

# The role of the mothers' sense of coherence in predicting dental caries risk in children

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**Background:** Individuals with a stronger sense of coherence (SOC) often show healthier behaviors. As parents, especially mothers, are behavioral role models for their children, this study aimed to explore the role of the mothers' SOC in prediction of the risk of dental caries in a sample of children aged 11-12 years old. **Design:** Cross-sectional study with 173 mother-child pairs enrolled by multi-stage sampling from four public schools in Torbat-e-Heydarieh, Iran. The data were obtained, using a demographic-health information sheet and the SOC-13 scale. Dental examinations of children were performed using the decay, missing and filled teeth index for primary (dmft) and permanent teeth (DMFT). Poisson regression analyses estimated the role of the mothers' SOC in predicting the relative risk (RR) of children's dental caries. **Results:** Mean dmft and DMFT were  $3.4 \pm 3.1$  and  $2.7 \pm 2.9$  respectively (medium severity). After controlling for demographic and health variables in regression models, greater maternal SOC indicated a protective effect against dental caries in primary (RR: 0.96; 95% CI: 0.96-0.97) and permanent teeth (RR: 0.96; 95% CI: 0.95-0.97) of their children. **Conclusions:** With greater maternal SOC, the risk of children's dental caries decreased. Whilst this relationship was not as strong as in previous studies in other countries, it can be a platform for further research and perhaps planning to identify children who are at a greater risk of dental caries before starting dental examinations in schools.

**Keywords:** Sense of coherence, dental caries, school children, oral health

## Introduction

Dental caries is a substantial global public health problem. It is the most universal noncommunicable disease (NCD) at high levels in middle-income countries. Reducing the mean number of decayed, missing and filled teeth (DMFT) to less than three in 12-year-old children was one of the important WHO (2000) worldwide goals for oral health in the year 2000. A subsequent WHO European goal was for a 12-year-old DMFT of less than two by 2020 (Peterson, 2003). However, a meta-analysis showed that 72.8% of Iranian children less than 18 years old had caries, with mean dmft / DMFTs of 3.86 and 2.33 respectively (Soltani, 2020). These rates were similar across genders but higher in rural than in urban areas.

Psychosocial determinants of health are important in research and practice. Sense of coherence (SOC) has been recognized as a psychosocial determinant of oral-health status in pre-school children and adolescents (Bonanato *et al.*, 2009; Freire *et al.*, 2001). The SOC is a salutary factor which enables individuals to use resources to cope with stressors and to maintain and improve their health. The SOC concept was derived from Antonovsky's Salutogenic theory. Salus is Latin meaning health, and Genesis is Greek meaning origin; the term defines an orientation focusing on elements that cause human health and well-being (Antonovsky, 1987). SOC is defined as an orientation to life that influences an individual's health and quality of life (Eriksson and Lindström, 2006).

Antonovsky (1987) saw SOC with three core elements: comprehensibility (a belief that things happening in life are logical, predictable and understandable), manageability (a belief that people have the ability and access to necessary resources to take care of things, and that things are manageable and within their control) and meaningfulness (a belief that things are valuable in life and there is a good reason to care about what happens. People with a stronger SOC often show better physical and mental health, preventive habits, and even healthier behaviors for maintaining oral hygiene (Khatri *et al.*, 2014).

A recent review found few studies on the relationship between the mothers' SOC and children's dental caries (Torres *et al.*, 2020). They have been reported in adolescents (Freire *et al.*, 2002, Lage *et al.*, 2017), preschool children (Bonanato *et al.*, 2009, Albino *et al.*, 2014) or junior high school children with various socioeconomic status (Mizu *et al.*, 2020). Their findings inversely correlated mothers' or parents' SOC with dental caries in adolescents and pre-school children, but this relationship was not found in 6-36 months old children (Sá-Pinto *et al.*, 2016). In that study, maternal SOC was only associated with the child's nocturnal oral hygiene. Furthermore, a significant inverse association was found between untreated tooth decay in junior high school children and their guardians' SOC (mother, father and grandmother). This association was stronger in children of lower economic status (Mizuta *et al.*, 2020). Moreover, Kaur and colleagues found that 4-8-year-old children

of mothers with higher SOC, experienced lower dental caries in the primary and permanent teeth (Kaur *et al.*, 2017). We only found one study in northern Iran, on the association between maternal SOC and oral health-related quality of life of preschool children (Taghian *et al.*, 2020). A negative correlation was reported between child dmft and maternal SOC. Appraisal of these studies indicates that they are in different age groups, with very few of 11-12 year old children.

