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# Evaluation of Caregivers Sense of Coherence and Its Association with Oral Health Status of Children with Down Syndrome

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**KEYWORDS**

Down Syndrome; Caregivers Sense of Coherence; Oral Health Status.

**ABSTRACT:**

Aim:

Due to altered salivary patterns, craniofacial anomalies, and impaired manual dexterity, those with Down syndrome (DS) tend to be more prone to experience oral health issues. Caregivers' Sense of Coherence (SOC), a psychological component influencing health, may have an impact on the child's dental health. Hence the aim of this study was to evaluate and compare caregivers' SOC and oral health status of children with and without DS in Lucknow city.

Materials and Methods: 208 children (104 DS, 104 controls) aged 8–16 years and their caregivers participated in a cross-sectional, descriptive study. SOC was measured using Antonovsky's SOC-13 scale, and oral health was evaluated using DMFT/dmft, PUFA/pufa, Plaque Index (PI), Gingival Index (GI), malocclusion assessment, and salivary flow rate. Statistical analysis was performed using SPSS (Version 21) with statistical significance set at $p<0.05$.

Results: Children with DS had significantly lower caries prevalence but higher plaque, gingival bleeding, malocclusion, and reduced salivary flow compared to control group ($p<0.001$). Caregivers of DS children showed significantly lower SOC scores (49.5) than controls (59.9). A significant positive association was identified between caregivers' SOC and children's oral

Journal of Chemical Health Risks

www.jchr.org

JCHR (2025) 15(5), 2319-2330 | ISSN:2251-6727

health status.

Conclusion: Caregivers' SOC strongly influences the oral health of children with DS. Interventions to strengthen caregiver SOC may improve both psychosocial well-being and oral health outcomes in this vulnerable population.

Clinical significance: Caregivers' Sense of Coherence (SOC) significantly influences oral health outcomes of children, with maternal SOC acting as a key resource in promoting dental well-being. Integrating the salutogenic framework into interventions may enhance parental SOC and foster healthier family environments for improved pediatric oral health.

**Background:**

Parents face a number of emotional, financial, and physical challenges when raising a kid with a developmental disability.[1] Parents raising children with developmental disabilities often experience reduced subjective well-being and are at greater risk of physical and mental health challenges—including elevated stress levels and clinical depression—compared to parents of children without such conditions.[2] Parents' stress levels can have a big impact on how well they adjust to raising a child with special needs. Among other things, how parents handle stress determines how well they adapt.[3]

Aaron Antonovsky presented his salutogenic theory, known as "Sense of Coherence (SOC)," which holds that people's perspective on life has a good impact on their health. This concept represents a global perspective where individuals view their surroundings as coherent, controllable, and significant. A person's ability to handle stressful events is reflected in the SOC construct.[4] The SOC of the parent before the child is born may shape if the experience is perceived as a risk to the parent's overall health and quality of life. Having a child with disabilities, or the diagnosis of a developmental disability, can be regarded as a significant acute source of stress.[3]

SOC has been identified as a psychosocial element affecting the oral health practices of adults. Compared to those with lower levels of SOC, those with higher levels are more likely to have healthier eating habits, brush their teeth more frequently, and go to regular dental checkups.[4] Young individuals with disabilities seem to have worse oral health than people without disabilities, according to a number of epidemiological studies.[3]

Children with compromised manual dexterity often experience oral hygiene difficulties due to factors such as late eruption of deciduous and permanent teeth, congenitally missing teeth, and the presence of abnormally small teeth. These challenges promote plaque and debris accumulation, increasing the risk of gingival and periodontal disease.[5]

Studies conducted in India are scarce, and little is known regarding the connection between the oral health status of children with DS and the SOC of their caregivers. Therefore, this study was conducted to assess and compare the caregivers SOC and status of oral health in children with and without DS in Lucknow city. This information will assist in identifying the particular requirements of this demographic so that their institutions can develop and implement preventive programs that are tailored to meet those needs.

