

Association of sense of coherence and periodontal disease severity, in two cross-sectional studies

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Abstract

Objectives: To investigate the association between the individuals' level of sense of coherence (SOC) and periodontal disease severity.

Methods: The study populations originated from two stratified cross-sectional random samples of residents in a medium-sized Swedish city in 2003 and 2013, respectively. The final samples constituted 491 individuals in 2003 and 538 individuals in 2013. The samples were classified into three groups according to the severity of periodontitis (no/minor, moderate and severe). The 13-item Swedish version of Antonovsky's "Orientation to life" questionnaire, measuring the individual's SOC, was filled out. Descriptive statistics were performed as well as multinomial logistic regression analysis. Dependent variable was the severity of periodontal disease and independent variables, age in years, presently smoking and education at university level.

Results: In the multinomial regression analysis, smoking, age, and total SOC score were significantly associated with severe periodontitis at both examinations. The strongest predictor of severe periodontal disease was smoking. The total SOC score did not differ between the examinations, but there was a statistically significant difference in two of the SOC dimensions, manageability (lower), and comprehensibility (higher), over time.

Conclusions: Individuals with severe periodontitis had significantly lower SOC compared to subjects periodontally having no/minor periodontal disease. Smoking was the strongest overall predictor of having severe periodontitis.

KEYWORDS

cross-sectional, epidemiology, periodontal diseases, periodontitis, sense of coherence, smoking

1 | INTRODUCTION

Periodontitis have a multifactorial aetiology involving the oral microflora, host defence, as well as inner and external modifying factors such as stress and smoking.¹ When treating periodontal

disease, it is essential to control the microbiota.^{2,3} This includes meticulous oral hygiene routines for the individual affected by the disease.³ In most cases, there is a need to change oral hygiene behaviour to treat periodontitis successfully and maintain healthy periodontal tissues.⁴

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Research on periodontal disease often focuses on pathogenesis, i.e., factors causing disease. Another approach would be to focus on health and health-promoting factors, i.e., a salutogenic perspective. Antonovsky's salutogenic theory of a healthy perspective and its concept of sense of coherence (SOC) seek to explain the relationship between coping with life stressors and maintaining health, i.e., an individual's ability to implement health-promoting behaviour. Individuals with a strong SOC are considered to have health-promoting behaviour.⁵ SOC consists of three dimensions: comprehensibility, manageability, and meaningfulness. Comprehensibility is the ability to perceive events in life as structured, predictable, and understandable. Manageability is a belief that you have resources, inner and outer, to take control of things or believe that help is available if necessary. Meaningfulness is an emotional competence; a feeling that life is interesting, and things are worth engagement and involvement.⁵

Studies reporting a positive effect of strong SOC on periodontal status have found that adults have more teeth,^{6,7} lower plaque scores and fewer periodontal pockets ≥ 4 mm.⁸ Strong SOC is associated with positive oral health behaviour.⁹⁻¹⁴ On a subjective level, it has been associated with individuals having a more positive attitude toward their teeth and perceiving their oral health as better.¹¹ However, a recent systematic review showed that the relationship between SOC and clinical periodontal health outcomes is contradictory.¹⁵ Other studies did not find any association between SOC and clinical periodontal health outcomes.^{16,17}

Improved knowledge of individual factors such as sense of coherence may lead to a more holistic view of subjects with periodontal disease and, in the future, the opportunity for more customised treatment. The aim of the present study was to investigate the association between the individuals' level of sense of coherence (SOC) and periodontal disease severity.

2 | STUDY POPULATION AND METHODOLOGY

The study sample originates from two stratified cross-sectional random samples, retrieved from the Swedish Population Register, of the inhabitants of four parishes, Kristine, Ljungarum, Sofia, and Järstorp, in the city of Jönköping, Sweden, in 2003 and 2013. The sampling method and reasons for not participating have previously been presented.¹⁸ One hundred and thirty individuals in each of the age groups 30, 40, 50, 60, 70 and 80 years were randomly selected in 2003 and 2013. In 2013, additional random samples of 40, 40 and 50 individuals were invited in the respective age groups of 30, 40 and 50 years. This was done to compensate for the tendency of fewer responders in these age groups in 2003. This corresponded to 780 individuals in 2003 and 910 individuals in 2013, respectively. Individuals under the age of thirty were excluded based on (I) the level of SOC is not considered to have stabilised before the age of thirty and (II) the prevalence of periodontitis is low in younger adults.^{19,20}

