Original Article

Impact of Sense of Coherence on Oral Health among Steel Plant Employees of Visakhapatnam City: A Cross-sectional Study

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Abstract

Background: Sense of coherence (SOC) measures a person's ability to use currently existing life scenarios to overcome the associated problems and cope with life stressors to lead a healthy lifestyle, free from any disease to stay well. It is the central construct of the salutogenic theory put forth by Aaron Antonovsky. Few studies have examined its impact on Oral Health status and oral hygiene behavior among steel plant employees. Hence, this study was conducted with an aim to assess the SOC and the impact of SOC on oral hygiene behavior and oral hygiene status among steel plant employees of Visakhapatnam city. **Materials and Methods:** A descriptive cross-sectional study was conducted during July–August 2022 among 300 factory employees from their regular shifts in steel factory. Cluster random sampling methodology was used for the selection of employees. The SOC-related data were obtained using short version of Antonovsky's SOC scale. Every item was scored on a Likert scale ranging from 1 to 7. The sum of the scores for SOC was 13–91. A high score indicates a strong SOC. Clinical examination was done for recording oral health status using Oral Hygiene Index-Simplified (OHI-S), dental caries, periodontal status, and oral mucosal lesions were recorded according to the WHO criteria 1997. Data were entered and analyzed using SPSS ver. 22 (SPSS Inc., Chicago, IL, USA). **Results:** Majority of the factory employees who participated in the study had a low SOC (60%). A significant ($P < 0.05$) positive correlation was observed with age (r = 0.1420), socioeconomic status (r = 0.1467), and visit to dentist (r = 0.1912). A nonsignificant negative correlation was observed with habits (r = −0.0681), OHI-S (r = −0.0772), dental caries (r = −0.0874), Community Periodontal Index (r = −0.0642), loss of attachment (r = −0.0650), and oral mucosal lesions (r = −0.0542). **Conclusion:** Strong SOC was associated with increase in age, better socioeconomic status, good habits, increased frequency of dental visits, and a good oral health.

Keywords: Ense of coherence, Oral health status, Steel plant employees.

Introduction

During the last three decades, theoretical approaches have been introduced to the public health literature to explain the importance of social context and its association with biological and psychological determinants of health and illness.[1] It is hypothesized that people with stronger sense of coherence (SOC) can better cope with existing stressors in their social life. A strong association between higher SOC and lower incidence of chronic diseases and better quality of life has been reported in several studies. In the field of oral health, the incidence of chronic diseases such as dental caries and periodontitis is not only related to biological factors but also may be influenced by the SOC concept.[1]

Individuals working in extremely stressful occupations are expected to have a strong SOC to cope up with their work stress. Among the various stressful occupations, industrial work is considered to be one of the extremely stressful jobs. Working conditions such as vibration, noise with high intensity and frequency, irregular work schedules, and long hours; night and weekend shifts may not coincide with their family's spending time. All these components may lead to a state of fatigue and stress.[2]

Hence, considering the above facts, industrial work can be considered a stressful job and workers have to cope up with the stress situations as mentioned above to survive in their professional and are expected to have a strong SOC with better oral health status. To the best of our knowledge, this is the first

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prospective survey to study the impact of SOC on oral health among steel plant workers. Hence, this study was conducted with an aim to assess the SOC and the impact of SOC on oral hygiene behavior and oral hygiene status among steel plant employees of Visakhapatnam city.

Objectives

- To assess the SOC among steel plant employees
- To assess the oral health status using Oral Hygiene Index-Simplified (OHI-S) and dental caries using dentition status index and to assess periodontal index using Community Periodontal Index (CPI) and loss of attachment (LOA) index among steel plant workers
- To correlate the impact of SOC with sociodemographic characteristics and oral health behaviors
- To correlate the impact of SOC on oral health status among steel plant workers.

Materials and Methods

Study design

This was a cross-sectional descriptive epidemiological study.

Study setting

The study was conducted among steel plant employees of Visakhapatnam city, Andhra Pradesh.

Study population

This cross-sectional study was carried out during July and August 2022 among steel plant workers of Visakhapatnam city, Andhra Pradesh. The permission will be obtained from respective authorities prior to the start of the study.

Inclusion criteria

- Industrial workers who are working in steel plant workers were included in the study
- Industrial workers who were willing to participate and who gave informed consent and who were present on that particular day of examination were included in the study.

Exclusion criteria

- Industrial workers who are uncooperative were not included in the study.

