Predictors of oral health-related quality of life in Iranian adolescents: A prospective study

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Short title: OHRQoL in Iranian schoolchildren

Abstract

Aim: This study evaluated the direct and mediating (indirect) effects of clinical oral conditions, dental anxiety, sense of coherence (SOC) and socio-economic variables on oral-health-related quality of life (OHRQoL) and general-health-related QoL (GHRQoL) in Iranian adolescents.

Methods: A longitudinal design was used with a sample of 1052 (694males; mean age=15.05) schoolchildren from city of Qazvin, Iran. Each participant completed a background information sheet and the following scales at baseline: Modified Dental Anxiety Scale, SOC, PedsQL™ 4.0 Generic Core Scale, and PedsQL™ Oral Health Scale. PedsQL™ 4.0 Generic Core and Oral Health scales were recompleted at 18-month follow-up.

Results: Father's education, monthly family income, dental anxiety, CPI, DMT, and SOC significantly and directly predicted OHRQoL at 18 months. Father's education had indirect effects on OHRQoL through CPI and DMT; family income had indirect effects through DMT; dental anxiety had indirect effects through CPI. OHRQoL at 18 months ($\beta=0.499$) and SOC ($\beta=0.084$) had significant and direct and mediating effects through OHRQoL on GHRQoL, while father's education, monthly family income, dental anxiety, CPI and DMT only showed mediating effects.

Conclusions: Clinical oral indicators had direct effects on OHRQoL but mediated the effects of dental anxiety and socio-economic status on both OHRQoL and GHRQoL.

Key Words: Adolescents, Oral health, Oral health related quality of life, Structural equation modeling, longitudinal study

Introduction

There is now a paradigm shift from the traditional biomedical model of health to biopsychosocial model of health that emphasizes on an individual's social, emotional as well as physical functioning ¹. Although clinical indices are useful for measuring oral disease levels, they are not suitable for gauging the health and treatment needs ². This limitation with clinical measures paved a way to the development of measures of Oral-Health-Related Quality of Life (OHRQoL) which takes into account the multidimensional nature of health ³. Previously, OHRQoL was only examined for adult patients; however, the impacts of oral disorders on QoL have also been found in children and adolescents recently. Moreover, the impacts on children may be as great as or greater than those on adults ⁴. Oral disorders can also impact general health by causing pain and affecting functional ability in performing daily life activities ⁵. However, the contemporary research on OHRQoL in children substantially relies on OHRQoL instruments only specific to oral health. On the other hand, general-health-related QoL (GHRQoL) instruments do not account for the specific impact of oral health on overall wellbeing despite oral diseases being among the most prevalent conditions in children ⁶. Therefore, usage of both generic and disease specific instruments has been suggested ⁷ to understand the impact of oral health on general wellbeing and also to measure the direct impact of physical impairment or functional limitation caused by oral diseases.

GHRQoL as implied from the WHO definition is a subjective perception of life quality that is affected by physical health and psychological state and also personal beliefs and social relationships ⁶, while OHRQoL refers to an individual's view of functioning, social interaction and psychological wellbeing with respect to oral health ⁷. In simpler terms, GHRQoL and

OHRQoL are individual's perception of QoL in relevance to overall health and specific to oral health, respectively.

However, the concept of HRQoL is complex and dynamic ⁸. There are several factors which range from the biological to individual and environmental characteristics, and their complex interactions that influence HRQoL ⁹. For example, OHRQoL in children is influenced by clinical oral health status ¹⁰, dental anxiety ¹¹ and also the socio-economic status ¹². Likewise, GHRQoL is influenced by several non-medical ¹³ and social factors ¹⁴. Sense of coherence (SOC) is one of those factors that strongly predict QoL, individuals with strong SOC consider life situations not stressful and use available resources to cope with the stress ¹⁵⁻¹⁷. Studies that have tested the effect of several psychosocial variables on QoL, indicated SOC as the only persistent psychosocial variable in predicting QoL ^{16,18}.