All subjects received a written invitation and were also contacted by phone. Furthermore, all participants were given detailed information about the clinical study and the questionnaires on oral care and related factors. Additional information was given that participation was voluntary, the examination was free of charge, and no compensation was offered for participation. Information about oral disease found at the examination was conveyed verbally. If needed and the study subject requested it, the clinical findings and radiographs were sent to their regular dentist. In every aspect of handling documents and radiographs for study purposes, confidentiality for the individual was guaranteed.

The clinical examinations were performed by eight dentists at the Departments of Periodontology/Endodontics, Prosthodontics, Stomatognathic Physiology and Oral Medicine at the Institute for Postgraduate Dental Education and at the Centre for Oral Health, School of Health and Welfare, Jönköping University, Sweden, in 2003 and 2013. In 2013, three general practitioners from the Public Dental Health Service in Jönköping, Sweden, also participated. The clinical examinations were conducted at dental offices with modern equipment and optimal light. Each clinical-radiographic examination took 60-90 minutes. Prior to the study, the examiners were calibrated regarding the diagnostic criteria.

2.1 | Clinical recordings

The number of remaining teeth, excluding third molars, was registered. Dental plaque (PLI), according to Silness and Løe,²¹ was recorded in the event of scores 2 and 3. Gingival inflammation (GI), bleeding, was recorded in the event of scores 2 and 3, according to Løe and Silness.²² The percentage of plaque and bleeding from the total number of sites was calculated.

Probing pocket depth (PD) was measured as the distance from the gingival margin to the bottom of the periodontal, pocket parallel to the long axis of the tooth, around all teeth. The deepest score at each surface was registered to the nearest mm. All clinical periodontal measurements were recorded at four sites (buccal-proximal-lingual) for each tooth.

In the 30- and 40-year-old, panoramic radiographs were taken, as well as four bilateral and two frontal bitewing radiographs on all dentate subjects. For the age groups 50 and older, panoramic radiographs were taken as well as full-mouth, intra-oral radiographs in dentate individuals in 2003. In 2013, panoramic radiographs were taken, as well as four bilateral and two frontal bitewing radiographs on all dentate subjects in the age groups 30, 40 and 50. For 60 years and older, panoramic radiographs were taken, as well as full-mouth, intra-oral radiographs in dentate individuals.

2.2 | Classification according to the severity of periodontal disease

A modification of the Hugoson and Jordan²³ classification was used.

Group 1. GI <20% and normal alveolar bone height.

Group 2. GI ≥20% and normal alveolar bone height.

Group 3. Predominantly alveolar bone loss <1/3 of the root length.

Group 4. Predominantly alveolar bone loss between 1/3 and 2/3 of the root length.

Group 5. Predominantly alveolar bone loss >2/3 of the root length, including the presence of angular bony defects and/or furcation defects.

As a measurement of periodontitis severity, the study sample was divided into three groups based on the classification. The no/minor group (Groups 1+2) had no or minimal severity of periodontal disease. The moderate group (Group 3) displayed marginal bone loss not exceeding 1/3 of the length of the roots, while the severe group (Groups 4+5) had lost ≥1/3 of the marginal bone.

2.3 | Questionnaire

When attending the clinical examination, the participants filled in a questionnaire, including questions on demographics, oral care habits and knowledge of oral health.

For statistical analysis, education was dichotomised into reporting having an education at the university level or reporting a lower level of education. Smoking was divided into presently smoking or not smoking.

The questionnaire included the Swedish 13-item version of Antonovsky's "Orientation to life" questionnaire measuring the individual's sense of coherence.²⁴ The SOC questionnaire, comprising thirteen items, consists of three dimensions, i.e., abilities: comprehensibility (five items), manageability (four items) and meaningfulness (four items). The items were scored on a Likert scale ranging from 1 to 7. The total sum ranged from 13 to 91. The questionnaire does not have reference values for what is considered a high or low level of SOC. A high SOC score indicates a strong sense of coherence. The questionnaire has been tested for validity and reliability and has been shown to produce acceptable results in terms of validity, reliability, and cross-cultural comparisons.^{24,25}

2.4 | Data analysis

Descriptive statistics, including frequencies, mean values and 95% confidence intervals, were calculated. Comparisons between groups were made using Pearson's chi-square test for categorical variables, ANOVA for numerical variables, and Bonferroni for multiple comparisons.