Sampling procedure

Before the start of the study, a pilot study was conducted among steel plant workers. Based on the prevalence (54%) of dental caries reported in the pilot study, the sample size was calculated using the formula:

$n = 4PQ/L2$
P = Prevalence of dental caries
L (allowable error) = 5%.
After calculating, the sample size came around 592 per group, which was rounded off to 600.

Calibration of examiners

The investigator was trained and calibrated for data recording before the start of the study. Training was carried on for the examiner till he produced consistent observations. Ten participants were examined and re-examined on successive days. Intra-examiner reliability was evaluated through percent agreement and Cohen's kappa statistics.

Data collection

Data were collected by means of a closed-ended questionnaire.

Questionnaire

The validated SOC 13-item questionnaire was translated into Telugu language and then re-translated into English language and checked for cross-cultural sensitivity. The questionnaire was checked for reliability on 10 participants, and the test–retest result obtained was 0.86 (Cronbach's alpha value) which showed a high agreement.

A specially designed questionnaire was used for data collection. The questionnaire consists of three parts. The first part was used for recording sociodemographic details of the participant and oral hygiene behaviors. The second part of the pro forma was used for recording SOC of participants using validated SOC-13 scale. Finally, the third part was used for recording clinical findings. SOC was measured by a short version of the SOC scale, which consisted of 13 items.

The SOC questionnaire consists of three dimensions: comprehensibility (five items), manageability (four items), and meaningfulness (four items). Every item was scored on a Likert scale ranging from 1 to 7. The sum of the scores for SOC was 13–91. A high score indicates a strong SOC.[3] The SOC scores were categorized as low (20–50), intermediate (51–70), and high (71–88) according to the study conducted by Gottlieb, 1988.[4]

Clinical examination was done for recording oral hygiene status using OHI-S. Dental caries, periodontal status, and oral mucosal lesions were recorded according to the WHO criteria 1997.[5]

Statistical analysis

Data were entered and analyzed using SPSS ver. 22 (SPSS Inc., Chicago, IL, USA). Analysis of variance was used to determine the association between the means of three variables. t-test was used to determine the association between the means of two variables. Pearson's and Spearman's correlation test was used to assess the correlation of SOC scores with sociodemographic characteristics, oral hygiene behaviors, and oral health status of study population.

Study duration

The study duration was 2 months.

Ethical clearance

Ethical approval for the study was obtained from the Institutional Review Board (IEC reference no: ANIDS/IEC/20221019). Written informed consent was taken from study participants prior to the start of the study.

Results

Out of total of 600 respondents, majority of them (39%) were in the age range of 51–55 years and all were male. About 81%

of the study population were from upper middle socioeconomic status and 37% had systemic diseases. Nearly 22% were smokers, 19% were tobacco chewers, and 20% had combined habit. About 41% never visited a dentist, and all of them used toothbrush and toothpaste to clean their teeth once daily.

Table 1 shows the oral hygiene status and periodontal status of the study population. Nearly 27% of the study population had good oral hygiene status. Majority of them (61%) had fair oral hygiene status with a mean OHI-S score of 2.25. The dental caries prevalence among the study population was 86%, with a mean decayed teeth (DT) score of 1.79, indicating high dental caries prevalence among study population. The prevalence of periodontitis was 79.33% with a mean of 4.36 sextants having pocket of 4–5 mm. About 2% of the study population had a LOA and mean of 5.62 sextants having a 0–3 mm LOA. The prevalence of oral mucosal lesions was 5%, with oral submucous fibrosis and lichen planus accounting the prevalence of 3% and 2%, respectively.

Majority of the respondents (60%) had a low SOC, 40% of the study participants had intermediate SOC, and none of the respondents had high SOC (Table 2).

Table 3 shows the comparison of mean SOC based on age groups on study participants. A significant difference was observed between mean scores of SOC based on age groups of study participants (F = 17.7027, $P < 0.05$).

The mean SOC scores increased with increasing age. Participants belonging to 51–55 years of age group had the highest mean SOC (48.22) followed by 46–50 (46.42) years, 41–45 (44.90) years, and 35–40 (37.80) years of age groups.

Table 3 shows the comparison of the overall mean SOC scores with oral health status. The mean SOC was higher in participants with good OHI-S status as compared to fair and poor OHI-S. The association of mean SOC was found to be statistically significant ($P < 0.05$). The participants with dental caries had lower mean SOC compared to participants without dental caries. The association of SOC was found to be nonsignificant ($P > 0.05$). The participants with periodontitis had lower mean SOC when compared to participants without periodontitis. The association of mean SOC was found to be nonsignificant ($P > 0.05$).