Understating the relationships between various predictors is important as this knowledge would be helpful in designing effective interventions that can improve QoL. Particularly with respect to subjective oral health outcomes, a thorough knowledge of these interactions and processes would help in planning targeted oral promotion strategies ^{16,19}. This prospective study aimed to evaluate the direct and mediating effects of clinical oral conditions, dental anxiety, SOC and socio-economic variables on OHRQoL and GHRQoL in Iranian adolescents.

We conceptualized a model based on the Wilson and Cleary model (Fig 1) that the impacts of clinical, individual and environmental variables on OHRQoL and HRQoL would be as depicted in Fig. 1:

- Direct effects: Dental anxiety (a) on OHRQoL at follow-up, SOC (b), environmental characteristics (c) and clinical indicators (d) would have a direct effect on OHRQoL and GHRQoL at follow-up.

- Mediating effects: Effects of environmental factors (e X d) on OHRQoL and GHRQoL would be mediated through clinical indicators and effect of dental anxiety (f X d) on OHRQoL would be mediated through clinical variables, SOC would have a mediating effect on the association of socio-economic factors (g X b) and clinical indicators (h X b) with OHRQoL and GHRQol.
- OHRQoL will have a direct effect on GHRQol as conceptualized by Sicho and Broder ¹.

Materials and Methods

This longitudinal study was conducted in Qazvin (located in 150 km northwest of Tehran), Iran between May 2013 to May 2015. Ethical approval for the study was granted by the Qazvin University of Medical Sciences. Permission to conduct the study was obtained from the Organization for Education at Qazvin, respective schools and parents of adolescents as well as the adolescents.

Participants

A two-stage sampling technique was employed to select the adolescents. Qazvin has two different educational districts containing 52 secondary schools. At the first step, four secondary schools were selected randomly in each district from official list of public secondary schools provided by the Qazvin Education Area. At the second step, all the adolescents were included in the study. However, students who used a fixed orthodontic appliance were excluded.

Measures

Socio-demographic information

Socio-demographic information of the adolescents including age, gender, father's and mother's educational years and number of family members were collected from student records. Moreover, self-administered questionnaire was used to ask the adolescents to indicate the frequency of tooth brushing (1= never, 2= less than once per month, 3= less than once per week, 4= once per week, 5= once per day, and 6= twice per day) and dental flossing (1= never, 2= less than once per month, 3= less than once per week, 4= once per week ,and 5= once per day) as well as time interval since the last dental visit (1=never, 2= more than 2 years, 3= last 1-2 years, 4= last 6-12 months, and 5= less than 6 month ago).

Dental anxiety

The level of dental anxiety was assessed using the Modified Dental Anxiety Scale (MDAS) ²⁰. The MDAS has five items which are rated on a five-point Likert type scale ranging from 1 (not anxious) to 5 (extremely anxious) with higher score indicating higher dental anxiety. All item scores are summed to produce a total score for the MDAS. The MDAS has been translated into several languages including Persian. The Persian version of the MDAS was found to highly valid, reliable, simple, quick, and easy-to-complete for using in Iranian populations ²¹.

SOC

SOC was measured using Antonovsky's SOC scale ²². The SOC has 13 items which are rated on a 7-point Likert scale ranging from 'never' (1) to 'always' (7). The total SOC score is the sum of all items, with the possible responses ranging from 7 to 91, with higher scores indicating stronger SOC. The SOC-13 has been used in several languages including Persian, and its scores were valid and reliable in Iranian adolescents (Cronbach's $\alpha = 0.87$ and test-retest reliability = 0.77) ²³.

