Socioeconomic status, social support, oral health beliefs, psychosocial factors, health behaviours and health-related quality of life in adolescents

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Abstract

Purpose This study assessed the relationships between socioecononic status (SES), social support, oral health beliefs, psychosocial factors, health-related behaviours and health-related quality of life (HRQoL) in adolescents.

Methods A school-based follow-up study involving 376 12-year-old adolescents was conducted in Manaus, Brazil. Baseline data included sociodemographic characteristics (sex, parental schooling, family income, household overcrowding and number of goods), social support (SSA questionnaire), oral health beliefs and psychosocial factors (Sense of Coherence [SOC-13 scale] and self-esteem [Rosenberg Self-Esteem Scale]). Health-related behaviours (toothbrushing frequency, sedentary behaviour, smoking and sugar consumption) and HRQoL [KINDL questionnaire] were assessed at 6-month follow-up. Structural Equation Modelling assessed the relationships between variables.

Results Greater social support ($\beta = 0.30$), higher SOC ($\beta = 0.23$), higher self-esteem ($\beta = 0.23$), higher toothbrushing frequency ($\beta = 0.14$) and less smoking ($\beta = -0.14$) were directly linked with better HRQoL. SES ($\beta = 0.05$), social support ($\beta = 0.26$), oral health beliefs ($\beta = -0.02$) were indirectly linked to HRQoL. Higher SES directly predicted higher toothbrushing frequency ($\beta = 0.14$) and less smoking ($\beta = -0.22$). Greater social support also directly predicted higher SOC ($\beta = 0.55$), positive oral health beliefs ($\beta = -0.31$) and higher self-esteem ($\beta = 0.58$). Greater social support indirectly predicted less smoking via oral health beliefs ($\beta = -0.05$) and less sugar consumption via SOC ($\beta = -0.07$).

Conclusion Socioeconomic status, social support, oral health beliefs and psychosocial factors were important predictors of adolescent's health behaviours and HRQoL over 6-month period through direct and indirect mechanisms. Health behaviours also directly influenced HRQoL.

Keywords Socioeconomic factors · Psychosocial factors · Health risk behaviour · Quality of life

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Introduction

Adolescence is a major transition period in the individual's life, and it is characterized by biological, behavioural and psychological changes that are influenced by social conditions and family characteristics [1]. Unhealthy behaviours, such as smoking, alcohol consumption, drug use, unprotected sex, inadequate diet and sedentarism, are commonly acquired during adolescence and may persist throughout the life-course affecting health and well-being [2]. Adolescence is also characterized by the modification and expansion of the social ties of family members, teachers and friends. Social support is strongly related to the emotional and social development of adolescents due to the interdependence and

influence between individuals interacting with different social groups. The importance of emotional support, loyalty, understanding and intimacy on well-being is emphasized at this stage of life [3–5]. In addition, positive oral health beliefs, protective psychosocial factors such as high sense of coherence and greater self-esteem are also considered to be important aspects that can positively influence adolescent health behaviour, health-related quality of life and mental health [6–12].

There is a growing interest in the assessment of health-related quality of life (HRQoL) in healthcare and health research. The limitations of normative clinical assessment of health have resulted in the expansion in the use of HRQoL measures because the latter considers the subjective aspects of health as well as how people perceived their own health and disease [13, 14]. HRQL is a multidimensional construct defined as "how well a person functions in their life and his or her perceived well-being in physical, mental, and social domains of health" [15].

Conceptual frameworks of HRQoL highlight the importance of socioeconomic position, behaviours and psychosocial factors on quality of life [16]. Demographic and socioeconomic characteristics can influence adolescent health-related behaviours and quality of life [8, 17–20]. Evidence suggests that young people from low socioeconomic backgrounds are more likely to engage in unhealthy behaviours such as tobacco smoking, poor diet and physical inactivity [21]. Socioeconomic status may influence adolescent health behaviours through psychosocial factors (e.g. coping mechanisms), oral health beliefs and social ties with family members and schoolmates [10, 22, 23]. Adolescents with a high socioeconomic status are more likely to live in intact families and to develop supportive social networks, which in turn enhance coping skills to reduce chronic disease risk behaviours [22, 23]. Furthermore, the influence of socioeconomic status during childhood on adult health behaviours (e.g. toothbrushing frequency) was mediated by oral health beliefs during early adulthood [10]. Socioeconomic status and social networks are significant predictors of adolescent psychosocial health, for example positive attitudes about health, greater self-esteem and self-efficacy and membership in peer groups, which in turn promote the adoption of healthy behaviours [4, 5, 22, 23]. Findings from large surveys conducted in European countries suggest that higher parental educational status and family wealth are associated with better HRQoL of both children and adolescents [24, 25].