Multinomial logistic regression analysis was performed in which the dependent variable was the different periodontal disease groups, and the independent variables were age in years, smoking expressed as presently smoking and education at university level. The variables age, gender, education, smoking, and SOC value were tested for collinearity.

A significant level of 5% was used in all tests.

The variable sex did not influence the regression model and was therefore removed.

All analyses were made using the SPSS version 28 statistical software (IBM Corp, Armonk, New York, USA).

2.5 | Ethical considerations

Throughout the study, the ethical principles for research the Helsinki Declaration, from the World Medical Association were followed.²⁶ The study was approved by the Ethics Committee at the University of Linköping, Linköping, Sweden (reference numbers 2003/02-376 and 2012/191-31). The STROBE checklists have been applied.

3 | RESULTS

3.1 | Clinical

The number of responding individuals was 505 (participation rate 65%) in 2003 and in 2013 there were 546 individuals (participation rate 60%) in the age groups of 30–80 years. Due to missing data regarding periodontal disease severity, the final sample constituted 491 individuals in 2003, and 538 individuals in 2013. The distribution of subjects according to gender, age, education, smoking habits, number of remaining teeth and percentage of sites with PD 4–5 mm and PD ≥6 mm, respectively, is shown in Table 1. The mean age for the total samples was 53.6 and 53.8 years in 2003 and 2013, respectively.

3.2 | Sense of coherence

In 2003, the mean total SOC score of the study population was 70.4 (95% CI 69.3–71.4). In the no/minor group, moderate and severe groups, the mean SOC score was 71.4 (95% CI 70.0–72.9), 70.4 (95% CI 68.6–72.2) and 68.5 (95% CI 65.2–71.7), respectively. The total mean SOC score for the study population in 2013 was 70.6 (95% CI 69.6–71.6). In the no/minor, moderate and severe groups, the mean SOC score was 70.5 (95% CI 69.1–71.9), 71.8 (70.0–73.5) and 67.6 (64.8–70.3), respectively. The SOC scores for all individuals are presented in Table 2.

In the multinomial regression analysis, smoking, age, and total SOC score were statistically significantly associated with having severe periodontitis (Table 3). The strongest overall predictor of periodontitis was smoking.

When it comes to the three domains of comprehensibility, manageability and meaningfulness, no significant difference could be detected when it comes to periodontal bone loss.

Comprehensibility was significantly higher in the total sample and in all three groups according to the severity of periodontitis in 2013 compared with 2003. Manageability, on the other hand, was

TABLE 1 Background factors 2003 and 2013.

	Total sample (CI)		No/Minor (CI)		Moderate (CI)		Severe (CI)	
	2003 n = 491	2013 n = 538	2003 n = 232	2013 n = 294	2003 n = 188	2013 n = 173	2003 n = 71	2013 n = 71
Mean age (years)	53.6 (52.1–55.0)	53.8 (52.4–55.3)	43.6 (41.8–45.4)	45.4 (43.7–47.1)	61.8 (60.0–63.9)	62.3 (60.3–64.4)	62.5 (59.2–65.6)	65.5 (62.7–68.3)
Sex, female (%)	53.1 (48.8–57.4)	51.7 (47.4–55.9)	49.6 (42.9–55.9)	51.7 (45.9–57.5)	59.0 (51.9–66.1)	49.1 (41.6–56.6)	49.3 (38.0–62.0)	47.9 (36.6–59.2)
Education at university level (%) ^a	26.5 (22.7–30.7)	34.7 (30.2–39.0)	36.6 (30.9–42.9)	42.5 (36.1–48.9)	18.5 (12.8–24.7)	27.6 (21.2–34.7)	13.8 (6.2–23.1)	21.2 (12.1–31.8)
Cigarette smoking (%) ^b	15.7 (12.6–19.0)	7.8 (5.5–10.3)	9.5 (5.8–13.7)	5.2 (2.8–5.0)	14.4 (9.6–20.2)	6.4 (2.9–10.4)	36.2 (24.6–47.8)	19.7 (11.3–29.6)
Mean number of teeth	23.9 (23.4–24.4)	24.6 (24.2–25.1)	26.6 (26.2–26.9)	26.5 (26.2–26.8)	23.5 (22.7–24.2)	24.0 (23.2–24.8)	19.2 (17.6–20.8)	21.0 (19.4–22.6)
Individuals with PPD ≥4 mm (%)	76.2 (72.4–80.1)	77.5 (73.8–80.8)	64.2 (58.5–70.4)	68.0 (62.9–73.5)	89.4 (84.7–97.6)	89.0 (83.8–93.6)	91.5 (84.5–97.2)	95.5 (90.1–100.0)
Individuals with PPD ≥6 mm (%)	29.9 (25.9–34.2)	26.2 (22.5–29.8)	10.8 (6.8–15.1)	9.9 (6.5–13.3)	37.2 (30.7–44.7)	35.8 (29.5–42.8)	76.1 (66.2–85.9)	71.8 (60.5–81.7)