GHRQoL

The PedsQL™ 4.0 Generic Core scales were used to assess GHRQoL. The PedsQL™ 4.0 Generic Core scales are self-administered questionnaires that have two parallel versions including child self-reports and parent proxy-reports. This measure has 23 items which cover four dimensions including; Physical Functioning (8 items), Emotional Functioning (5 items), Social Functioning (5 items) and School Functioning (5 items). All items are rated on a 5-point Likert scale ranging from ‘never a problem’ (score = 0) to ‘almost always a problem’ (score = 4). The items responses are reversed and then transformed into a 0-100 point scale, with higher scores indicating better HRQoL. The psychometric properties of the Persian version of the PedsQL™ 4.0 Generic Core scales have been reported elsewhere²⁴.

OHRQoL

OHRQoL was measured using the 5-item PedsQL™ Oral Health Scale. All items are rated on a 5-point Likert scale ranging from ‘never a problem’ (score = 0) to ‘almost always a problem’ (score = 4). Identical to the PedsQL™ 4.0 Generic Core scales, all items of the PedsQL™ Oral Health Scale are reversed and then transformed into a 0-100 point scale, with higher scores indicating better OHRQoL. The Persian version of PedsQL™ Oral Health Scale was translated, and its scores were validated by Pakpour et al., who tested the psychometric properties in Iranian children and adolescents²⁵.

Clinical oral examination

All adolescents were clinically examined by two trained and calibrated dentists in a classroom under natural light daytime hours. The decayed, missing and filled teeth (DMFT) index and Community Periodontal Index (CPI) were measured according to the

recommendations of the World Health Organization for epidemiological surveys ²⁶. To improve the reliability of the study, the dentists were trained and calibrated by an experienced examiner at Faculty of Dentistry of Qazvin University of Medical Sciences 2 weeks before the start of the study. An independent sample of 16 adolescents was examined by the dentists. These dentists independently reexamined the adolescents after 24 hours of the first examination. The results of the Kappa coefficients revealed that inter-examiner reproducibility was 0.97 and 0.94 for the mean DMFT and the mean CPI score, respectively. In addition to this, intra-examiner reproducibility was also assessed and the results indicated that the Kappa coefficients were 0.96 and 0.95 for the mean DMFT and the mean CPI score, respectively.

Procedure

All adolescents were asked to complete the questionnaire including oral health behaviors, MDAS, SOC-13, the PedsQL™ 4.0 Generic Core scales and PedsQL™ Oral Health Scale in a classroom setting. Afterward, the dentists clinically examined the adolescents in classrooms under natural daylight using standard explorers, mirrors and the Community Periodontal Index probes. Eighteen months later, the same adolescents were asked to recomplete the PedsQL™ 4.0 Generic Core scales and PedsQL™ Oral Health Scale.

Statistical analysis

Before we tested the proposed model, we first examine the construct validity of two QoL instruments (PedsQL™ 4.0 Generic Core scales for GHRQoL and PedsQL™ Oral Health Scale for OHRQoL) using confirmatory factor analysis (CFA). Then, we used structural equation modeling (SEM) to answer our research questions. The proposed model (Fig. 2a) examined the impacts of several potential predictors (father's education, monthly family income, dental

anxiety, community periodontal index, DMT, SOC) on both 18-month follow-up OHRQoL and GHRQoL. The potential predictors did not include mother's education because mother's education was highly correlated with father's education ($r=0.8$). We also analyzed the indirect impacts of these predictors on generic quality of life at 18-month follow-up through OHRQoL. In addition, some mediating effects for OHRQoL were investigated using the proposed model.

For both CFA and SEM, we used the following fit indices to evaluate the data-model fit: χ^2 test, comparative fit index (CFI), Tucker-Lewis index (TLI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR). The cutoffs for satisfactory fit were set at CFI and TLI > 0.9 ; RMSEA and SRMR < 0.08 ²⁷. Although a nonsignificant χ^2 test also suggests a good data-model fit, we intended not to use the criterion because of its oversensitivity to a large sample^{28,29}. In addition, the direct and indirect effects were tested using bootstrap methods. Specifically, we used the bias-corrected bootstrap with 1000 bootstrap samples to calculate the 95% confidence intervals, and the indirect effects occur when the confidence interval does not contain zero^{30,31}.