Social support may affect health through favouring adaptive behaviours in stressful situations [26]. Supportive social relationships from family members, friends and schoolmates may positively impact on a range of health-related behaviours in adolescents [4, 5, 9, 27, 28]. Data from the BELLA German study involving children and adolescents revealed that individual factors (e.g. self-efficacy, optimism and sense of coherence), family and social characteristics (e.g. social support) are important resources associated with HRQoL [7]. Direct and indirect mechanisms may explain the influence of social support and socioeconomic status on health outcomes and quality of life. Direct pathways suggest that adolescent health and quality of life can be affected through material circumstances and psychological mechanisms. The former include standard of living (e.g. housing conditions and quality of neighbourhood) and consumption potential (e.g. financial means to buy healthy food) [29]. Psychological mechanisms operate through cognitive and emotional processes including the development and strengthening of trust, well-being, self-efficacy, social integration, self-esteem and mutual cooperation [30, 31]. Indirect effects of social connections and social status on health result from behavioural pathways because health-related behaviours in adolescents are related to social influence from family members and friends and mediated by access to material goods and resources [4, 5, 15, 32, 33].

The possible influence of oral health beliefs and health-related behaviours on HRQoL among children and adolescents has been investigated [9–12, 34–36]. The findings suggest a continuity in oral health beliefs about a range of preventive behaviours and quality of life [10–12]. Positive oral health beliefs directly predict better overall quality of life among adolescents in a 6-month follow-up study [12]. Similarly, adolescents with stable favourable oral health beliefs had a significantly lower prevalence of poor self-rated oral health during adulthood [11]. Children reporting unhealthy behaviours were more likely to have worse HRQoL even when sex, social context and symptoms were taken into account [37]. Similarly, data from 12 countries revealed that better HRQoL was inversely correlated with health risk behaviours in children and adolescents [38].

Despite the available research on the possible risk factors of HRQoL in adolescents, the majority of evidence relies on cross-sectional data and longitudinal studies on this topic are scarce [9, 34]. Furthermore, the rationale for selecting the independent variables in the previous studies was not theoretically sound. The use of conceptual frameworks is recognized as an important strategy when investigating the predictors and determinants of HRQoL [8, 16, 17]. The predictors of health and well-being are organized into structural and intermediary determinants according to the WHO's conceptual framework. The former includes socioeconomic position (e.g. income and education), while the latter is composed of psychosocial factors and behavioural characteristics [29].

As far as the authors are aware, no previous studies have evaluated the simultaneous role of multiple structural and intermediary determinants of HRQoL in adolescents using a conceptual framework and a prospective study design. We hypothesized that adolescents with a low socioeconomic

status, low social support, negative health beliefs and lower levels of protective psychosocial factors are more likely to report unhealthy behaviours and poor HRQoL. It was also hypothesized that unhealthy behaviours would predict poor HRQoL in adolescents. In addition, we also conjectured that the influence of socioeconomic status, social support, health beliefs and protective psychosocial factors on HRQoL was mediated by health behaviours.

Materials and methods

Study design and participants

A school-based follow-up study involving 12-year-old adolescents was conducted in the eastern region of the city of Manaus, Brazil. Baseline data included demographics (sex) and socioeconomic status (parental schooling, family income, household overcrowding and number of goods), social support, oral health beliefs and psychosocial factors (self-esteem and sense of coherence). Health-related behaviours (frequency of toothbrushing, sedentary behaviour, smoking and sugar consumption) and HRQoL were assessed at a 6-month follow-up. The eastern region of the city of Manaus is the second most populous urban area of the city (population size nearly 450,000 habitants), and the region with worst social indicators (Gini Index = 0.440). Adolescence is a transition period from childhood to adulthood that typically spans from 12 to 18 years of age. Since age is a meaningful aspect related to risk-taking behaviours, psychological changes and HRQoL, this study focused on

12 year-old adolescents [39]. Adolescents with any syndrome and/or in need of special care, and those using orthodontic appliances, were excluded.

Sampling procedures and study power

A representative sample of 12-year-old adolescents enrolled in year 7 of public schools in the eastern region of the city of Manaus was selected using a two-stage sampling process. Initially, 25 of the 36 schools with students in year 7 were selected. The selection of schools was proportional to the number of 12-year-old students in each school. Therefore, schools with larger number of students were more likely to be selected. All 12-year-old students from all classes in year 7 of the selected schools were invited to participate.

The final sample size comprised 376 adolescents, considering a power of 90% to detect statistically significant effects of 0.20 and 5% statistical significance to estimate a structural equation analysis model with three latent variables and eight observed variables [40].