Finally, the participants with oral mucosal lesions have lower SOC as compared to their counterparts. The association of mean SOC was found to be statistically significant ($P < 0.05$).

Table 4 shows the correlation of SOC with sociodemographic characteristics, oral hygiene behaviors, and oral health status

Table 1: Oral health status of study population

Dental indices	Mean	SD
OHI-S	2.25	0.98
DMFT	3.23	2.89
	n	*n*%
With periodontitis	476	79.33
With LOA	12	2
With oral mucosal lesions	30	5

SD: Standard deviation, DT: Decayed teeth, DMFT: Decayed, missing, and filled teeth, OHI-S: Oral Hygiene Index-Simplified, LOA: Loss of attachment

Table 2: Sense of coherence levels in the study population

SOC score	*n* (%)
Low (20–50)	360 (60)
Intermediate (51–70)	240 (40)
High (71–88)	0
Total	600 (100)

Table 3: Comparison of the overall mean sense of coherence scores with oral health status

Age groups (years)	Mean		SD
35–40	37.80		11.20
41–45	44.90		11.58
46–50	46.42		9.13
51–55	48.22		11.70
Total	45.02		11.59
P		0.0001*	
OHI-S			
Good	52.75		7.33
Fair	43.54		12.32
Poor	44.93		10.01
P		0.0001*	
With dental caries	45.16		11.76
P		0.4548	
With periodontitis	45.50		11.79
P		0.8361	
With oral mucosal lesions	44.37		2.99
P		0.0001*	

*$P<0.05$, *ANOVA, **t-test. ANOVA: Analysis of variance, SD: Standard deviation, CPI: Corruption Perceptions Index, SOC: Sense of coherence, OHI-S: Oral Hygiene Index-Simplified

Table 4: Correlation of sociodemographic characteristics, oral hygiene behaviors, and oral health status of the study population with sense of coherence scores

Dental indices	r/R	*P*
Age	0.1420#	0.0005*
Socioeconomic status	0.1467#	0.0003*
Habits (smoking and tobacco chewing)	−0.0681#	0.1597
Visit to dentist	0.1912#	0.0001*
OHI-S	−0.0772#	0.0581
DT	−0.0874#	0.1854
CPI	−0.0642##	0.1156
LOA	−0.0650##	0.1109
Oral mucosal lesions	−0.0542##	0.1842

*$P<0.05$ (significant); $P>0.05$ (nonsignificant), ##Spearman's correlation test, #Pearson's correlation test. LOA: Loss of attachment, CPI: Corruption Perceptions Index, OHI-S: Oral Hygiene Index-Simplified, DT: Decayed teeth

of the study population. A significant ($P < 0.05$) positive correlation was observed with age, socioeconomic status, and visit to dentist indicating strong SOC with increasing age, better socioeconomic status, and increased frequency of dental visits. A weak nonsignificant ($P > 0.05$) negative correlation was observed with oral hygiene status, dental caries, CPI, LOA scores, oral mucosal lesions, and good habits, indicating that participants with higher SOC had better good oral health habits, better oral hygiene status, periodontal condition, and fewer decayed component and did not had any mucosal lesions.

Discussion

Antonovsky was confronted with the salutogenic question why some people, regardless of major stressful situations and severe hardships, stay healthy and others do not.

How do people manage the lack of control of their life? The answer was formulated in terms of SOC and general resistance resources. The SOC is a resource that enables people to manage tension, to reflect about their external and internal resources, to identify and mobilize them, to promote effective coping by finding solutions, and to resolve tension in a health-promoting manner. The SOC scale has proved to be psychometrically sound.[6]

SOC has a main, moderating, and mediating effect on health. Findings from cross-sectional studies of Finnish, Swedish, English, and Canadian populations, French students, employees, patients with rheumatic diseases or depressive disorders, and immigrants support a direct or indirect relation between perceived good health and a strong SOC.[7]

The individuals working in extremely stressful occupations are expected to have a strong SOC to cope up with their work stress. Among the various stressful occupations, professional driving is considered to be one of the extremely stressful jobs. Therefore, the present study was designed to investigate the level of SOC and correlation of SOC with sociodemographic characteristics, oral hygiene behaviors, and oral health status among steel plant workers. This study was conducted among 600 professional steel plant workers.