**Methodology:**

**Study design**:

This observational, cross-sectional study included 208 children (with and without Down syndrome) aged 8–16 years, along with their caregivers, recruited from the Institutes of Special Health Care Needs and the Department of Pediatric and Preventive Dentistry, Sardar Patel Post Graduate Institute of Dental and Medical Sciences, Lucknow, Uttar Pradesh.

**Approval & Ethical Clearance**:

Ethical approval was granted by the Research Advisory Council and the Institutional Ethics Committee (RAC Protocol No.: PEDO/05/222355/RAC, dated 02.04.2023; IEC Protocol No.: PEDO/05/222355/IEC, dated 27.04.2023). In addition, permission to conduct the study was obtained from the Principal of Sardar Patel Post Graduate Institute of Dental and Medical

Journal of Chemical Health Risks

www.jchr.org

JCHR (2025) 15(5), 2319-2330 | ISSN:2251-6727

Sciences, Lucknow. Approval letters from the various institutes of special healthcare needs were also obtained. All participants provided written informed consent at baseline and were assured of confidentiality and anonymity. The study complies with STROBE principles and was carried out in accordance with the Declaration of Helsinki.

**Sample size calculation**:

The sample size estimation was carried out using GPower software (version 3.1.9.7). Based on the chosen parameters, a minimum of 208 participants (104 in each group) was determined to be adequate, assuming an alpha level of 0.05, statistical power of 80%, and an effect size of 0.4.

**Inclusion criteria**:

- Cytogenetic confirmation of trisomy 21.
- Cooperative behavior demonstrated by the selected children.
- Written informed consent provided by the legal guardians.

**Exclusion criteria:**

- Children with serious systemic illnesses.
- Presence of additional coexisting syndromes.
- History of previous orthodontic treatment.
- Children with behavioural changes or intellectual impairments that could make the dental inspection process more difficult.

**Methodology**:

The participants were categorized as:

- Group 1: Children suffering from DS and their caregivers
- Group 2: Healthy children (without DS) and their caregivers (control group)

The study participants and their caregivers were completely instructed about all the information related to the study and was ensured that their participation shall remain confidential and voluntary. Written informed consent was obtained from the caregiver of the patients. On the other hand, the control group i.e. the non-syndromic group was selected from the Outpatient Department from the college.

The present research was carried out in two phases wherein the Phase I involved interviewing and filling of questionnaire by the caregivers, while in phase II, Intraoral clinical examination for assessment of oral health status of children were performed.

**Phase I**:

Data was collected using a questionnaire which included two parts. Part 1 included demographic details of child and caregiver (Date of birth of child, gender, schooling, address, mothers' education and employment). Part 2 included mothers' Sense of Coherence which was evaluated using a questionnaire consisting of 13-items based on the Sense of Coherence scale (SOC-13)[4] wherein there was presence of three domains. The first domain talks about Comprehensibility (2,6,8,9 and 11), the second was Manageability (3,5,10 and 13) and Meaningfulness (1,4,7 and 12) was the third. After recording all the domain, the responses were recorded using a seven-point Likert scale, ranging from 1 (very often) to 7 (never). The domains of the items 1, 2, 3, 7, and 10 comprised of negative words and the score was reversed for these items. The complete total score was supposed to range from 13 to 91, wherein the higher the score indicating a stronger sense of coherence (SOC) level.

**Phase II**:

Intraoral clinical examination was conducted to evaluate child's oral health status which included assessment of dental caries, presence of plaque, gingival bleeding, malocclusion and salivary flow rate. Clinical oral examination was conducted by single trained and calibrated examiner in the chosen institutions with the aid of the following instruments: examination gloves, artificial light source, ordinary mouth mirror, William's periodontal probe and funnel shaped graduated saliva collection tube.