^an explained by missing self-reported data. 2003 n = 475 (No/Minor n = 227, Moderate n = 178, Severe n = 65).

2013 n = 520 (No/Minor n = 180, Moderate n = 170, Severe n = 66).

^bn explained by missing self-reported data. 2003 n = 489 (No/Minor n = 232, Moderate n = 188, Severe n = 69).

2013 n = 531 (No/Minor n = 287, Moderate n = 173, Severe n = 71).

TABLE 2 Unadjusted mean scores for SOC of subjects according to periodontal disease severity.

	Total sample (CI)		No/Minor (CI)		Moderate (CI)		Severe (CI)	
	2003 (n = 461)	2013 (n = 515)	2003	2013	2003	2013	2003	2013
Total SOC	70.4 (69.3–71.4)	70.6 (69.6–71.6)	71.4 (70.0–72.9)	70.7 (69.4–72.1)	70.4 (68.6–72.2)	71.8 (70.0–73.5)	68.5 (65.2–71.7)	67.6 (64.8–70.3)
Comprehensibility	21.3 (20.9–21.7)	26.3 (25.8–26.7)	21.6 (21.0–22.2)	26.3 (25.7–26.9)	21.4 (20.7–22.1)	26.8 (26.0–27.6)	20.9 (19.7–22.0)	25.2 (24.0–26.3)
Manageability	26.1 (25.7–26.6)	21.7 (21.4–22.1)	26.5 (26.0–27.1)	21.7 (21.1–22.1)	26.2 (25.5–26.9)	22.1 (21.4–22.7)	25.3 (23.9–26.7)	21.2 (20.2–22.2)
Meaningfulness	23.0 (22.6–23.3)	22.5 (22.2–22.9)	23.3 (22.8–23.8)	22.7 (22.3–23.2)	22.8 (22.2–23.5)	22.9 (22.2–23.5)	22.3 (21.1–23.5)	21.2 (20.1–22.3)

significantly lower in the whole study population, as well as in all three groups in 2013 compared with 2003.

No collinearity could be detected in the variables of age (tolerance 0.9, VIF 1.1), sex (tolerance 1.0, VIF 1.0), education (tolerance 0.9, VIF 1.1), smoking (tolerance 1.0, VIF 1.0) and SOC score (tolerance 1.0, VIF 1.0).

4 | DISCUSSION

The objective of the present study was to investigate the association between the individuals' level of sense of coherence and periodontal disease severity. The key finding was a statistically significant association between the individual's SOC and periodontal disease severity.

In the multivariate analysis, there was a statistically significant association between SOC score and severe periodontal disease at both examinations, 2003 and 2013. The severe group had more clinical signs of disease as they had significantly more PD \geq 4 mm compared to the no/minor and moderate groups. In comparison, Bernabe et al. (2010)⁶ found no correlation between SOC and the extent of periodontal pockets when controlling for diabetes, oral health-related behaviour, and dental plaque. Furthermore, no association between SOC and number of teeth with periodontal pockets could be seen after a four-year follow-up.¹⁷ One Brazilian cross-sectional study showed an association between a lower SOC and perceived worse periodontal health, but no association could be detected when it came to clinical periodontal health outcomes.¹⁶

