Sense of coherence and oral health-related quality of life among southern Brazilian male adolescents

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Abstract: This study evaluated the association between sense of coherence (SoC) and oral health-related quality of life (OHRQoL) among conscripts of the Brazilian Army, in two cities of southern Brazil. A cross-sectional study included all 18-19-year-old adolescents who joined the Brazilian Army as draftees for mandatory military service in the cities of Itaqui, RS, and Santiago, RS (n = 505). Data collection was conducted from 2019 to 2021, and included the application of questionnaires and a clinical oral examination to record gingivitis, malocclusion, and dental caries. OHRQoL was collected through the Brazilian short version of the Oral Health Impact Profile (OHIP), composed of 14 questions. The adolescents' SoC was assessed using the validated Brazilian version of the SOC-13 scale. The primary outcome of this study was OHRQoL, modeled as a discrete variable (OHIP-14 scores). The main predictor variable was SoC, categorized as low, moderate, or high. The association between predictor variables and OHRQoL was assessed by Poisson regression models using a hierarchical approach. Unadjusted and adjusted rate ratios (RR), and 95% confidence intervals (CI) were estimated. All the analyses were performed using STATA software version 14.2. Adolescents with a moderate and high SoC had 27% (RR = 0.73, 95%CI = 0.64–0.84) and 51% (RR = 0.49, 95%CI = 0.41–0.58) lower mean OHIP-14 scores, respectively, than those with a low SoC score, after the inclusion of behavioral and clinical variables. This study showed a significant association between SoC and OHRQoL among 18–19-year-old southern Brazilian adolescents. Strengthening the SoC as a psychosocial resource may improve the well-being and OHRQoL of adolescents.

Keywords: Sense of Coherence; Oral Health; Cross-Sectional Studies; Adolescent; Quality of Life.

Introduction

Oral health-related quality of life (OHRQoL) is an important element to assess the impact of oral diseases and disorders on the psychological, social, and functional well-being of individuals.[1] In addition to clinical conditions, such as untreated caries, gingivitis, traumatic dental injuries, and malocclusion, certain individual sociodemographic characteristics,

such as age, sex, and socioeconomic factors, have been shown to influence OHRQoL.[2,3]

More recently, sense of coherence (SoC) was identified as another individual factor pivotal to the study of oral conditions and OHRQoL. SoC researches the reason why some people remain healthy when facing stressful situations.[4] It is the main constituent of the salutogenic theory, which assesses the individual's ability to use existing resources as a way of adapting to an adverse situation.[4] Individuals with higher SoC can cope better with existing stressors in their social lives. In addition to influencing habits related to oral health[5] and clinical parameters,[6] SoC can influence OHRQoL.

The systematic review conducted by Gomes et al.[7] included 13 studies, and found that a low SoC was associated with a poor OHRQoL. Despite these findings, only five studies have evaluated this relationship in adolescents, all of which were conducted during the period known as early adolescence (from age 10 to 14 years). Further studies carried out in adolescents also included those up to 15 years old.[8] The only study that includes individuals in late adolescence (from age 15 to 19 years) is the recent cohort study conducted by Tondolo Junior et al.,[9] which has shown that SoC has a direct effect on the OHRQoL of adolescents with a mean age of 17.5 years.

Although previous studies have evaluated the association between SoC and OHRQoL in different populations and age groups, there is no study investigating this relationship among 18–19-year-old adolescents drafted for mandatory military service. The investigation of this association in a homogeneous population of adolescents in terms of sex and age, during a potentially stressful period of their lives, both physically and psychologically, seems to yield advantages. During the period of military service, adolescents usually move and start living away from their families, face an exhausting workday, and introduce new habits and environments, a situation that may cause oral health to be neglected. In this context, we hypothesized that a higher SoC is associated with a better OHRQoL in this population. Therefore, this study was conducted to assess the association between SoC and OHRQoL among conscripts of the Brazilian Army, in two cities of southern Brazil.

Methodology

Ethical aspects

The study protocol was approved by the Research Ethics Committee of the Federal University of Santa Maria (CAAE 20079519.1.0000.5346). All participants were informed about the research objectives, and provided written informed consent. Those with treatment needs received dental treatment.