Despite preventive oral and dental health measures in Iran (Khoshnevisan *et al.*, 2018), caries levels in children up to 12 years of age (DMFT=2.9) are still far from the standards of the WHO. Therefore, we investigated the relationship between maternal SOC and child dental caries as a possible avenue to improve child dental health. Thus, the main aim of this study was to explore the role of the mothers' SOC in prediction of dental caries in a sample of children aged 11-12-year old in *Torbat-e Heydarieh* in the North-East of Iran.

## Methods

### Study design

This cross-sectional study with correlational design was part of a larger study with children aged 11-12 years old and their mothers in the city of Torbat-e-Heydarieh. The study was approved by the research ethics committee of the university (ethical code of IR. SBMU. PHNM.1394.183).

The intended sample was 171 pairs of mothers and children, calculated by the sampling formula: ( $Z_{1-\alpha/2} = 1.96$ ,  $Z_{1-\beta} = 0.80$ ,  $\alpha = 0.05$ ,  $\beta = 0.2$ ,  $r = 0.45$ ) using data from a pilot study with 15 students and 15 mothers. Anticipating a 10% dropout rate, the sample size was increased to 188 child and mother dyads (total  $n = 376$ ). Inclusion criteria for children were: being a student aged 11-12 years old in fifth or sixth grade at a public primary school, involvement in the study with their mothers and living with their mothers. Inclusion criteria for mothers were: being able to read and write in Persian and answering the questionnaires. Exclusion criteria for children were: having physical or mental chronic illness or using medications which can influence dental health. Exclusion criteria for mothers were: being unable to approach the mothers to complete the questionnaires or them submitting incomplete questionnaires.

The mother-child pairs were enrolled by multi-stage sampling from four public schools in Torbat-e-Heydarieh. Following the necessary permissions, two girls and two boys' public schools were randomly selected from the list of primary public schools ( $n=70$  girls,  $n=51$  boys). One fifth and one sixth grade class was randomly chosen in each school. The aims of the study were explained to the mother-child pairs, and then an informed written consent form was obtained at a meeting at their school. Around 47 children from each school, and a total of 188 children from the four primary schools were enrolled.

Before the dental examination, the children were asked to brush their teeth. Dental examinations (by HY) were conducted using a flashlight, a disposable dental mirror and a tongue depressor and the results were recorded in a dental examination checklist. The examiner was trained by

a specialist dentist for two weeks and examined 20 other children with the specialist. The level inter-rater reliability between two examiners was satisfactory ( $Kappa=0.90$ ). All examinations were performed during a four-month period.

At the end of the examination, the questionnaires (in closed envelopes) were given to each child to deliver to their mothers at home. The children returned the completed questionnaires to the school nurse or healthcare provider 1 to 3 days later.

Of 188 distributed questionnaires, 173 were returned. Three questionnaires from boys' and 12 from girls' schools were not returned (response rate: 92%). Missing data in the questionnaires was less than 5% and they were treated by the option of the mean replacement in the SPSS version 20 (IBM Corporation, Armonk, NY, USA).

Child demographic and health information (age, gender, tooth brushing, tooth brushing after dinner, using dental floss, visiting a dentist during the last 8 months, toothache during the last week and gum bleeding) was recorded before the dental examination. Maternal demographic and health information collected in the questionnaire included 6 items (age, marital status, educational level, employment status, family monthly income coverage, having dental caries, and visiting a dentist during the last 8 months). Data on SOC were collected with the Sense of Coherence (SOC-13) Scale (Antonovsky, 1987). The validity and reliability of the Persian version of this scale have been confirmed (Rohani *et al.*, 2010). Each question has seven options scored from 1 to 7 (Possible range 13 to 91). Questions 1, 2, 3, 7 and 10 have reverse scores. Higher scores indicate a higher SOC. In this study, internal consistency of the scale was satisfactory ( $\alpha=0.78$ ).

The dental examination was performed according to the WHO (2000) method for oral health surveys. dmft and DMFT scores were calculated (Petersen *et al.*, 2013) and classified in five levels of severity: very low (0-1.1), low (1.2-2.6), moderate (2.7-4.4), high (4.5-6.5) and very high (more than 6.6).