Conceptual framework and measures

The conceptual framework of the present study was adapted from the WHO conceptual framework of social determinants of health and well-being [29] (Fig. 1). It was expected a priori that structural determinants, including poor socioeconomic status (low family income, high household overcrowding, fewer number of goods and low parental education), low social support and sex would predict intermediary determinants, including negative oral health beliefs, low
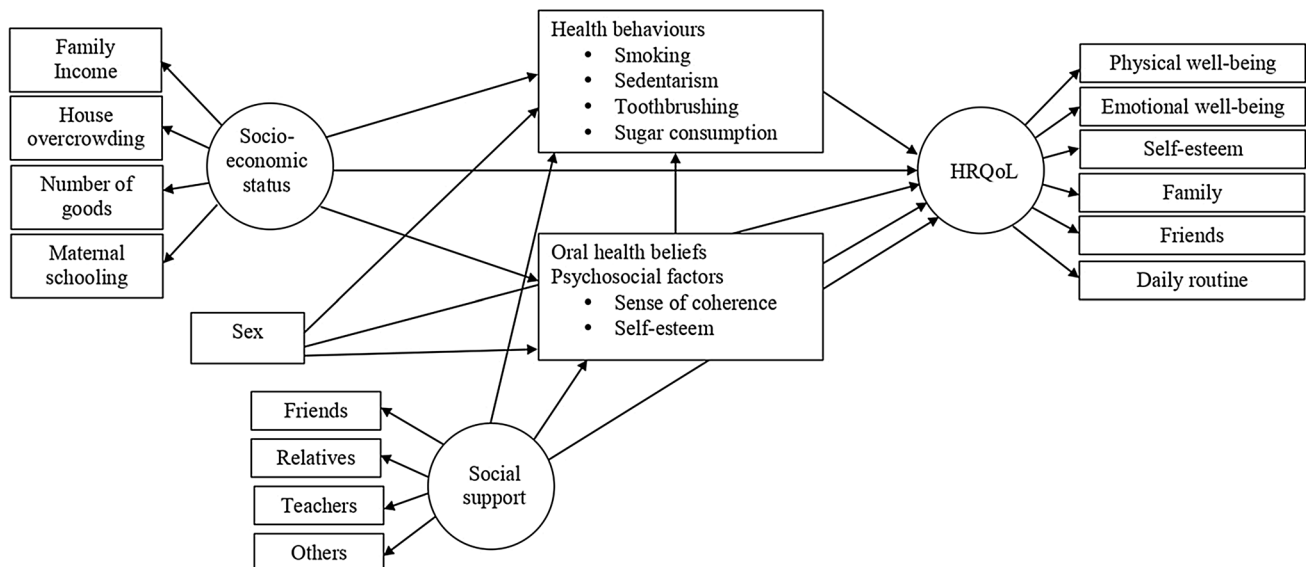

Fig. 1 Conceptual framework of the associations between socioeconomic status, sex, social support, oral health beliefs, psychosocial factors, health behaviours and health-related quality of life (HRQoL)

protective psychosocial factors and unhealthy behaviours. It was also expected that the aforementioned structural and intermediary determinants would predict worse HRQoL. In addition, the intermediary determinants would mediate the relationship between structural determinants and HRQoL.

Data were collected using self-administered standardized questionnaires and interviews completed by adolescents under the researcher's supervision in a private room at each school. The participants' parents or guardians provided information concerning socioeconomic status through a structured questionnaire completed at home. The socioeconomic questionnaire reached the parents or guardians through the adolescents.

Socioeconomic status

Socioeconomic status was a latent variable measured by four indicators: family income, household overcrowding, number of goods and parental schooling. Family income was categorized as: 1 = up to ½ minimum wage, 2 = > ½ minimum wage up to 1 minimum wage and 3 = > 1 minimum wage. The minimum wage in the study period was U$ 271.09 [41]. Household overcrowding was assessed by dividing the number of residents by the number of rooms in the household and categorized as 1 = 3 or more people per room, 2 = between 2 and 2.99 people per room, 3 = 0 to 1.99 people per room. Number of goods in the household was assessed according to a list of 11 durable goods at home. Parental schooling was registered as the total number of years of schooling with approval and categorized into 3 groups: 1 = 1–7 years of schooling, 2 = 8–11 years of schooling and 3 = ≥ 12 years of schooling.

Social support

Social support was a latent variable using the dimensions of the Social Support Appraisals (SSA) instrument as indicators [42]. SSA assesses emotional support according to Cobb's theoretical definition of social support: beliefs that one is loved, respected and esteemed by and involved with family, friends and others [23]. The SSA valid version for the Brazilian population was used [43]. The questionnaire comprises a total of 30 items grouped into four dimensions that assesses emotional social support from family (e.g. My family cares for me very much), friends (e.g. My friends look out for me), teachers (e.g. My teachers like me) and others (e.g. I fell valued by other people). SSA questionnaire is a 6-point Likert scale with the following response options: 1 = "I fully agree", 2 = "I strongly agree", 3 = "I agree a little", 4 = "I disagree somewhat", 5 = "I strongly disagree" and 6 = "I fully disagree". The total score of SSA questionnaire is obtained by adding up the scores of the items and

vary from 30 to 180. A higher SSA score indicates greater social support.

Oral health beliefs

Adolescents completed a questionnaire about oral health beliefs proposed by Broadbent et al. concerning six behaviours: avoiding a large amount of sweet foods, using fluoride toothpaste, visiting the dentist regularly, keeping teeth and gums very clean, drinking fluoridated water and floss [11]. Participants ranked each belief as: 1 = "Extremely important", 2 = "Reasonably important", 3 = "It does not matter much/Not very important" or 4 = "Nothing important". The oral health beliefs items are combined resulting in a final score ranging from 6 (very favourable) to 24 (very unfavourable). The higher the score, the worse the oral health beliefs.