Study design and sample

This observational cross-sectional study was carried out with adolescents aged 18-19 years, who joined the Brazilian Army as draftees for mandatory military service at two Brazilian Army military bases located in southern Brazil. All the conscripts doing mandatory military service in the city of Itaqui, RS, in the years 2019 and 2020, and Santiago, RS, in 2021, were invited to participate, resulting in a sample size of 520 individuals. The estimated population of these two cities is about 37,000 and 50,000 inhabitants, respectively. Mandatory military service in Brazil targets young Brazilian males who complete 18 years of age between January 1st and December 31st.

Data collection

Data collection included the application of questionnaires and a clinical oral examination. A structured questionnaire gathered data on sociodemographic information, including level of education and family income. The short form (OHIP-14) of the Brazilian version of the Oral Health Impact Profile (OHIP) was applied to assess the impact of oral conditions on OHRQoL.[10] The instrument is composed of 14 questions divided into the following seven domains: functional limitation, physical pain, psychological discomfort, physical disability, social disability, psychological disability, and handicap. Each question has the following alternative answers, scored on the following five-point Likert scale: 0, never; 1, almost never; 2, occasionally; 3, reasonably frequent; 4, very often. The total OHIP-14 score is calculated by using the additive method, and can

range from 0 to 56. The higher the score, the poorer the OHRQoL.

The SoC was assessed using the validated Brazilian short version of the SoC scale (SOC-13).[11] This instrument is composed of 13 items, and assesses the following components: comprehensibility, manageability, and meaningfulness. The response options are presented on a five-point Likert scale, in which the sum of points can range from 13 to 65. Higher scores represent a higher SoC. The individuals were categorized as low, moderate, or high SoC, based on tertiles.[12]

A clinical examination was performed in a dental chair, with a sterile clinical mirror, a millimeter-scaled periodontal probe, and a WHO probe. All surfaces were examined, from incisors to third permanent molars. First, the gingival bleeding index was recorded[13] as absent or present at four sites per tooth (buccal, lingual, mesial, and distal). Then, the percentage of sites with gingival bleeding was computed, and each individual was classified as presenting no (< 10% of bleeding sites), localized (≥ 10% to ≤ 30% of bleeding sites), or generalized (> 30% of bleeding sites) gingivitis.[14] After the teeth were cleaned professionally with a toothbrush, and dried, a single calibrated examiner (NCL) recorded the presence of non-cavitated or cavitated, and inactive or active caries lesions.[15] Missing and filled surfaces were also recorded to determine the decayed, missing, or filled teeth (DMF-T) index, which was defined at the cavity level, according to the WHO standards.[16] Untreated caries was considered as occurring when the adolescent had at least one carious cavity or residual root. Evaluation of malocclusion was performed according to the Dental Aesthetic Index (DAI),[16] and the cutoff proposed by the WHO was adopted (absent when DAI≤25 or present when DAI≥26).

Training and calibration

Training and calibration for the dental caries examination were performed before the study began, under the supervision of a reference examiner (PKM), by repeated examinations of individuals not pertaining to the study sample. The intraexaminer unweighted Cohen's kappa value observed for dental caries was 0.96. The intraclass correlation coefficient for DAI was 0.94. The examiner designated to conduct the gingival bleeding index was trained by a periodontist, but no calibration was performed due to the temporary nature of this condition.

Data analysis

The primary outcome of this study was OHRQoL, modeled as a discrete variable (OHIP-14 scores). The main predictor variable was SoC, categorized as low, moderate, or high, as previously described. Other predictor variables were level of education (categorized as < 8 years, 8–10 years, or ≥ 11 years), family income (≤ 3 Brazilian minimum wages [BMW, where 1 BMW corresponded to approximately 200 USD during the period of data collection] or ≥ 4 BMW), untreated caries (absent or present), gingivitis (none, localized, or generalized), and malocclusion (absent or present). Preliminary analysis comparing the mean OHIP-14 scores among the categories of predictors was carried out using the Wald test. Unadjusted and adjusted rate ratios (RR) and respective 95% confidence intervals (CI) were estimated by the Poisson regression analysis. Adjusted analysis followed a hierarchical approach. Four models were described: Model 1 included only the socioeconomic indicators; Model 2 was composed of Model 1 plus the psychological variable; Model 3 was composed of Model 2 plus the behavioral variable; and Model 4 was composed of Model 3 plus clinical variables. All variables with p < 0.20 in the unadjusted analysis were included in the adjusted analysis. The deviance (− 2 log likelihood) was measured in all models to assess the quality of fit. Data analysis was performed using STATA software (Stata 14.2, Stata Corporation, College Station, USA), and the level of significance was set at 5%.