The area for conducting clinical examination was planned and arranged for maximum efficiency and ease of operation, as per the convenience of the centers visited. Clinical examination of children was performed by making them sit on an ordinary chair and position of examiner sitting in front of the chair, pertaining to examine variables. During the study, participants if receiving any kind of problem or discomfort, they had a free hand to leave the study as it was purely voluntary.

The assessment of caries was done using the DMFT/dmft and PUFA/pufa index[6] whereas the gingival

Journal of Chemical Health Risks
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JCHR (2025) 15(5), 2319-2330 | ISSN:2251-6727

health status was evaluated using the Löe and Silness Gingival Index (GI)and the plaque was assessed using the Silness and Löe. Assessment of plaque using Plaque Index and Assessment of gingival bleeding using Gingival Index.[7] A complete orthodontic evaluation (overjet, overbite and crossbite) was performed by the same trained examiner using occlusion criteria by WHO 1997.[8] (figure1) Assessment of Salivary Flow Rate was done by measuring the Unstimulated salivary flow rate of the patient, expressed in mL/min or g/min.[9] The saliva was collected for 5 minutes (figure 2).

**Figure 1 and Figure 2: Assessment of oral health status and salivary flow rate**

**Statistical analysis used**:

Data recorded was mentioned in the Microsoft Excel spreadsheet and any missing values were also checked which was further analysed using SPSS (version 21). The variables which were continuous were summarized under the mean and standard deviation category, whereas the categorical variables were mentioned as percentages following this the graphs were prepared in Excel. The Shapiro–Wilk test was used to assess data normality, and the data were found to be normally distributed. Given the continuous nature and normal distribution of the data, inferential analyses were performed using parametric tests. Inferential statistics were performed using Chi-square test, Independent t Test & Mann Whitney U test. The level of statistical significance was set at 0.05.

**Results:**

A total of 208 subjects (104 in each group) in the age group of 8 to 16 years with a mean age of 11.00 ± 2.414 in Down syndrome group, whereas 11.31 ± 2.509 in Control group were included in the study sample. Among them approximately 60.6% of study subjects in DS group were males while in control group there were approximately 56.7% females.

Table 1 shows the comparison of the dental caries, presence of plaque, gingival bleeding and salivary flow rate among the study groups using the Mann Whitney U test. It showed that all the variables, except presence of plaque and gingival bleeding, were significantly lower among Down syndrome participants than among control group participants.

**Table 1: Comparison of Overall Oral Health Status among the study groups**

| | Group | N | Mean | Std. Deviation | P value |
|---|---|---|---|---|---|
| dmft | Group 1 (Down Syndrome Group) | 104 | 1.05 | 0.840 | **<0.001, S** |
| | Group 2 (Control Group) | 104 | 3.84 | 0.790 | |
| DMFT | Group 1 (Down Syndrome Group) | 104 | 1.22 | 0.763 | **<0.001, S** |
| | Group 2 (Control Group) | 104 | 4.22 | 0.824 | |
| Pufa | Group 1 (Down Syndrome Group) | 104 | .13 | 0.411 | **<0.001, S** |
| | Group 2 (Control Group) | 104 | 3.31 | 0.848 | |
| PUFA | Group 1 (Down Syndrome Group) | 104 | .11 | 0.460 | **<0.001, S** |

Journal of Chemical Health Risks
www.jchr.org
JCHR (2025) 15(5), 2319-2330 | ISSN:2251-6727

| | | | | | |
|---|---|---|---|---|---|
| | Group 2 (Control Group) | 104 | 3.76 | 0.830 | |
| Plaque Index | Group 1 (Down Syndrome Group) | 104 | 2.2018 | 0.20200 | **<0.001, S** |
| | Group 2 (Control Group) | 104 | 1.0913 | 0.45500 | |
| Gingival Index | Group 1 (Down Syndrome Group) | 104 | 2.0510 | 0.20664 | **<0.001, S** |
| | Group 2 (Control Group) | 104 | .9176 | 0.53668 | |
| Salivary Flow Rate | Group 1 (Down Syndrome Group) | 104 | 1.260 | 0.4621 | **<0.001, S** |
| | Group 2 (Control Group) | 104 | 3.000 | 0.0000 | |

Table 2 shows the comparison of malocclusion (Posterior Crossbite) between the study groups. It showed that significantly higher population of Down syndrome participants had increased posterior crossbite as compared to control group participants.