Psychosocial factors

Psychosocial factors were sense of coherence (SOC) and self-esteem. Adolescent SOC was assessed using the Brazilian version of the SOC-13 scale [44, 45]. The scores related to negative SOC items were reversed. The final score of the SOC measure was obtained by summing the points of the 13 items, ranging from 13 to 65. The higher score, the higher the SOC. Self-esteem was assessed through the Brazilian version of the Rosenberg's Self-Esteem Scale [46, 47]. The 10 items were answered on a four-point Likert scale: 4 = "I totally agree", 3 = "I agree", 2 = "I disagree" and 1 = "I totally disagree". The total self-esteem score comprised the sum of the items and can vary from 10 to 40. The higher score indicates higher self-esteem. The above-mentioned psychosocial measures have been previously used to assess the relationship between psychosocial factors and quality of life in adolescents [12].

Health-related behaviours

Smoking, sedentary behaviour and frequency of toothbrushing were measured according to questions used in the National School-Based Health Survey (*Pesquisa Nacional de Saude do Escolar—PeNSE*) [48]. Smoking was assessed according to the question: "During the last 30 days, have you smoked cigarette?" (1 = Yes, 2 = No). Sedentary behaviour was measured in response to the question: "In an ordinary weekday, how many hours per day do you spend in watching TV, using computer and video games or doing other sitting activities?" (1 = < 1 h per day, 2 = 1 to 2 h per day, 3 = 3 to 4 h per day or 4 = > 4 h per day). The item "How many times do you brush your teeth per day?" (1 = up to 2 times a day, 2 = 3 times a day or more) was used to assess the frequency of toothbrushing.

The annual amount of sugar consumption was evaluated through a Food Frequency Questionnaire (FFQ) applied by trained examiners using coloured figures of real-size food portions and drinks. The FFQ consists of a list of cariogenic foods and drinks previously used by Peres et al. [49], and originally advocated by Chaffe et al. [50]. The adolescents were questioned about the frequency and amount of consumption of fourteen groups of foods and drinks with cariogenic potential. These groups are based on their respective amounts of sucrose and/or associations with dental caries. The daily intake of sugar-related foods and drinks was transformed into annual amount of sugar consumption.

Health- related quality of life

Health-related quality of life was measured using the Kiddo-KINDL questionnaire validated for Brazilian adolescents aged from 12 to 16 years-old [51]. The Kiddo-KINDL was originally developed by Bullinger (1994) and reviewed by Ravens-Sieberer and Bullinger [52]. The Kiddo-KINDL questionnaire contains 24 items distributed into six subscales corresponding to the following dimensions: physical well-being, emotional well-being, self-esteem, family, friends and daily routine (school). The total score of Kiddo-KINDL was obtained by the sum of all items and can vary from 24 to 120. HRQoL was a latent variable using the scores of each dimension as indicators. Higher scores of Kiddo-KINDL indicate better HRQoL.

Pilot study and instrument reliability

A pilot study was conducted involving ten 12-year-old students who did not participate in the main study. The students were interviewed to verify understanding of the items in the questionnaires. Ten percent of the participants of the main study were re-interviewed in order to assess the temporal reliability of the instruments. Internal consistency and reliability of the instruments were evaluated through Cronbach's alpha coefficient and Intraclass Correlation Coefficient (ICC), respectively. Cronbach's alpha coefficient greater than 0.80 suggests high reliability, whereas Cronbach's alpha between 0.50 and 0.80, and below than 0.50 indicate moderate and low reliability, respectively [53]. ICCs between 0.50 and 0.75, between 0.75 and 0.90 and greater than 0.90 indicate moderate, good and excellent reliability, respectively [54]. The Cronbach's alpha coefficients were: social support = 0.876, self-esteem = 0.844, SOC = 0.674, QFA = 0.748 and HRQoL = 0.810. The ICCs were: social support = 0.892, self-esteem = 0.878, SOC = 0.888, oral health beliefs = 0.701; QFA = 0.720 and HRQoL = 0.885.

Data analysis

Descriptive analysis reported the distribution of the variables through means and standard deviations (continuous variables) and proportions (categorical variables). Confirmatory factorial analysis (CFA) was used to evaluate the measurement model involving three latent variables (socio-economic status, social support and HRQoL). Structural equation modelling (SEM) examined the direct and indirect relationships between observed and latent variables according to the conceptual framework (Fig. 1) using SPSS AMOS 24.0 software.

The standardized total effects composed of standardized direct effects (a direct path from one variable to another) and standardized indirect effects (a pathway mediated by other variables) were estimated. The 95% confidence intervals (95% CIs) were estimated using the maximum likelihood method via bias-corrected bootstrap to assess whether mediation was present by testing the statistical significance of the indirect effects, with 900 resampling from the original data set in order to derive less biased standard errors [55]. The adequacy of the measurement and structural models was evaluated according to the following fit indexes and threshold values: $\chi^2/df < 3.0$, standardized root-mean-square residual (SRMR) ≤ 0.08, comparative fit index (CFI) ≥ 0.90, goodness of fit index (GFI) ≥ 0.90 and root-mean-square error of approximation (RMSEA) ≤ 0.06 [56]. The non-significant direct paths were removed from the full model to estimate a statistically parsimonious model.