Some respondents did not fully answer the following scales: PedsQL oral-related health module at base (missing $n=33$) and at 18-month follow-up (missing $n=20$); PedsQL generic scale at 18-month follow-up (missing $n=197$); modified dental anxiety scale (missing $n=1$); community periodontal index (missing $n=3$); DMT (missing $n=42$); SOC (missing $n=34$). In order to reach the maximum power in SEM, we used Bayesian imputation^{32,33} to impute the missing values mentioned above. The descriptive analyses were done using SPSS 17.0 (SPSS Inc., Chicago, IL), and SEM were performed using AMOS 20.0 (IBM SPSS, Chicago, IL).

Results

A total of 1529 students participated in this study with a response rate of 90%. Sixty four (4.2%) adolescents were lost to follow-up. Table 1 shows the participants' characteristics in terms of their demographics, health behaviors on dental care, and health outcomes. The mean age of the participants was 15.05 (SD=2.12) years, and slightly less than half of them were male (45.4%). As for their health behaviors, more than one third of the participants (34.1%) have never been to a dentist and only one fifth (20.8%) of them have visited a dentist within 6 months. In addition, more than one tenth (12.4%) of the participants brushed their teeth less than once per month, and nearly half (46.2%) of them never used dental floss. As for the health outcomes, the Mean $\pm$ SD scores were 14.65 $\pm$ 5.44 for MDAS; 6.83 $\pm$ 2.75 for oral health knowledge; 1.62 $\pm$ 1.11 for CPI; 2.19 $\pm$ 2.32 for DMT; 28.79 $\pm$ 13.83 for SOC; 65.87 $\pm$ 18.65 for overall GHRQoL at baseline and 77.72 $\pm$ 13.20 at 18-month follow-up; 74.99 $\pm$ 26.37 for OHRQoL at baseline and 80.70 $\pm$ 18.43 at 18-month follow-up.

Table 2 shows that our data fit perfectly in the CFAs and SEM, except for the significant χ^2 tests. We additionally examined the effects of all predictors on adolescents' OHRQoL, and found that all predictors were significant (Table 3). Higher scores of dental anxiety, CPI, and DMT predicted a worse OHRQoL at 18-months follow-up. In contrast, higher level of father's education, monthly family income, SOC, and baseline OHRQoL predicted a better OHRQoL at 18-month follow-up. Moreover, we found that OHRQoL had a strong direct effect on GHRQoL (β =0.499; 95% CI=0.460-0.539). Based on the direct effect of OHRQoL on GHRQoL, it is clear that all the predictors had indirect effects on GHRQoL through OHRQoL; however, all the predictors but SOC (β =0.084; 95% CI=0.035-0.123) did not have direct effects on GHRQoL as we hypothesized (Fig. 2b).

As hypothesized, our results showed that father's education and monthly family income had indirect effects on OHRQoL and GHRQoL, and also dental anxiety had an indirect effect on OHRQoL mediated by CPI and/or DMT (Table 3). However, SOC did not exert any mediating effect on the influence of father's education and income on OHRQoL/GHRQoL (Fig. 2b).

Discussion

In this longitudinal study, we intended to evaluate the influence of clinical oral conditions, dental anxiety, SOC and socio-economic variables on OHRQoL and GHRQoL in Iranian adolescents. We also assessed the direct and theoretically driven mediating effects of these variables on OHRQoL and GHRQoL. Longitudinal studies in this area are scarce, and to the best of our knowledge there is only one study evaluating the effects of various predictors on OHRQoL in adolescents with a longitudinal design¹⁸. Further, SEM was used in this study which helps in concurrent assessment of the direct and indirect effects of exploratory variables on the outcome. This is not possible with traditional regression analysis³⁴. Presently, there are many validated instruments available to evaluate the OHRQoL in children and adolescents but we preferred PedsQL™ Oral Health Scale as many of the existing measures are specific and fail to evaluate the impact of oral health on general health domains^{25,35}. PedsQL™ Oral Health Scale was introduced to measure OHRQoL as a component of GHRQoL^{6,35,36}. This measure has already been translated to Persian language and was found to be valid and reliable in assessing OHRQoL in Iranian Children²⁵.