In the present study, we have used SOC-13 item questionnaire which is a short version of SOC 29-item. To the best of our knowledge, this is the first study to access the correlation of SOC with oral health in steel plant workers.

OHI-S, dentition status index, CPI, and LOA index were established measures for the assessment of oral hygiene status, dental caries, and periodontal status in population (WHO).[5] The major advantages are simplicity and international uniformity; therefore, in the present study, these indices were used to determine the oral health status.

In the present study, oral health behaviors were taken into account to know whether SOC influences oral health behaviors among steel plant workers. Interestingly, in our study, all the study participants used toothbrush and toothpaste for cleaning teeth, brushed once daily, and did not use any oral hygiene aids. Since all the participants had similar oral hygiene behavior, it was not possible to correlate the oral hygiene behavior with SOC in the present study.

In the present study, the mean SOC scores increase with increasing age in participants. A significant positive correlation was observed with age indicating high level of SOC with increasing age. Similar findings were reported in a study conducted by Viswanath and Krishna[8] in which SOC scores increased with increasing age. They were able to cope up more effectively tension and external and internal resources, find solutions, and resolve tension in a health-promoting manner.

In the present study, most of the steel plant workers were from upper-middle and lower-middle socioeconomic status. A significant positive correlation was observed between SOC and socioeconomic status indicating high level of SOC with better socioeconomic status. Similar findings were observed in a study conducted by Reddy *et al*.[9] Socioeconomic status is determined by education, occupation, and income of an individual. The participants with better education and who are secured will be able to manage tension from external and internal resources and will be able to resolve tension by coping and finding solution in a health-promoting manner.

In the present study, 22% were smokers, 19% were tobacco chewers, and 20% had combined habit. SOC was negatively correlated with habits, indicating that participants with high level of SOC had good habits. Similarly, a study conducted by Glanz *et al*.[10] and Lindmark *et al*.[11] showed that SOC is strongly associated with ever-smoking participants. On the contrary, a study conducted by John *et al*.[12] showed that majority (76%) of the steel plant workers had smoking habit. Participants with high SOC may be better prepared to cope with peer pressure, less susceptible to advertising appeals, and/or less tempted to experiment with tobacco out of curiosity and rebelliousness.

In the present study, 41% never visited a dentist. A significant positive correlation was observed between SOC and visit to dentist, indicating increasing frequency of dental visits with better SOC. Similarly, a study conducted by Reddy *et al*.[9] reported that there was a positive correlation between SOC and visit to dentist. According to the SOC concept, individuals with higher SOC face their daily life challenges in a manner that they are more manageable and predictable. Therefore, attending routine checkups may be more feasible for these people compared to those with a lower SOC.

In the present study, the mean SOC was higher in participants with good oral hygiene status followed by fair and poor. A nonsignificant negative correlation was observed with OHI-S, indicating that participants with higher SOC had better oral hygiene status. Similarly, studies done by Lindmark *et al*.,[13] Bernabé *et al*.,[14] and Savolainen *et al*.[15] reported that strong SOC is associated with good oral health. In the present study, participants with dental caries had lower mean

SOC when compared to participants without dental caries. A nonsignificant negative correlation was observed with dental caries, indicating that participants with higher SOC had fever DT. Similarly, studies conducted by Bernabé *et al*.[16] and Lindmark *et al*.[11] reported that SOC was related to having fewer DT. The individuals with a high internal locus of control who placed a high value on having their own teeth had less visible plaque and fewer decayed surfaces and root caries surfaces. It means that the participants with high internal locus of control had a strong SOC.[16]

In the present study, the participants with periodontitis had lower mean SOC when compared to participants without periodontitis. A nonsignificant negative correlation was observed with CPI scores, indicating that participants with higher SOC had better periodontal condition. Similarly, a study conducted by Cyrino *et al*.[17] showed that higher SOC scores may be a protective determinant of plaque and periodontal diseases indicating an association between SOC and oral health. In the study, majority of the study participants had LOA <0–3 mm. A nonsignificant negative correlation was observed with LOA scores, indicating that the participants with higher SOC had better periodontal condition. These findings were similar to Reddy *et al*.[9] Similarly, a study conducted by John *et al*.[12] reported that majority of the study participants had LOA <0–3 mm. Most people in the society do not experience gingivitis or periodontitis as stressful situations. It has been advocated that SOC is more often related to psychological symptoms.[17]

In the study, the participants with oral mucosal lesions had lower SOC as compared to the participants without oral mucosal lesions. A nonsignificant negative correlation was observed with oral mucosal lesions, indicating that participants with higher SOC did not have any oral mucosal lesion. As far as the literature available, there is no study done on steel plant workers comparing with oral mucosal lesions.