Ethical considerations

The present study was conducted in accordance with the Declaration of Helsinki and the research protocol was approved by the Ethics Committee of the Federal University of Amazonas (Protocol no. 57273316.1.0000.5020). All participants of this study and their parents provided signed informed consent before data collection.

Results

Figure 2 presents the flow chart for selecting the participants. Initially 442 adolescents were assessed for participation according to the eligibility criteria. 27 adolescents were excluded from the study due to current use of orthodontic appliances. The remaining 415 eligible participants all agreed to participate. Nine participants were excluded from the analysis because of incomplete data. The baseline and follow-up data collection included 406 and 376 participants, respectively (retention rate of 96.6%). Female adolescents represented 56.4% of the sample and most of them were from low-income families. The majority of participants'
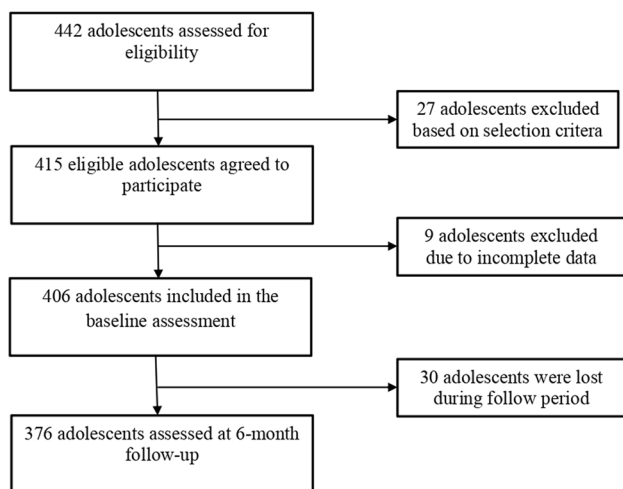
Fig. 2 Flow chart of participants at baseline and follow-up periods

parents or guardians reported having between 8 and 11 years of schooling (71.8%) and residing predominantly in households with less than two residents per room (Table 1).

The confirmatory factor analysis (CFA) evaluated the measurement model for the latent variables; socioeconomic status, social support and HRQoL (Fig. 3). The items that confirmed the latent variable "social support" were SSA dimensions perceived support from friends ($\beta = -0.703$), parents ($\beta = -0.683$), teachers ($\beta = -0.569$) and others ($\beta = -0.836$). The items that confirmed the latent variable "socioeconomic status" were family income ($\beta = 0.581$), parental schooling ($\beta = 0.284$), household overcrowding ($\beta = -0.318$) and number of goods ($\beta = 0.474$). The items that confirmed the latent variable "HRQoL" were the Kiddo-KINDL dimensions physical well-being ($\beta = -0.498$), emotional well-being ($\beta = -0.686$), self-esteem ($\beta = -0.612$), family ($\beta = -0.579$), friends ($\beta = -0.590$) and daily routine ($\beta = -0.446$). The highest values of R^2 were 0.836 (others) for social support, 0.666 (emotional well-being) for HRQoL and 0.581 (family income) for socioeconomic status.

Structural equation modelling supported the hypothesized model (full model) with the following values: SRMR = 0.047, CFI = 0.920, GFI = 0.935, RMSEA = 0.044. No significant association between sex and other variables was observed in the full model. Variable sex and non-significant direct paths were removed to obtain the statistical parsimonious model. The fit indices of the full, measurement and parsimonious models are presented in Table 2.

The parsimonious model showed good fit since all criteria were met. The direct and indirect relationships of this model are summarized in Fig. 4. Greater social support ($\beta = 0.30$), higher SOC ($\beta = 0.23$), higher self-esteem ($\beta = 0.23$), frequency of toothbrushing ($\beta = 0.14$) and lower frequency of smoking ($\beta = -0.14$) were directly related to better HRQoL.

Table 1 Socioeconomic status, sex, social support, oral health beliefs, psychosocial factors, health-related behaviours and health-related quality of life (HRQoL)

	Total $N = 376$
Socioeconomic characteristics	
Family income	
$\leq \frac{1}{2}$ BMW	100 (26.6%)
$\frac{1}{2}$ to 1 BMW	148 (39.4%)
> 1 BMW	128 (34.0%)
N of residents per room	
≥ 3	35 (9.3%)
2 to 2.99	73 (19.4%)
0 to 1.99	268 (71.3%)
Number of durable goods, mean	6.7 (SD ± 2.5)
Parental schooling	
1 to 7 years	64 (17.0%)
8 to 11 years	270 (71.8%)
≥ 12 years	42 (11.2%)
Sex	
Female	164 (43.6%)
Male	212 (56.4%)
Social support	
Total score, mean (± SD)	141.5 ± 16.9
Friends, mean (± SD)	33.1 ± 5.7
Relatives, mean (± SD)	42.2 ± 5.4
Teachers, mean (± SD)	29.7 ± 5.2
Others, mean (± SD)	36.5 ± 5.7
Oral health beliefs, mean (± SD)	8.6 ± 2.5
Psychosocial factors	
Sense of coherence, mean (± SD)	44.8 ± 7.0
Self-esteem, mean (± SD)	28.6 ± 4.1
Health-related behaviours	
Toothbrushing frequency	
≤ 2 times per day	161 (42.8%)
≥ 3 times per day	215 (57.2%)
Sedentary behaviour	
< 1 h per day	123 (32.7%)
1 to 2 h per day	98 (26.1%)
3 to 4 h per day	80 (21.3%)
> 4 h per day	75 (19.9%)
Smoking	
Never smoker	355 (94.4%)
Previous or current smoker	21 (5.6%)
Sugar consumption (kg/year), mean (± SD)	7.9 ± 5.6
HRQoL	
Total score, mean (± SD)	85.3 ± 12.4
Physical well-being, mean (± SD)	14.8 ± 2.8
Emotional well-being, mean (± SD)	15.3 ± 3.0
Self-esteem, mean (± SD)	12.9 ± 3.8
Family, mean (± SD)	15.5 ± 3.2
Friends, mean (± SD)	13.7 ± 3.3
Daily routine, mean (± SD)	13.1 ± 2.5