A systematic review of the relationship between SOC and oral health behaviour concluded that a strong SOC is correlated to positive oral health behaviour, including regular tooth brushing, dental attendance, and daily smoking.¹⁴ Most of the studies in this review examined children, adolescents and/or their caregivers. Other studies have also shown that adults with a strong SOC attend dental care on a more regular basis, compared with individuals with a low SOC.^{9,10,12} They are also more likely to brush their teeth twice a day.^{9,10,13}

When treating periodontitis, an individual's ability to adapt to a high level of oral hygiene is essential to control the disease. The presence of plaque is a weak predictor of severe periodontitis at population level.^{27,28} SOC has been shown to correlate to positive oral health behaviour^{9–14} and should therefore lead to better periodontal health. However, the use of other instruments measuring adaptability and coping may be more relevant when studying the effect of oral health behaviour on periodontitis.

Sense of coherence is correlated to mental health and wellbeing but when it comes to physical health an association is not so clearly shown.²⁵ Galetta et al. (2019)²⁹ found that SOC was associated with mental health in outpatients having chronic diseases. In this study, there was not a direct association between SOC and physical health problems, but their findings supported evidence for an indirect relationship. Holde et al. 2018,³⁰ demonstrated that more social structure (education, income and urbanisation) and higher SOC were

	2003			2013		
	p-value	Odds ratio	95% CI for odds ratio	p-value	Odds ratio	95% CI for odds ratio
Moderate						
Intercept	<0.001			<0.001		
Total SOC	0.009	0.97	0.95–0.99	0.263	0.99	0.97–1.01
Age	<0.001	1.10	1.08–1.12	<0.001	1.08	1.06–1.96
Presently smoking	0.001	3.47	1.67–7.20	0.081	2.19	0.91–5.26
Education at university level	0.349	1.32	0.74–2.35	0.512	1.17	0.73–1.89
Severe						
Intercept	<0.001			<0.001		
Total SOC	0.001	0.95	0.92–0.98	0.008	0.97	0.94–0.99
Age	<0.001	1.13	1.10–1.17	<0.001	1.11	1.08–1.14
Presently smoking	<0.001	13.35	5.41–32.89	<0.001	11.76	4.43–31.19
Education at university level	0.763	1.15	0.47–2.78	0.309	1.47	0.70–3.08

Note: Reference category No/Minor.

related to the individual having more enabling resources, which in turn was associated with more utilisation of dental services. They found that socioeconomic factors and smoking were the main predictors of having periodontitis.

One interesting finding in the present study was that the total SOC score did not differ between the examinations, but there was a statistically significant difference in two of the dimensions, comprehensibility and manageability. Antonovsky assumed that an individual's level of SOC was stable over time and that only major life events could affect it. The SOC score is now known to increase with older age; older individuals report a higher SOC compared to younger individuals.³¹ Nilsson et al. (2003)³² found that SOC was only stable for those with initially high levels of SOC. This is in accordance with a study by Hendriks et al. (2008)³³ who studied the level of SOC in three randomly selected cross-sectional studies, repeated during over a period of ten years in a Swedish population. They found that SOC was relatively stable over time, minor changes were noted, and they interpreted these changes as being related to societal changes during that time. This explanation may also be relevant to the result of the present study.

In the present study, we found that being a smoker was the strongest predictor for belonging to the severe group. Smoking has been shown to be strongly correlated to having periodontitis. Smokers have a higher prevalence of the disease and higher odds of having a more severe form of periodontitis.^{30,34,35} There is also an increased risk of periodontitis progression when smoking.^{36,37}

Smoking is an important factor when it comes to oral health behaviour, as smoking has an impact on oral health as well as general health. Current smokers have a lower mean SOC compared to non-smokers,^{38,39} and having a high SOC is negatively related to daily smoking.^{9,10,14} In the present study, the negative association

TABLE 3 Multinomial logistic regression with periodontal disease severity as dependent variable. Explanatory variables total SOC, age, gender, smoking and education.

between periodontitis severity and the individuals' SOC score must be a weak association.⁴⁰ A strong sense of coherence might have a protective role when it comes to periodontal disease severity. Since the study design is cross-sectional, it is only possible to demonstrate an association between an individual's sense of coherence and periodontal disease experience. Both examinations had the same study design,^{18,41} each with a randomly selected stratified population sample, with individuals living in the City of Jönköping, and there is, therefore, no follow-up. No conclusions can be drawn at the individual level; however, changes over time at the population level can be detected.