According to the number of the samples and P-P plots, the distribution of the main variables was considered as normal. Pearson and Spearman correlation coefficients were used to examine the relationships between the variables before running the regression models. Poisson regression analyses examined the role of the mothers' SOC (continuous variable) in predicting the dental caries risk in children (count variable). All significant demographic-health variables, were dichotomised, except for child's age (continuous variable). The significance level was considered less than 0.05. SPSS version 20 (IBM Corporation, Armonk, NY, USA) was used to analyze the data.

## Results

The 173 mothers and children had mean ages of 36.9 (s.d. 5.1) and 11.5 (s.d. 0.5) years respectively. Their demographic and health information is summarised in Tables 1 and 2.

The severity of total dental caries of children was medium (Table 3). Mean caries index scores were: girls: dmft= 3.0 (s.d. 2.6) (medium), DMFT=1.8 (s.d. 2.3) (low), and boys: dmft=3.8 (s.d. 3.5) (medium), DMFT=3.4 (s.d. 3.2) (medium).

Mean maternal SOC was 66.92 (s.d. 11.9) (range: 31-87).

**Table 1.** Demographic and health information of 173 mothers.

Variable	%
Marital Status	
Married	92.5
Divorced/Widowed	7.5
Education	
Illiterate	1.2
Primary school	6.4
Secondary school	6.9
High school	8.1
College	41.0
University	36.4
Employment status	
Employed	31.8
Housewife	68.2
Sufficient monthly income	
Yes	76.3
No	23.7
Dental caries	
Yes	44.5
No	55.5
Visiting a dentist during the past 8 months	
Yes	37.0
No	63.0

**Table 2.** Demographic and health information of 173 children.

Variable	%
Gender	
Girl	47.4
Boy	52.6
Tooth brushing after dinner	
Yes	42.2
No	57.8
Tooth brushing	
Yes	63.3
No	36.4
Dental flossing	
Yes	23.1
No	76.9
Visiting a dentist during the past 8 months	
Yes	32.4
No	67.6
Toothache during the last week	
Yes	35.3
No	64.7
Gum bleeding	
Yes	23.1
No	76.9

There were negative moderate correlations between the mothers' SOC and dental caries index (dmft;  $r=-0.50$ ,  $p < 0.01$ ; DMFT,  $r= -0.37$ ,  $p < 0.01$ ). Demographic and health variables significantly correlated with dmft/DMFT (child age, visiting a dentist during the last 8 months, gum bleeding and dental flossing) were entered into the two Poisson regression analyses for predictors of dmft and DMFT (Table 4). After controlling for demographic and health variables, maternal SOC had a protective effect for dental caries in children (dmft and DMFT). In other words, mothers with greater maternal SOC had a lower relative risk (RR) of developing dental caries in primary (higher dmft) and permanent teeth (higher DMFT) of their children, and the caries showed a 4% decrease. Furthermore, the RR of developing permanent dental caries (higher DMFT) in children who were visited by a dentist during the last 8 months, compared to the children who had not been visited, was 11% lower.

**Table 3.** Dental status of primary and permanent teeth in 173 children aged 11-12 years.

Variables	Mean (SD)	Variables	Mean (SD)
<i>Primary teeth</i>		<i>Permanent teeth</i>	
Decayed	2.8 (2.9)	Decayed	2.4 (2.5)
Filled	0.3 (0.8)	Filled	0.3 (0.8)
Missed	0.3 (0.6)	Missed	0.05 (0.2)
dmft	3.4 (3.1)	DMFT	2.7 (2.9)

**Table 4.** Poisson regression analyses for predictors dmft and DMFT in 173 children aged 11-12 years old.

	B Coefficient	Standard Error	RR <sup>1</sup> (95% CI)
<i>dmft</i>			
Gum bleeding (yes, no)	-0.06	0.09	0.94 (0.81-1.19)
Child visited a dentist in the last 8 months (yes, no)	-0.08	0.08	0.91 (0.82-1.40)
Mother's Sense of Coherence	-0.03	<0.01	0.96 (0.96-0.97)
Child age	-0.05	0.08	0.94 (0.90-1.13)
<i>DMFT</i>			
Gum bleeding (yes, no)	-0.16	0.11	0.84 (0.72-1.13)
Child visited a dentist in the last 8 months (yes, no)	-0.11	0.10	0.89 (0.78-0.97)
Child dental flossing (yes, no)	-0.03	0.12	1.03 (0.84-1.35)
Mother's Sense of Coherence	-0.03	<0.01	0.96 (0.95-0.97)
Child age	-0.10	0.09	0.90 (0.75-1.09)

<sup>1</sup>RR: Relative Risk. Significant demographic-clinical variables were entered into the regression models based on the results of the correlation matrix. In dichotomised variables, "yes" is considered as a reference category.