Results

All invited individuals agreed to participate. A total of 520 participants were examined clinically and completed the questionnaires; however, 13 had missing information in the SoC scale, and another 2, in the OHIP-14 questionnaire, resulting in a final sample of 505 individuals. This population had a

mean (± standard deviation [SD]) DMF-T index of 2.3 (± 2.5), ranging from 0 to 14 (median 2, interquartile range [IQR] 0, 4).

Table 1 shows the sample distribution and OHRQoL by explanatory variables, and the unadjusted analysis. A significant gradient of OHIP-14 scores was observed across SoC categories;

the higher the SoC, the lower the OHIP, hence the better the OHRQoL. In the unadjusted analysis, adolescents with moderate and high SoC had 28% and 53% lower OHIP-14 scores, respectively, than those with low SoC. All the other variables were significantly associated with OHIP-14 scores, except gingivitis and malocclusion.

Table 1. Sample distribution and OHRQoL (overall OHIP-14 score) by explanatory variables and unadjusted analysis (Poisson regression).

Variables	n (%)	Mean (SE)	RR (95%CI)	p-value
Socioeconomic indicator				
Education level (years)				
< 8	75 (14.8)	10.9 (0.9)[a]	1.00	
8–10	181 (35.8)	9.2 (0.5)[ab]	0.84 (0.70–1.02)	0.08
≥ 11	249 (49.3)	8.6 (0.4)[b]	0.78 (0.65–0.95)	0.01
Family income				
≤ 3 BMW	378 (74.8)	9.8 (0.4)[a]	1.00	
≥ 4 BMW	127 (25.2)	7.3 (0.6)[b]	0.75 (0.63–0.89)	0.001
Psychological variable				
Sense of coherence				
Low	161 (31.9)	12.6 (0.6)[a]	1.00	
Moderate	176 (34.8)	9.0 (0.5)[b]	0.72 (0.62–0.83)	< 0.001
High	168 (33.3)	5.9 (0.4)[c]	0.47 (0.39–0.55)	< 0.001
Behavioral variable				
Tooth brushing frequency				
≤ Once/day	32 (6.4)	11.2 (1.5)[a]	1.00	
Twice/day	190 (37.7)	10.7 (0.5)[a]	0.96 (0.72–1.27)	0.75
≥Three times/day	282 (55.9)	7.8 (0.4)[b]	0.70 (0.53–0.93)	0.01
Clinical variable				
Gingivitis				
None	160 (31.7)	8.7 (0.5)[a]	1.00	
Localized	215 (42.6)	8.9 (0.5)[a]	1.03 (0.87–1.21)	0.74
Generalized	130 (25.7)	10.0 (0.7)[a]	1.15 (0.97–1.38)	0.11
Untreated caries				
Absent	365 (72.3)	8.4 (0.3)[a]	1.00	
Present	140 (27.7)	11.1 (0.7)[b]	1.31 (1.13–1.52)	< 0.001
Malocclusion				
Absent	256 (50.7)	8.7 (0.4)[a]	1.00	
Present	249 (49.3)	9.6 (0.5)[b]	1.10 (0.96–1.26)	0.17
Total	505 (100.0)	9.1 (0.3)		

BMW: Brazilian minimum wage; SE: standard error; RR: rate ratio; CI: confidence interval. Different letters indicate statistically significant difference between categories (p < 0.05, Wald test).