The non-responding rate was 35% in 2003 and 40% in 2013, respectively; this is in accordance with other studies from Sweden, Norway and Germany during the same period.^{42–44} The study sample can be regarded as representative when it comes to sex and education. The education at the university level (26.5% in 2003 and 34.7% in 2013) is comparable to the level of the population in the City of Jönköping, where it was 29% in 2003 and 37% in 2013 among 30–74-year-old.⁴⁵ The degree of severe periodontitis is comparable to that in other epidemiologic studies globally.^{19,46}

There are no recommendations regarding the cut-off point when considering a high or low value for SOC. The scale has been used in different ways; in the present study, the total score was used as the primary outcome. The mean sum of the SOC score in the present study was almost equal in 2003 and 2013, 70.4 and 70.6, respectively. The mean SOC scores in the present study are in accordance with those in other Swedish studies.^{33,47}

Our study added knowledge about the association between SOC and periodontal disease severity. SOC is about enabling resources in a healthy direction.⁵ An individual's SOC reflects a person's view of life and by that also the choices they make,⁵

more than the actual clinical measures of disease, i.e., periodontitis. When treating severe periodontitis, a more person-centred approach is important; the person's life context should be considered in clinical practice, with more focus on enabling healthy resources. However, for this approach, more interventional studies are needed.

5 | CONCLUSIONS

Individuals with severe periodontitis had significantly lower SOC compared to subjects who were periodontally healthy or with minor periodontal disease. Changes in two of the dimensions, manageability (lower) and comprehensibility (higher), could be seen between the two examinations. Smoking was the strongest overall predictor of having severe periodontitis.

CLINICAL RELEVANCE

Individuals with a high sense of coherence are considered to have health-promoting behaviour. Contradictory results have been shown in previous studies on SOC and periodontal diseases. In the present study, a potential effect of SOC on the severity of periodontal disease was examined at two different time points. Individuals with severe periodontitis had statistically significantly lower SOC compared to subjects who were periodontally healthy or with moderate periodontal disease. When treating periodontitis, especially stages III and IV, when the patient has difficulties adapting to health-promoting oral health habits, there can be an advantage to adapt the care for individuals having a low SOC.

AUTHOR CONTRIBUTIONS

Åsa Wahlin, Ulrika Lindmark and Ola Norderyd conceived the idea. Ola Norderyd and Ulrika Lindmark collected the data. Åsa Wahlin analysed the data and led the writing.

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CONFLICT OF INTEREST STATEMENT

The authors declare no potential conflicts of interest with respect to the authorship and/or publication of this article.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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REFERENCES