Conclusion

Majority of the steel plant workers who participated in the study had a low SOC. In the present study, SOC was positively correlated with age, socioeconomic status, and visit to dentist. The overall SOC was negatively correlated with habits, oral hygiene status scores, dental caries prevalence, periodontal status scores, and oral mucosal lesions, which indicates a good oral health in participants with strong SOC.

The present study concluded that the strong SOC was associated with increasing age, better socioeconomic status, good habits, increased frequency of dental visits, and a good oral health.

Limitations

Since all the participants had similar oral hygiene behaviors, it was not possible to correlate the oral hygiene behaviors with SOC. The cross-sectional nature of the study does not permit us to check for causality. Since there are no studies conducted on steel plant workers comparing with clinical parameters, it was not possible to compare oral health status with SOC among steel plant workers.

Recommendations

Since the sample size is small, the study should be done among a large group of populations to know how SOC is related to oral health. The cross-sectional nature of the study does not permit us to check for causality. Hence, longitudinal studies are recommended. To the best of our knowledge, there is limited literature reported on SOC among steel plant workers. Hence, within the limited constraints, comparison was done.

References

1. 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:e0133918.
2. Iva Hanzlikova. Steel Plant Workers: The Sources of Occupational Stress. Accessed details: Available from: https://www.ectri.org/yrs05/papiers/session 4/hanzlikova.pdf [Last accessed on 2015 May 23].
3. Freire MC, Sheiham A, Hardy R. Adolescents' sense of coherence, oral health status, and oral health-related behaviours. Community Dent Oral Epidemiol 2001;29:204-12.
4. Gottlieb A. The Role of Sense of Coherence in Managing Multiple Challenges. Thousand Oaks, California: Saga Publications; 1998. p. 1892-04.
5. World Health Organization. Oral Health Surveys-Basic Methods. 4th ed. New Delhi: A.I.T.B.S. Publishers and Distributors; 1997.
6. Eriksson M. The sense of coherence in the salutogenic model of health. In: The Handbook of Salutogenesis. Cham: Springer; 2017. p. 916.
7. Eriksson M, Lindström B. Antonovsky's sense of coherence scale and the relation with health: A systematic review. J Epidemiol Community Health 2006;60:376-81.
8. Viswanath D, Krishna AV. Correlation between dental anxiety, Sense of Coherence (SOC) and dental caries in school children from Bangalore North: A cross-sectional study. J Indian Soc Pedod Prev Dent 2015;33:15-8.
9. Reddy KS, Doshi D, Kulkarni S, Reddy BS, Reddy MP. Correlation of sense of coherence with oral health behaviors, socioeconomic status, and periodontal status. J Indian Soc Periodontol 2016;20:453-9.
10. Glanz K, Maskarinec G, Carlin L. Ethnicity, sense of coherence, and tobacco use among adolescents. Ann Behav Med 2005;29:192-9.
11. Lindmark U, Hakeberg M, Hugoson A. Sense of coherence and oral health status in an adult Swedish population. Acta Odontol Scand 2011;69:12-20.
12. John JR, Kesavan P, Sridharan P, Rajendran G. Evaluation of oral health status among Steel plant workers in Erode district of Tamil Nadu. J Oral Health Community Dent 2016;10:35-9.
13. 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;38:1-8.
14. Bernabé E, Watt RG, Sheiham A, Suominen-Taipale AL, Nordblad A, Savolainen J, *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;37:357-65.
15. Savolainen J, Suominen-Taipale A, Uutela A, Aromaa A, Härkänen T, Knuuttila M. Sense of coherence associates with oral and general health behaviours. Community Dent Health 2009;26:197-203.
16. Bernabé E, Newton JT, Uutela A, Aromaa A, Suominen AL. Sense of coherence and four-year caries incidence in Finnish adults. Caries Res 2012;46:523-9.
17. Cyrino RM, Costa FO, Cortelli JR, Cortelli SC, Cota LO. Sense of coherence and periodontal health outcomes. Acta Odontol Scand 2016;74:368-73.