally demonstrate early inflammatory changes including gingival bleeding and pocketing. Gingival bleeding did influence the overall OHIA score as well as social and role affection domains. There was a statistically significant impact on OHRQoL in persons who had at least one gingival bleeding site compared with gingival health. OHIA was reliable and

| Index Category (score range) | OHIA score, mean (SD) | OHIA domain scores, mean (SD) |
|-----------------------------|-----------------------|--------------------------------|
| DMFT                        |                       | Physical | Psychological | Social | Role affection | Socioeconomic |
| No caries (score 0)         | 16.46 (9.34)          | 7.49 (4.25) | 4.77 (3.75) | 3.08 (3.04) | 1.10 (0.09) | 0.84 (1.93) |
| At least one caries (score 1 and above) | 19.2 (9.92)          | 9.68 (4.55) | 4.45 (3.83) | 3.23 (3.47) | 1.38 (0.08) | 0.99 (2.13) |
| t                           | 2.763*                | −4.878* | 0.539 | −0.439 | −2.831* | −0.699 |
| DAI                         |                       |                       |               |            |                |                |
| No treatment (score up to 30) | 15.42 (8.23)        | 8.27 (4.46) | 3.12 (2.53) | 2.61 (2.98) | 0.58 (1.22) | 0.90 (2.09) |
| Definite need (score 31 and more) | 28.46 (8.22)       | 10.93 (4.32) | 9.95 (2.82) | 5.34 (3.58) | 1.20 (1.46) | 1.05 (1.89) |
| t                           | 12.85*                | −4.865* | −21.377* | −7.110* | −3.985* | −0.590 |
| CPI bleeding                |                       |                       |               |            |                |                |
| No bleeding (score 0)       | 16.53 (9.43)          | 8.65 (5.18) | 4.26 (3.22) | 2.44 (2.65) | 0.49 (1.05) | 0.70 (1.74) |
| Bleeding (score 1)          | 18.92 (9.86)          | 8.90 (4.22) | 4.67 (4.05) | 3.54 (3.53) | 0.82 (1.38) | 1.04 (2.18) |
| t                           | 2.32*                 | −0.513 | −1.039 | −3.149* | −2.428* | −1.592 |
| CPI pockets                 |                       |                       |               |            |                |                |
| No pockets (score 0)        | 18.01 (9.69)          |                       |               |            |                |                |
| Pockets (score 1 and 2)     | 18.53 (10.1)          |                       |               |            |                |                |
| t                           | 0.438                 |                       |               |            |                |                |

*Statistically significant (P<0.05). OHIA=Oral health Impacts in adolescents; DMFT=Decayed Missing Filled Teeth Index; DAI=Dental Aesthetic Index; CPI bleeding=Community Periodontal Index bleeding score; CPI pockets=Community Periodontal Index Pocket score

| Table 6: Logistic regression model of OHRQoL as dependent variable (good OHRQoL vs poor OHRQoL) and socioeconomic status, dental caries, malocclusion, gingival bleeding, and last dental visit as independent variables |
|---------------------------------------------------------------|
| Risk factor                                                  | Poor OHRQoL n (%) | Good OHRQoL n (%) | P   | Odds ratio | 95% CI       | P   |
| Socioeconomic status                                         |                  |                  |     |            |              |     |
| Low                                                          | 132 (46.0)       | 42 (37.2)        | 0.118 | 1.348 | 0.831, 2.185 | 0.226 |
| High                                                         | 155 (54.0)       | 71 (62.8)        |     |          |              |     |
| Dental caries                                                |                  |                  |     |            |              |     |
| No caries                                                    | 99 (34.5)        | 58 (51.3)        | 0.002 | 2.057 | 1.275, 3.319 | 0.003 |
| At least one caries                                          | 188 (65.5)       | 55 (48.7)        |     |          |              |     |
| Malocclusion                                                 |                  |                  |     |            |              |     |
| No definite treatment need                                   | 80 (27.9)        | 110 (97.3)       | 0.001 | 13.804 | 4.196, 45.414 | 0.001 |
| Definite treatment need                                      | 207 (72.1)       | 3 (2.7)          |     |          |              |     |
| Gingival bleeding                                            |                  |                  |     |            |              |     |
| Absent                                                       | 88 (30.7)        | 45 (39.8)        | 0.099 | 1.204 | 0.739, 1.960 | 0.456 |
| Bleeding                                                     | 199 (69.3)       | 68 (60.2)        |     |          |              |     |
| Last dental visit                                            |                  |                  |     |            |              |     |
| Within 1 year                                                | 72 (28.1)        | 100 (88.5)       | 0.003 | 2.063 | 1.047, 4.065 | 0.036 |
| More than 1 year                                             | 215 (74.9)       | 13 (11.5)        |     |          |              |     |