- Hajishengallis G. Immunomicrobial pathogenesis of periodontitis: keystones, pathobionts, and host response. *Trends Immunol.* 2014;35(1):3-11.
- Socransky SS, Haffajee AD, Cugini MA, Smith C, Kent RL Jr. Microbial complexes in subgingival plaque. *J Clin Periodontol.* 1998;25(2):134-144.
- Suvan J, Leira Y, Moreno Sancho FM, Graziani F, Derks J, Tomasi C. Subgingival instrumentation for treatment of periodontitis. A Systematic Review. *J Clin Periodontol.* 2020;47(Suppl. 22):155-175.
- Sanz M, Herrera D, Kepschull M, et al. Treatment of stage I-III periodontitis—the EFP S3 level clinical practice guideline. *J Clin Periodontol.* 2020;47(Suppl 22):4-60.
- Antonovsky A. *Unraveling the Mystery of Health: how People Manage Stress and Stay Well.* Jossey-Bass; 1987.
- Bernabé E, Watt RG, Sheiham A, et al. Sense of coherence and oral health in dentate adults: findings from the Finnish health 2000 survey. *J Clin Periodontol.* 2010;37(11):981-987.
- Bernabé E, Watt RG, Sheiham A, et al. Childhood socioeconomic position, adult sense of coherence and tooth retention. *Community Dent Oral Epidemiol.* 2012;40(1):46-52.
- Lindmark U, Hakeberg M, Hugoson A. Sense of coherence and oral health status in an adult Swedish population. *Acta Odontol Scand.* 2011;69(1):12-20.
- Bernabé E, Kivimäki M, Tsakos G, et al. The relationship among sense of coherence, socio-economic status, and oral health-related behaviours among Finnish dentate adults. *Eur J Oral Sci.* 2009;117(4):413-418.
- Bernabé E, Watt RG, Sheiham A, et al. The influence of sense of coherence on the relationship between childhood socioeconomic status and adult oral health-related behaviours. *Community Dent Oral Epidemiol.* 2009;37(4):357-365.
- Lindmark U, Hakeberg M, Hugoson A. Sense of coherence and its relationship with oral health-related behaviour and knowledge of and attitudes towards oral health. *Community Dent Oral Epidemiol.* 2011;39(6):542-553.
- Savolainen J, Knuutila M, Suominen-Taipale L, et al. A strong sense of coherence promotes regular dental attendance in adults. *Community Dent Health.* 2004;21(4):271-276.
- Savolainen J, Suominen-Taipale A, Uutela A, Aromaa A, Härkänen T, Knuutila M. Sense of coherence associates with oral and general health behaviours. *Community Dent Health.* 2009;26(4):197-203.
- Elyasi M, Abreu LG, Badri P, Saltaji H, Flores-Mir C, Amin M. Impact of sense of coherence on Oral health behaviors: a systematic review. *PLoS One.* 2015;10(8):e0133918.
- Cruz Olivo EA, Corradi-Dias L, Paiva SM, et al. Association between sense of coherence and periodontal outcomes: a systematic review and meta-analysis. *Fam Community Health.* 2021;44(3):225-234.
- Cyrino RM, Costa FO, Cortelli JR, Cortelli SC, Cota LO. Sense of coherence and periodontal health outcomes. *Acta Odontol Scand.* 2016;74(5):368-373.
- Kanhai J, Harrison VE, Suominen AL, Knuutila M, Uutela A, Bernabé E. Sense of coherence and incidence of periodontal disease in adults. *J Clin Periodontol.* 2014;41(8):760-765.
- Norderyd O, Kochi G, Papias A, et al. Oral health of individuals aged 3–80 years in Jönköping, Sweden, during 40 years (1973–2013). I. Review of findings on oral care habits and knowledge of oral health. *Swed Dent J.* 2015;39(2):57-68.