The adjusted association between explanatory variables and OHRQoL is described in Table 2. In Model 1, adolescents whose family earns ≥ 4 BMW had significantly better OHRQoL than their counterparts with lower family income. In Model 2, SoC was significantly associated with the study outcome. Adolescents with moderate and high SoC had 28%

and 53% lower mean OHIP-14 scores, respectively, than those with low SoC. The inclusion of behavioral (Model 3) and clinical (Model 4) variables exerted no major effect on the association between SoC and OHRQoL. In Model 4, adolescents with moderate and high SoC had 27% (RR = 0.73, 95%CI = 0.64–0.84) and 51% (RR = 0.49, 95%CI = 0.41–0.58) lower mean OHIP-

Table 2. Adjusted association between explanatory variables and OHRQoL (overall OHIP-14 score). Poisson regression analysis.

Variable	Model 1[a]	Model 2[b]	Model 3[c]	Model 4[d]
Socioeconomic indicator				
Education level				
< 8	1.00	1.00	1.00	1.00
8–10	0.85 (0.70–1.03)	0.87 (0.73–1.04)	0.87 (0.73–1.03)	0.90 (0.76–1.07)
≥ 11	0.82 (0.68–1.00)	0.83 (0.70–0.99)*	0.86 (0.72–1.01)	0.90 (0.76–1.07)
Family income (years)				
≤ 3 BMW	1.00	1.00	1.00	1.00
≥ 4 BMW	0.76 (0.64–0.91)*	0.78 (0.66–0.92)*	0.79 (0.68–0.94)*	0.80 (0.68–0.94)*
Psychological variable				
Sense of coherence				
Low		1.00	1.00	1.00
Moderate		0.72 (0.62–0.83)*	0.72 (0.63–0.83)*	0.73 (0.64–0.84)*
High		0.47 (0.40–0.56)*	0.48 (0.41–0.57)*	0.49 (0.41–0.58)*
Behavioral variable				
Tooth brushing frequency				
≤ Once/day			1.00	1.00
Twice/day			1.03 (0.81–1.31)	1.06 (0.83–1.34)
≥ Three times/day			0.82 (0.64–1.05)	0.86 (0.67–1.10)
Clinical variable				
Gingivitis				
None				1.00
Localized				0.97 (0.84–1.13)
Generalized				1.02 (0.87–1.19)
Untreated caries				
Absent				1.00
Present				1.17 (1.01–1.34)*
Malocclusion				
Absent				1.00
Present				1.06 (0.93–1.19)
Deviance (- 2 log likelihood)	4718.26	4332.49	4267.42	4232.22

[a]Model 1 included only the socioeconomic indicators; [b]Model 2 was composed of Model 1 plus the psychological variable; [c]Model 3 was composed of Model 2 plus the behavioral variables; [d]Model 4 was composed of Model 3 plus clinical variables. RR: rate ratio; CI: confidence interval; *p-value < 0.05.

14 scores, respectively, than those with a low SoC. Lower family income and the presence of untreated caries were also associated with a poorer OHRQoL.

Regarding OHIP-14 domains, adolescents with moderate and high SoC were found to have significantly better OHRQoL in all domains, except for physical pain, in which the category of moderate SoC did not attain statistical significance. These associations remained significant even after the adjustment for behavioral (Model 3) and clinical (Model 4) variables.

The study power was calculated at 100% to compare the mean (SD) OHIP-14 score between non-exposed (low SoC) and exposed (high SoC) individuals, using 95%CI.

Discussion

This cross-sectional study assessed the association between SoC and OHRQoL among 18–19-year-old male adolescents who joined the Brazilian Army as draftees for mandatory military service in two cities of southern Brazil. Our main finding was that SoC was significantly associated with the adolescents' OHRQoL – the higher the SoC, the better the OHRQoL. Therefore, strengthening the SoC as a psychosocial resource may improve the well-being and OHRQoL of adolescents. To the best of our knowledge, this is the first study to evaluate this association among recruits of mandatory military service.