In addition to socio-economic variables, we also assessed the effects of dental anxiety and SOC on QoL in this study. Research indicates that OHRQoL is significantly related to SOC

^{19,37,38} and also dental anxiety ^{39,40}. In accordance, we found that SOC and dental anxiety were significantly related to self-perceived oral health with dental anxiety having a negative impact and SOC having a positive impact. SOC was also associated with GHRQoL which is indisputably consistent in the literature ⁴¹⁻⁴³. According to salutogenic theory, a strong SOC is associated with physical and psychological health ⁴⁴. Individuals with high SOC tend to be more resilient in stressful situations and thus less distress ⁴⁵. In relation to dental anxiety, individuals who are anxious tend to avoid dental visits and rely on self-care and thus poor clinical oral health status ⁴⁰ which influences perception of QoL. In accordance with literature, OHRQoL increased with increase in parental education level and family income ^{12,14}. This might be because lower education level and income leads to material deprivation which leads to limited access to health facilities and thus poor QoL ¹². However, it was surprising and beyond our understanding to note that socio-economic variables failed to directly influence GHRQoL but had mediating effects via OHRQoL.

We also found that clinical status (dental caries and periodontal status) predicted OHRQoL. There are conflicting reports on the effect of clinical status on OHRQoL ³⁷. However, a systematic review by Barbosa et al., concluded that clinical oral status is related to OHRQoL ¹⁰. They suggested that weak relationships observed between clinical status and OHRQoL in few studies might be due to low disease levels or low impact of the condition under investigation in those studies ¹⁰. As the case with socio-economic variables, oral indicators did not have a direct effect on GHRQoL. This might be because of the clinical indicators used in this study. In order to have an impact on general wellbeing (or, GHRQoL), the oral condition has to be associated with considerable pain and limited functioning which is possible when dental caries involves pulpal involvement and very few adolescents in our study had dental caries associated with pupil

involvement. This is in accordance with a previous study on adolescents⁴⁶. Also, the periodontal status of the study population was considerably fair (CPI: 1.62 ± 1.11) with gingival bleeding and calculus being observed in a majority of the population which have direct relevance to OHRQoL rather than GHRQoL. A literature review has found that four of the seven reviewed studies demonstrated an association between oral health status and GHRQoL but the only study that had evaluated the effect of dental caries on GHRQoL demonstrated results similar to our finding⁴⁷.

QoL is subjective perception that differs between cultures which is determined by population preferences for a given health state⁴⁸. Therefore, the findings observed in our study might not hold good with those conducted in other cultures. However, as the sample selected was representative of Qazvin province, the findings can be generalized to the child population of Qazvin and might be Iran as a whole. Although we have tried to include the factors which we assumed to be predictors of QoL in this study, we could have missed some potential predictors that might be significantly related to QoL. As envisaged by Wilson and Cleary, overall QoL is associated with several factors at various levels ranging from individual's perceptions and psychosocial factors to environmental and traditional clinical variables. Further, there are several other factors that might operate at each level which are integrated and difficult to define⁹. Another limitation that needs to be mentioned is the clinical indices used in this study and low level of disease burden observed in this study. The effect of clinical indicators on perceived QoL would have been different if the disease burden was more or was associated with considerable pain. In addition, the SEM analysis without using weighted structure is the third limitation. Because we used the two-stage sampling method, a cluster effect is very likely to exist, and may result in sampling errors. Therefore, decreased statistical power may be occurred. Some would suggest using weighted structure to resolve the above problem. However, we intended not to do

so because we want to fulfill the principal of parsimony in the SEM. In addition, we did not collect any cluster-level information (e.g., the overall social economic status in each school). Moreover, we are confident that our sample size is quite large, and the problem of decreased statistical power can somewhat be remediated. Nevertheless, future studies may want to use a weighted structure in the SEM when they adopt a two-stage sampling method, especially those only have small sample sizes.