19. Kassebaum NJ, Bernabé E, Dahiya M, Bhandari B, Murray CJ, Marcenes W. Global burden of severe periodontitis in 1990–2010: a systematic review and meta-regression. *J Dent Res*. 2014;93(11):1045-1053.
20. Wahlin A, Papias A, Jansson H, Norderyd O. Secular trends over 40 years of periodontal health and disease in individuals aged 20–80 years in Jonkoping, Sweden: repeated cross-sectional studies. *J Clin Periodontol*. 2018;45(9):1016-1024.
21. Silness J, Loe H. Periodontal disease in pregnancy. II. Correlation between Oral hygiene and periodontal condition. *Acta Odontol Scand*. 1964;22:121-135.
22. Loe H, Silness J. Periodontal disease in pregnancy. I. Prevalence and severity. *Acta Odontol Scand*. 1963;21:533-551.
23. Hugoson A, Jordan T. Frequency distribution of individuals aged 20–70 years according to severity of periodontal disease. *Community Dent Oral Epidemiol*. 1982;10(4):187-192.
24. Langius A, Björvell H, Antonovsky A. The sense of coherence concept and its relation to personality traits in Swedish samples. *Scand J Caring Sci*. 1992;6(3):165-171.
25. Eriksson M, Lindström B. Validity of Antonovsky's sense of coherence scale: a systematic review. *J Epidemiol Community Health*. 2005;59(6):460-466.
26. WMA. World Medical Association (WMA). Declaration of Helsinki - Ethical Principles for Medical Research Involving Human Subjects. Available from: 1964 <https://www.manet/policies-post/wma-declaration-of-helsinki-ethical-principles-for-medical-research-involving-human-subjects/2022>
27. Ismail AI, Morrison EC, Burt BA, Caffesse RG, Kavanagh MT. Natural history of periodontal disease in adults: findings from the Tecumseh periodontal disease study, 1959–87. *J Dent Res*. 1990;69(2):430-435.
28. Petersen PE, Ogawa H. The global burden of periodontal disease: towards integration with chronic disease prevention and control. *Periodontol*. 2000;60(1):15-39.
29. Galletta M, Cherchi M, Cocco A, et al. Sense of coherence and physical health-related quality of life in Italian chronic patients: the mediating role of the mental component. *BMJ Open*. 2019;9(9):e030001.
30. Holde GE, Baker SR, Jönsson B. Periodontitis and quality of life: what is the role of socioeconomic status, sense of coherence, dental service use and oral health practices? An exploratory theory-guided analysis on a Norwegian population. *J Clin Periodontol*. 2018;45(7):768-779.
31. Lindmark U, Stenström U, Gerdin EW, Hugoson A. The distribution of "sense of coherence" among Swedish adults: a quantitative cross-sectional population study. *Scand J Public Health*. 2010;38(1):1-8.
32. Nilsson B, Holmgren L, Stegmayr B, Westman G. Sense of coherence - stability over time and relation to health, disease, and psychosocial changes in a general population: a longitudinal study. *Scand J Public Health*. 2003;31(4):297-304.
33. Hendriks T, Nilsson M, Westman G. Sense of coherence in three cross-sectional studies in northern Sweden 1994, 1999 and 2004 - patterns among men and women. *Scand J Public Health*. 2008;36(4):340-345.
34. Bergström J, Eliasson S, Dock J. A 10-year prospective study of tobacco smoking and periodontal health. *J Periodontol*. 2000;71(8):1338-1347.
35. Bergström J, Eliasson S, Dock J. Exposure to tobacco smoking and periodontal health. *J Clin Periodontol*. 2000;27(1):61-68.
36. Tomar SL, Asma S. Smoking-attributable periodontitis in the United States: findings from NHANES III. National Health and nutrition examination survey. *J Periodontol*. 2000;71(5):743-751.
37. Norderyd O, Hugoson A, Grusovin G. Risk of severe periodontal disease in a Swedish adult population. A longitudinal study. *J Clin Periodontol*. 1999;26(9):608-615.
38. Paulander J, Wennström JL, Axelsson P, Lindhe J. Some risk factors for periodontal bone loss in 50-year-old individuals. A 10-year cohort study. *J Clin Periodontol*. 2004;31(7):489-496.
39. Abrahamsson A, Ejlertsson G. A salutogenic perspective could be of practical relevance for the prevention of smoking amongst pregnant women. *Midwifery*. 2002;18(4):323-331.
40. Chen H, Cohen P, Chen S. How big is a big odds ratio? Interpreting the magnitudes of odds ratios in epidemiological studies. *Commun Stat Simul Comput*. 2010;39(4):860-864.
41. Hugoson A, Koch G, Göthberg C, et al. Oral health of individuals aged 3–80 years in Jönköping, Sweden during 30 years (1973–2003). I. Review of findings on dental care habits and knowledge of oral health. *Swed Dent J*. 2005;29(4):125-138.
42. Edman K, Öhrn K, Nordström B, Holmlund A, Hellberg D. Trends over 30 years in the prevalence and severity of alveolar bone loss and the influence of smoking and socio-economic factors—based on epidemiological surveys in Sweden 1983–2013. *Int J Dent Hyg*. 2015;13(4):283-291.
43. Holde GE, Oscarson N, Tillberg A, Marstrander P, Jönsson B. Methods and background characteristics of the TOHNN study: a population-based study of oral health conditions in northern Norway. *Int J Circumpolar Health*. 2016;75:30169.
44. Holtfreter B, Kocher T, Hoffmann T, Desvarieux M, Micheels W. Prevalence of periodontal disease and treatment demands based on a German dental survey (DMS IV). *J Clin Periodontol*. 2010;37(3):211-219.
45. SCB. SCB statistics Sweden, Population statistics. Available from: 2016 <https://www.scb.se>
46. Bernabé E, Marcenes W, Hernandez CR, et al. Global, regional, and National Levels and trends in burden of Oral conditions from 1990 to 2017: a systematic analysis for the global burden of disease 2017 study. *J Dent Res*. 2020;99(4):362-373.
47. Boman UW, Wennström A, Stenman U, Hakeberg M. Oral health-related quality of life, sense of coherence and dental anxiety: an epidemiological cross-sectional study of middle-aged women. *BMC Oral Health*. 2012;12:14.

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