BMW Brazilian minimum wage

Better socioeconomic status directly predicted higher toothbrushing frequency ($\beta = 0.14$) and lower smoking frequency ($\beta = -0.22$). Having greater social support was a direct predictor for higher SOC ($\beta = 0.55$), positive oral health beliefs ($\beta = -0.31$) and higher self-esteem ($\beta = 0.58$). Significant indirect relationships between socioeconomic status and HRQoL ($\beta = 0.05$), social support ($\beta = 0.26$) and oral health beliefs were identified. In addition, greater social support was an indirect predictor for lower frequency of smoking via oral health beliefs ($\beta = -0.05$) and lower sugar consumption via SOC ($\beta = -0.07$). The parameters of the direct and indirect effects are described in Fig. 4.

Discussion

The present follow-up study assessed the relationships between socioeconomic status, social support, health-related behaviours, oral health beliefs, psychosocial factors and HRQoL in 12 year-old Brazilian adolescents. Overall, the findings of this study support the hypothesis that low socioeconomic status, poor social support, negative oral health beliefs and lower levels of protective psychosocial factors were significantly associated with unhealthy behaviours and poor HRQoL in adolescents. The hypothesis of a negative effect of unhealthy behaviours on adolescent HRQoL was partially confirmed. Similarly, the mediation effect of health behaviours on the influence of socioeconomic status, social support, oral health beliefs and protective psychosocial factors on HRQoL was observed to a certain extent. Therefore, our results support the temporal relationships between socioeconomic inequalities, social support, oral health beliefs, psychosocial factors, health behaviours and HRQoL among adolescents. These findings suggest the importance of intermediary social determinants of adolescent health and well-being. The relationships were tested according to a hypothesized conceptual framework that included socioeconomic factors, oral

Fig. 3 Likelihood estimates for the confirmatory factor analysis (measurement model)
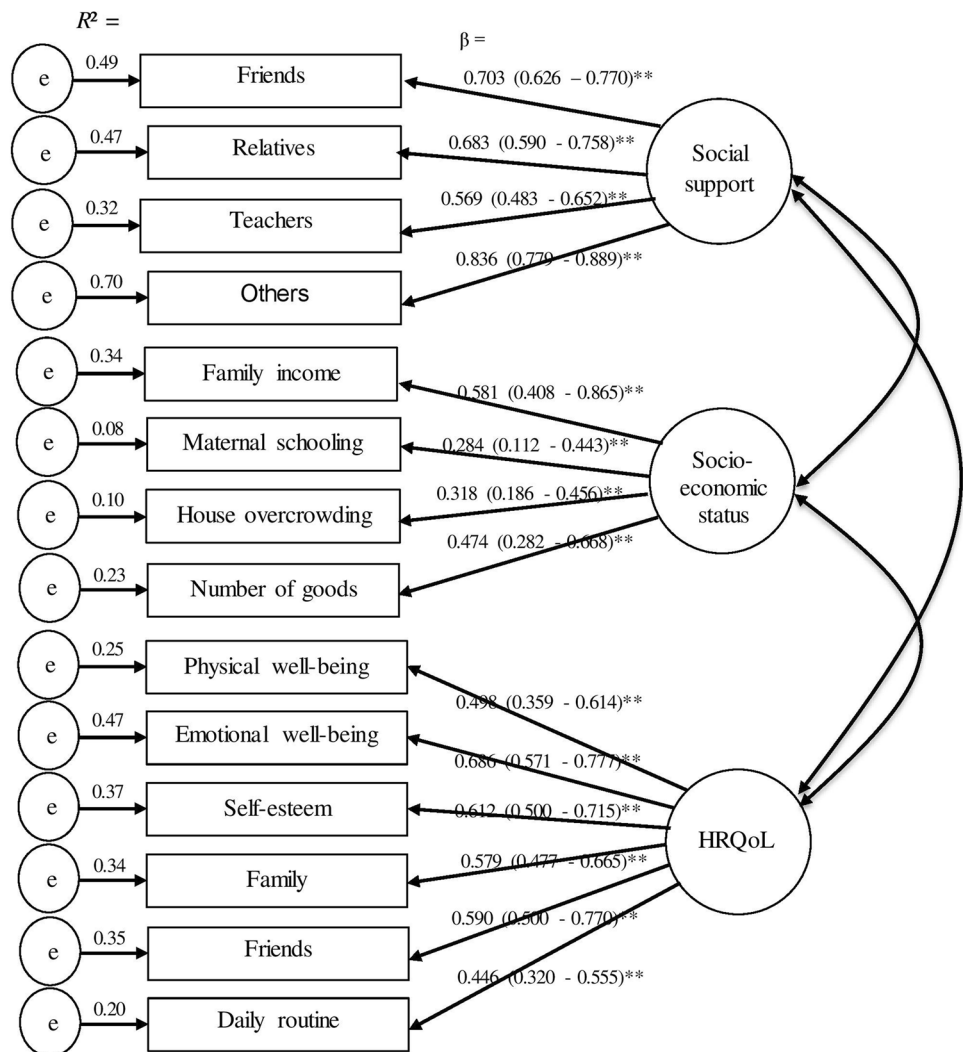
Table 2 Fit indices for the confirmatory factor analysis of full, measurement and parsimonious models