Few studies indicate that disease status is associated with SOC⁴⁹ but we observed no mediating effect of SOC on the association of clinical oral status with QoL. Supporting our finding, a literature review has found psychological status but not physical health status to be associated with SOC⁵⁰. Literature also suggests the existence of a psychosocial pathway with individuals belonging to higher social status having optimum conditions for the development of SOC⁴⁹, also few studies observed that higher SES during childhood predicted better SOC in adulthood⁵¹. Therefore, we assumed that SOC might mediate the effect of socio-economic status on QoL. However, SES had a direct effect but not a mediating effect via SOC on QoL. SOC might play an important role in mediating the effect of the SES on QoL perception in patients with chronic and severe diseases as individuals from higher SES have greater resources to cope with the stress than those belonging to lower SES. However, this explanation might not hold good when the disease burden is low and less severe as was observed in our study.

Conclusions

As was hypothesized, clinical oral indicators and socio-economic variables had direct effect on OHRQoL while it was surprising to observe that SOC was the only factor to directly influence GHRQoL. Given the relevance of SOC to both OHRQoL and GHRQoL, planning salutogenic interventions for this study population might help in improving the quality of life.

Although the oral health did not have direct effect on GHRQoL, the observed direct effect of OHRQoL on GHRQoL demonstrates that perception of oral health wellbeing has an effect on general wellbeing. The observation of clinical oral conditions mediating the effect of dental anxiety and socio-economic variables on OHRQoL and GHRQoL stresses the importance of improving clinical oral status to improve overall perception of quality of life. Also both the SOC and socio-economic variables had an effect on subjective perception of well-being. The multiple direct and mediated effects that were observed provides more opportunities in planning targeted oral health promotion strategies for improving the QoL in this population

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Table 1: Participants characteristics

Table 2: Fit indices for confirmatory factor analysis (CFA) and structural equation modelling (SEM)

Table 3: Predictors for both oral-health-related Quality of Life (OHRQoL) and general-health-related Quality of Life (GHRQoL) at 18-month follow-up

Figure 1 Conceptualized effect of clinical, individual and environmental factors on prospective oral-health-related quality of life (OHRQoL) and general-health-related QoL (GHRQoL) based on Wilson and Cleary model; T2 represents 18-month follow-up; DMT=decayed and missing teeth; CPI= community periodontal index

Figure 2 OHRQoL=oral-health-related quality of life; GHRQoL=general-health-related quality of life; OHRQoL and GHRQoL were assessed at 18-month follow-up, all other variables were assessed at baseline

Table 1: Participants characteristics

	n (%) or Mean $\pm$ SD
Demographics	
Age	15.05 $\pm$ 2.12
Gender (male)	694 (45.4%)
Number of family member	
≤ 5	903 (59.6%)
6-10	546 (35.7%)
> 10	65 (3.9%)
Father's educational year	8.35 $\pm$ 5.38
Mother's educational year	6.39 $\pm$ 5.33
Teeth and gum care	
Last time visit dentist	
< 6 months	318 (20.8%)
6 months to 1 year	226 (14.8%)
1 to 2 years	128 (8.4%)
> 2 years	256 (16.7%)
Never	521 (34.1%)
Frequency of using dental brush	
Never	111 (7.3%)
Less than once per month	78 (5.1%)
Less than once per week	82 (5.4%)
Once per week	216 (14.1%)
Once per day	717 (46.9%)
Twice per day	321 (21.0%)
Frequency of using dental floss	