The systematic review by Gomes et al.[7] included 13 studies, and concluded that a stronger SoC was a predictor of fewer symptoms and functional impacts, and of better perceptions of health and quality of life. After this systematic review, 3 other studies that included adolescents were published on this topic. The study by Soares et al.[8] showed that SoC did not influence OHRQoL in children; however, they found that the higher the SoC, the lower the impact on the family's quality of life at the age group from 7 to 15 years. The study by Tondolo Junior et al.[9] evaluated subjects with a mean age of 17.5 years, and showed that SoC and dental caries had a direct effect on OHRQoL. The cohort study by Knorst et al.[17] evaluated adolescents between 11-15 years of age, and showed that individuals with a high SoC were more

likely to report better OHRQoL. According to Baker et al.,[18] a stronger SoC predicted fewer symptoms, better functioning, greater health perceptions, and a better oral health status in adolescence. Our findings are in agreement with those of the previous literature, considering that we found that a high SoC afforded significant protection (about 50%) to a poorer OHRQoL outcome in all models. The inclusion of behavioral and clinical variables in Models 3 and 4, respectively, had no major effect on the association between them. This finding indicates that we kept identifying the beneficial effect of a high SoC in terms of self-perception and OHRQoL, even after removing the effect of other variables that could explain this association. The SoC depends on the individual's ability to plan, solve problems, and adapt to conflicting contexts.[4]

Although previous studies have assessed SoC and OHRQoL, apparently, none has focused specifically on individuals aged 18–19 years. This age can be considered critical due to the transition from adolescence to adulthood, a time when many individuals experience uncertainties regarding their lives and careers, not to mention the psychological difficulties typical of this period. In addition to the aspect of age, we opted to investigate 18–19-year-olds who were doing mandatory military service. In this context, individuals are involved in daily stressful situations physically and psychologically, and a psychological resource such as SoC could be of great value to help them face these difficulties. Individuals with a high SoC may be more likely to have better adaptive strategies and positive coping methods to deal with them. Some studies have shown that SoC is stable from early adolescence onwards, and can contribute to moderating stressful experiences.[19] In addition, stress levels increase from pre-adolescence to adolescence.[20] Hence, the study of the SoC in adolescence becomes even more relevant, since it can be used as an individual resource for handling stressful events of daily life, and for developing positive strategies for the adversities that they experience during this phase.[21]

In addition to SoC, family income remained significantly associated with OHRQoL in all the models. Adolescents from more affluent families

(family income ≥ 4 BMW) reported better OHRQoL than their counterparts with lower income, which is in agreement with the recent systematic review by Knorst et al.[3] Individuals with poorer socioeconomic conditions are more likely to have a lower educational level, leading to limited access to health care and preventive interventions, and, ultimately, to a poor quality of life.[22] In addition, adolescents with a disadvantaged social status, despite their poor oral health, may not make use of dental services regularly.[23] Among the other variables included in the adjusted models, untreated dental caries was found to be negatively associated with an adolescent's OHRQoL, in agreement with the previous literature.[24] This is a conceivable finding, since carious cavities and residual roots are likely to cause pain, discomfort, and functional and psychological consequences. On the other hand, gingivitis and malocclusion were not associated with OHRQoL in this population.

This study has some limitations that should be addressed. The cross-sectional design does not allow examining the temporal relationship between variables, thus keeping us from studying causal relationships. We used a convenience sample of individuals; therefore, the sample is not representative of the whole population at this age group. Among the strengths of our study, it is important to highlight its homogeneous population in terms of sex and age, which seems to be an advantage, since it eliminates the possible influence of these factors on the study findings. In this regard, it has been shown that SoC affects the mental health of girls and boys differently during adolescence.[21] Lastly, the study of SoC and OHRQoL in individuals subjected to a daily environment of stress may also be seen as a strength of this study.

Based on the findings of the present study and the previous literature on this topic, it can be inferred that interventions to improve SoC in adolescents could result in enhanced OHRQoL, and this outcome could be achieved in two ways. First, an improvement in oral health behaviors and habits would ultimately result in better oral health; second, improved SoC would promote a greater likelihood of viewing life in a coherent, manageable, and meaningful way[4]. In this respect, previous intervention studies based on improving SoC in school-based oral health promotion settings have reported promising results.[25-26] Further intervention studies may elucidate whether addressing SoC is a feasible strategy to be adopted in oral health promotion programs targeting older adolescents.

Conclusion

This cross-sectional study found a significant association between SoC and OHRQoL among 18-19-year-old recruits of the Brazilian Army from southern Brazil.

Acknowledgments

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