Model	χ^2/df ratio	GFI	CFI	SRMR	RMSEA
Full	1.722	0.935	0.920	0.047	0.044
Measurement model	1.522	0.960	0.963	0.042	0.037
Parsimonious	1.623	0.931	0.922	0.048	0.041

Model Full: Theoretical model. Measurement model: confirmatory factor analysis between latent variables (Socioeconomic status, social support and health-related quality of life [HRQoL]). Parsimonious model: Associations between socioeconomic status, social support psychosocial factors, health-related behaviours and HRQoL with multiple direct and indirect effects model with pathways between all adjacent and non-adjacent levels

χ^2/df ratio Chi square and degrees of freedom ratio, GFI Goodness of fit statistics; CFI comparative fit index, SRMR standardized root-mean-squared residual, RMSEA root-mean-square error of approximation

health beliefs, psychological characteristics, behaviours and HRQoL using structural equation modelling, which is considered to be the most adequate statistical approach when evaluating multiple relationships between variables. The use of a representative and random sample suggests that our findings are potentially applicable to other populations with similar demographic and socioeconomic characteristics.

Socioeconomic status was a relevant determinant of health behaviours in the studied population because better socioeconomic status predicted greater frequency of toothbrushing and lower smoking. This finding reinforces the

importance of socioeconomic characteristics on oral and general health behaviours, which is in agreement with previous research [57, 58]. In addition, frequency of toothbrushing, smoking and oral health beliefs mediated the relationship between socioeconomic status and HRQoL. Although previous research reported the link between socioeconomic status and adolescent HRQoL, epidemiological investigations assessing the possible mediators between socioeconomic factors and HRQoL are scarce [59]. Since our study simultaneously assessed the role of socioeconomic conditions, oral health beliefs, psychosocial factors and behavioural characteristics on HRQoL, it was possible to reveal the potential pathways by which low social background influences HRQoL [16, 24, 25].

Adolescent perception of social support was associated with oral health beliefs, and all psychosocial factors included in this study. This result demonstrates the relevance of supportive social relationships on enhancing adolescent oral health beliefs, SOC and self-esteem. The link between social support and psychosocial factors suggests that adolescents perceiving more support from their social ties tend to develop a greater sense of confidence, belonging and care. In addition, social support was indirectly linked to smoking mediated by oral health beliefs. This finding emphasizes the protective effect of social support on unhealthy behaviours in adolescents, including less psychological complaints [4, 5]. It must be noted that social support was also a direct predictor of HRQoL, revealing the importance of social ties on quality of life and well-being of adolescents, which tends to remain over time [4, 5, 25].
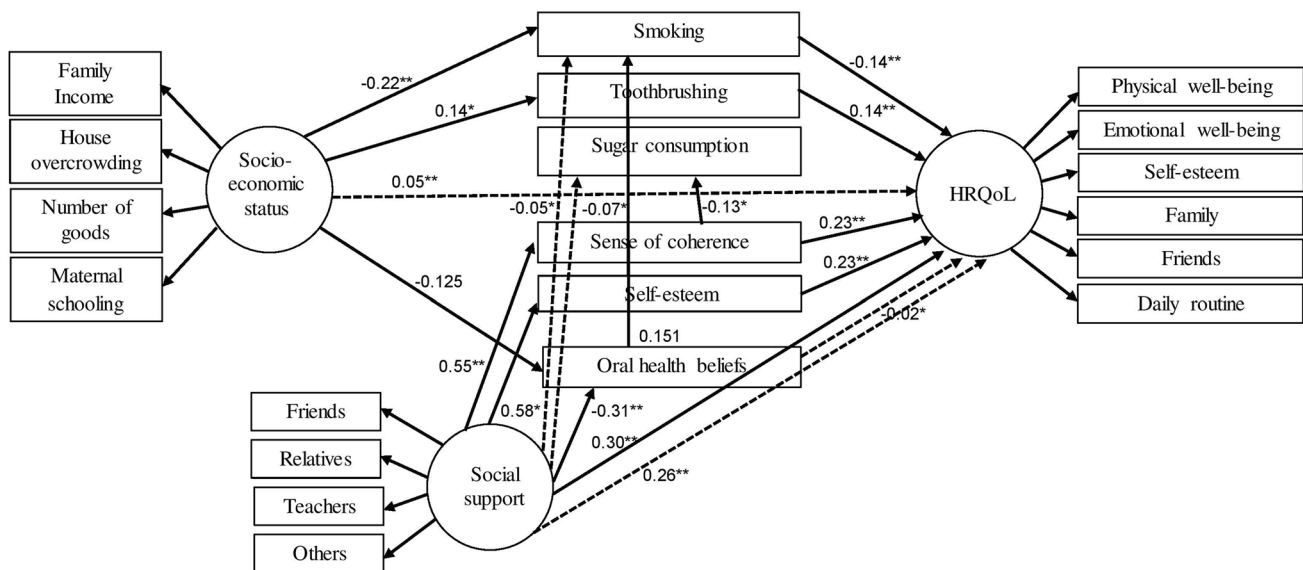