## Discussion

This cross-sectional study explored the role of the mothers' SOC predicting the risk of dental caries in children aged 11-12 years old. Maternal SOC showed a protective role in the prevention of dental caries in the primary and permanent teeth of their children. This relationship is compatible with, though not as strong as in previous studies (Tomazoni, 2019). Factors such as the sample size, age of the children, socio-economic conditions of the family, behavioral oral-dental health outcomes and categorization of the level of the SOC may explain any variations. Therefore, it is suggested that future research is conducted with consistent definitions and controlled for socioeconomic status of the families. Furthermore, our data are consistent with a meta-analysis of the association between SOC and dental caries. Subgroup analysis in that study showed that the level of the mothers' SOC with children or adolescents without dental caries was higher than the level of the SOC in their counterparts with children or adolescents with dental caries (Torres *et al.*, 2020).

Antonovsky (1987) claimed that a high SOC causes individuals to deal better with life events. As a health promoting factor it can assist in improving subjective health and health behaviours and reinforce resilience in individuals (Eriksson and Lindström, 2006). Our findings support the utility of SOC as a psychosocial predictor of dental caries in children. Previous findings have shown that mothers' SOC is related to both objective assessment of oral health and self-reported behaviors, such as tooth brushing, dental flossing, visiting a dentist regularly and healthy eating (Khatri *et al.*, 2014). High maternal SOC may reinforce oral health behaviors in their children, operating as an internal resource to find and utilize appropriate resources within the family and outside. Mothers with a stronger SOC, experience less stress, which may be conveyed to their children's behaviour. Mothers' SOC influences the social development of their children through development of the child's attitudes and behaviors as well as their selection of healthy behaviors (Hosokawa *et al.*, 2017).

Whilst Antonovsky (1987) discussed 'high' and 'low' levels of SOC, he didn't define these terms or describe a gold standard. If we compare our results with earlier studies, the maternal SOC in our study is consistent with studies in Sweden and Finland (Boman *et al.*, 2012, Savolainen *et al.*, 2005), and higher than in Indian women (James *et al.*, 2017). These comparisons corroborate Antonovsky's statement regarding cross-cultural applicability of the concept of SOC (Eriksson and Lindström, 2006). Scores here were higher than in a sample of Iranian women with preschool children and the control group of a study of women with breast cancer (Taghian *et al.*, 2020; Rohani *et al.*, 2015).

Thus, this study provides evidence of the clinical relevance of SOC to dental caries in children in our society. According to the Salutogenic theory and the concept of the SOC, this relationship can be a novel area for clinicians, researchers and school nurses to predict dental caries and other health conditions. Therefore, recording the level of the mothers' SOC is suggested in children's school health profiles. Interventions for increasing the mothers'

SOC remain an area for discussion. Antonovsky (1987) explained that the SOC become stable in adulthood with only small changes after stressful life situations. Although, there is a growing body of evidence about intervention studies within the salutogenic framework (Nammontri *et al.*, 2013), increasing maternal SOC to prevent caries in children has been only suggested in the literature (Elyasi *et al.*, 2015; Torres *et al.*, 2020). The results of this study can also be used to further research and development of behavioural models of oral-dental health for children.

The novelty of the concept of SOC in dental health in Iran and our focus on dental caries in children aged 11-12, are the strengths of our study. At the age of 12 all the permanent teeth, except third molars are likely to have erupted. In the worldwide comparisons, the age of 12 is determined as the specific age of global monitoring of caries in children (Reddy *et al.*, 2017). Longitudinal data would have provided stronger evidence of causation however.

In conclusion, this study suggested a protective role of the mothers' SOC as a psychosocial factor predicting dental caries in their 11-12 year-old children. Mothers with a higher SOC may better understand their children's dental health, better manage it and find available resources in the family and community. Although, the protective effect of the mothers' SOC was not as strong as earlier studies, it can be a platform for further research and possibly planning to identify children who are at a higher risk of dental caries.

## Conflict of interest

The authors declare that they have no conflict of interest.

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