OHRQoL=Oral health-related quality of life; CI=Confidence interval
sensitive enough to capture the relatively milder variations in gingival health in adolescents.[30]

Presence of periodontal pockets did not impact any of the OHIA domains unlike that reported among 12- to 15-year-old Thai children in a previous study using another OHRQoL scale.[3] This finding is clinically significant as most patients with periodontal disease are unaware about the existence of periodontal pockets as it seldom cause any impact on QoL. Features of advanced disease such as gingival recession and tooth mobility were rare in the adolescent group.

Malocclusion showed a consistent strong correlation with OHIA score. All OHIA domains except socioeconomic showed significant impact in adolescents with malocclusion. Those with malocclusion requiring definite treatment reported significantly poor QoL. This is in agreement with earlier studies using established scales like CPQ.[17,27] Malocclusion showed significantly greater impacts on OHIA domains compared with dental caries and periodontal disease.

In the multivariate regression model after adjusting for socioeconomic status, dental caries, last dental visit, and gingival bleeding, malocclusion emerged as the most significant predictor for poor OHRQoL pointing to the impact of untreated malocclusion on the psychological social and functional well-being of adolescents.[28,29] Dental caries experience and not visiting dentist regularly were also significant in predicting poor OHRQoL.[30]

It has been demonstrated that poor socioeconomic status could predict poor OHRQoL.[31] Socioeconomic status in this study was determined using the ration card status of the families, which is not the ideal way as there could be a lot of misrepresentations. There were no backward regions included in the study locations. This could be the reason for socioeconomic status not emerging as a significant predictor in this study.

The established scales for school-age children, CPQ 8–10 and 11–14, are not intended for older (15- to 18-year-old) adolescents.[32] COHIP is for a broader age group (8- to 15-year-olds) compared with CPQ and measures both positive and negative aspects of health.[16] COHIP is lengthy and does not cover older adolescents. Long scales require more time for administration and can affect honesty in response. Shortened measures are advantageous as it reduces research cost and are easier to score and interpret. OHIP, the most validated scale, had been used for adolescents, but it is primarily developed for adults and certain adolescent-specific attributes might have been excluded.[30] Thus, OHIA assumes significance as a specific OHRQoL scale for older adolescents.

Health, well-being and culture, are inseparably linked. OHIA has been developed considering the cultural and social scenario related to oral health among adolescents in India. Even though the domains of HRQoL tend to be similar across cultures, the relevance of each and the emphasis upon them may be different.[33]

Kerala is the most literate Indian state with good health indicators. Higher secondary education in India is very critical in shaping a student’s career. Studying being their primary role, the older adolescent students in the state are subjected to considerable academic stress. The social and financial situation of the family and parent’s education influence their oral health perceptions.[11] Hence, the two new domains, namely, role affection (which deals with their school attendance and performance) and socioeconomic (which deals with parent’s education and family income) with items relevant to the context contributed significantly to content validity. Role affection domain had only two items. There should be a minimum of two items per domain to control for random error and to facilitate within domain analysis.[14]

The strengths of the study are as follows: (1) new age-group-specific tool with good psychometric properties, (2) community-based sample enabling to establish its discriminative property, (3) two new domains imparting adolescent concerns in the sociocultural context, (4) its brevity enabling easy administration, and (5) its assessment of both positive and negative impacts of oral health.[34,35]

Further validation studies in different populations and settings are required to confirm the psychometrics of the new scale. Longitudinal studies are needed to prove the usefulness of OHIA as an outcome measure after assessing properties such as minimally important difference and responsiveness.

Conclusion
The new tool demonstrated sound psychometric properties. It is relatively short, culturally equivalent, age-specific, and can assess both positive and negative aspects of adolescent oral health. Further longitudinal studies are required to establish the property of responsiveness and its employability as an outcome measure.

Declaration of patient consent
The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest
There are no conflicts of interest.
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