Never	706 (46.2%)
Less than once per month	169 (11.1%)
Less than once per week	163 (10.7%)
Once per week	225 (14.7%)
Once per day	245 (16.0%)
Health outcomes	
Modified dental anxiety scale	14.65±5.44
Community periodontal index	1.62±1.11
Decayed and missing teeth	2.19±2.32
Sense of coherence	28.79±13.83
GHRQoL at baseline	65.87±18.65
Physical functioning	74.50±25.45
Emotional functioning	71.13±24.41
Social functioning	51.53±16.05
School functioning	60.37±22.66
GHRQoL at 18 months	77.72±13.20
Physical functioning	81.00±16.10
Emotional functioning	72.27±18.70
Social functioning	75.71±14.63
School functioning	79.38±17.33
OHRQoL at baseline	74.99±26.37
OHRQoL at 18 months	80.70±18.43

GHRQoL=general-health-related quality of life; OHRQoL=oral-health-related quality of life

Table 2: Fit indices for confirmatory factor analysis (CFA) and structural equation modelling (SEM)

Model	χ^2 (df)	CFI	TLI	RMSEA	SRMR
CFA for GHRQoL	1783.252 (213)*	0.920	0.905	0.069	0.057
CFA for OHRQoL	10.219 (3)*	0.998	0.995	0.040	0.007
SEM	179.212 (41)*	0.971	0.954	0.047	0.025

* p<0.001; CFI=comparative fit index; TLI=Tucker-Lewis index; RMSEA=root mean square error of approximation; SRMR=standardized root mean square residual

GHRQoL= general-health-related Quality of Life; OHRQoL= oral-health-related Quality of Life

Table 3: Predictors for both oral-health-related Quality of Life (OHRQoL) and general-health-related Quality of Life (GHRQoL) at 18-month follow-up

Predictors	β	Bootstrap SE	Bias-corrected 95% CI (lower bound)	Bias-corrected 95% CI (upper bound)
Direct effects on GHRQoL				
OHRQoL at 18 months	0.499*	0.020	0.460	0.539
Father's education	0.001	0.025	-0.048	0.054
Monthly family income	0.039	0.021	-0.005	0.081
Community periodontal index	0.030	0.023	-0.019	0.072
Decayed and missing teeth	-0.034	0.019	-0.068	0.007
Sense of coherence	0.084*	0.021	0.035	0.123
Indirect effects on GHRQoL mediated by OHRQoL=Direct effects of OHRQoL				
Father's education	0.235*	0.023	0.184	0.278
Monthly family income	0.163*	0.023	0.119	0.209
Dental anxiety	-0.142*	0.023	-0.185	-0.094
Community periodontal index	-0.118*	0.023	-0.163	-0.075
Decayed and missing teeth	-0.171*	0.027	-0.225	-0.120
Sense of coherence	0.110*	0.021	0.069	0.153
Indirect effects on OHRQoL/GHRQoL mediated by decayed and missing teeth				
Father's education	0.073*	0.025	0.021	0.122
Monthly family income	-0.077*	0.024	-0.124	-0.032
Dental anxiety	0.008	0.025	-0.045	0.057
Indirect effects on OHRQoL/GHRQoL mediated by community periodontal index				
Father's education	0.064*	0.026	0.013	0.115
Monthly family income	-0.022	0.024	-0.071	0.022

Dental anxiety	0.090*	0.024	0.042	0.141
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Indirect effects on OHRQoL/GHRQoL mediated by sense of coherence

Father's education	-0.010	0.026	-0.066	0.039
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Monthly family income	0.046	0.027	-0.008	0.101
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Decayed and missing teeth	0.022	0.022	-0.021	0.066
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Community periodontal index	0.001	0.027	-0.049	0.058
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* p<0.05; β =standardized coefficient; SE=standard error; CI=confidence interval

Figure 1: Conceptualized effect of clinical, individual and environmental factors on prospective oral-health-related quality of life (OHRQoL) and general-health-related QoL (GHRQoL) based on Wilson and Cleary model; T2 represents 18-month follow-up; DMT=decayed and missing teeth; CPI= community periodontal index

Fig. 2. OHRQoL=oral-health-related quality of life; GHRQoL=general-health-related quality of

life; OHRQoL and GHRQoL were assessed at 18-month follow-up, all other variables were assessed at baseline