Fig. 4 Parsimonious model of associations between socioeconomic status, social support, oral health beliefs, psychosocial factors, health behaviours and health-related quality of life (HRQoL). Direct effects are indicated by solid lines. Indirect effects are indicated by dashed lines. *P < 0.05, **P < 0.01

Smoking and toothbrushing were meaningful health-related behaviours associated with HRQoL among adolescents. The association between smoking and poor quality of life has been widely studied among adults [60]. However, studies involving adolescents are scarce [20]. In addition, few studies have explored the relationship between toothbrushing and HRQoL since previous evidence relies on the link between toothbrushing and OHRQoL [61, 62]. The lack of association between sedentarism and HRQoL was an unexpected finding. The use of a single item to assess adolescent sedentary behaviour might be the possible explanation for this result.

Psychosocial factors investigated in the present study (SOC and self-esteem) directly predicted adolescent HRQoL. Furthermore, oral health beliefs were indirectly related to adolescent HRQoL. The association of SOC and self-esteem with quality of life among adolescents has been reported and our findings confirm previous results [6–8, 17]. However, few studies have identified the association between oral health beliefs and HRQoL. The indirect effect between these two variables was mediated by smoking. Longitudinal studies using the life-course approach suggested that oral health beliefs are related to dental caries, oral hygiene and self-assessment of oral health [50, 62]. A substantial proportion of the population tends to change their beliefs about health practices between adolescence and young adulthood [11]. Therefore, the link between oral health beliefs, smoking and HRQoL in adolescents is a potential topic for future intervention studies. Our findings emphasize the importance of oral health beliefs and psychosocial factors on adolescent health and well-being. Along with health-related behaviours, oral health beliefs and psychosocial factors may be considered modifiable risk factors in adolescents. The identification of those risk factors provides multiple opportunities to improve adolescent quality of life through tackling social inequalities in health using inter-sectoral approaches [59].

The present study benefits from the advantages of using SEM that simultaneously analyses the direct and indirect complex relationships according to a pre-established conceptual framework [29]. In this study, HRQoL, social support and socioeconomic status were analysed as latent variables to represent multidimensional measures. Using family income, household overcrowding, number of goods and parental schooling as indicators of socioeconomic status overcame the well-known limitation of measuring social status through a single characteristic. The use of latent variables to represent HRQoL and social support using the instrument's dimensions provides more reliable data and less measurement errors. Previous research has employed SEM to investigate biological, functional, socioeconomic and psychological determinants of HRQoL in adolescents [8, 9, 34]. However, the cross-sectional nature of these studies imposes limitations concerning the temporal relationships between variables.

Some limitations of this study need to be considered. The studied sample is a specific school cohort of adolescents attending public schools and living with social disadvantage. Consequently, our findings should not be extrapolated to other age groups and populations from different socioeconomic backgrounds. Although previous research suggests the importance of health conditions on HRQoL, clinical variables were out of the scope of this study and therefore were not examined. It has been suggested that the predictors of adolescent quality of life should be investigated according to sex. This approach was not adopted in this study because it would have significantly reduced the sample size and therefore the power of the study.

Conclusion

The present study elucidated the complex relationships between socioeconomic status, social support, oral health beliefs, psychosocial factors, health behaviours and HRQoL among adolescents. Socioeconomic status, social support, oral health beliefs and psychosocial factors were important predictors of health behaviours and HRQoL through direct and indirect mechanisms. In addition, health behaviours directly influenced HRQoL. Our findings suggest the need to develop and test interventions addressing multiple modifiable behavioural and psychosocial risk factors to improve adolescent quality of life. The study highlights the importance of taking into account multiple aspects of adolescent life on the development of health promotion strategies and healthcare services planning in order to enhance quality of life. A comprehensive approach to improve adolescents health and quality of life should consider socioeconomic status, psychosocial characteristics, health beliefs, level of perceived social support and behaviours. In addition, health care services should move towards a more patient-centred approach since individual characteristics were meaningful aspects of adolescent quality of life. Finally, inter-sectoral policies to reduce social inequalities can possibly improve adolescent behaviours, health beliefs and psychosocial factors, and therefore would positively impact on their health and well-being.

Compliance with ethical standards

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