**Table 2: Comparison of the malocclusion (Posterior Crossbite) among the study groups**

| | | | **Posterior Crossbite** | | **Total** |
|---|---|---|---|---|---|
| | | | **Absent** | **Present** | |
| **Group** | Group 1 (Down Syndrome Group) | N | 26 | 78 | 104 |
| | | % | 25.0% | 82.0% | 100.0% |
| | Group 2 (Control Group) | N | 81 | 23 | 104 |
| | | % | 77.9% | 22.1% | 100.0% |
| Total | | N | 107 | 101 | 208 |
| | | % | 51.4% | 48.6% | 100.0% |
| P value | | | **<0.001, S** | | |

Table 3 shows the intergroup comparison of Mean SOC score among caregivers of children with/without DS, done using Mann Whitney U test. It showed that the mean SOC score of caregivers of Down Syndrome participants was found to be significantly lower as compared to caregivers of control group participants.

**Table 3: Intergroup comparison of Mean SOC score of caregivers of children with / without DS**

| | **Group** | **N** | **Mean** | **Std. Deviation** | **P value** |
|---|---|---|---|---|---|
| SOC score | Group 1 (Down Syndrome Group | 104 | 49.5192 | 1.99505 | **<0.001, S** |

Journal of Chemical Health Risks
www.jchr.org
JCHR (2025) 15(5), 2319-2330 | ISSN:2251-6727

| | | | | | |
|---|---|---|---|---|---|
| | Group 2<br>(Control Group) | 104 | 59.9327 | 1.79137 | |

Table 4 shows the association of SOC score with the severity of dental caries in children with DS, which was done using Mann Whitney U test. The mean caregivers SOC score was found to be significantly higher among those children who had dmft score upto 1, as compared to those who had dmft score of 2 or more.

**Table 4: Association of SOC score with the severity of dental caries among children with Down Syndrome**

| **Group 1 (Down Syndrome)** | | | | | |
|---|---|---|---|---|---|
| | **dmft score** | **N** | **Mean** | **Std. Deviation** | **P value** |
| SOC score | 0 – 1 | 70 | 49.5286 | 2.01244 | **0.032, S** |
| | ≥ 2 | 34 | 42.5000 | 1.98860 | |

Table 5 shows the association of SOC score with PI and GI score among children with Down syndrome, which was done using Spearman correlation coefficient. A statistically significant positive correlation was found in the PI & GI with SOC score.

**Table 5: Association of SOC score with PI score & GI score among children with Down syndrome**

| | **Spearman correlation coefficient** | **P value** |
|---|---|---|
| Correlation between SOC score & PI | 0.189 | **0.049, S** |
| Correlation between SOC score & GI | 0.192 | **0.042, S** |

**Discussion:**

Children with long-term physical, cognitive, behavioral, and communication challenges fall within the category of those requiring special healthcare needs (SHCN). Such needs may arise due to intellectual, physical, social, or emotional difficulties. These difficulties can originate from congenital, developmental, acquired medical conditions, injuries, or environmental influences, and may interfere with the ability to perform daily self-care activities or significantly hinder major aspects of life.[10]

According to the World Health Organization (WHO), approximately 10% of individuals in developed countries and about 12% in developing nations live with disabilities or special needs. Since these individuals are more likely to experience long-term physical, developmental, behavioral, or emotional challenges, children with SHCN often require additional healthcare services. They also tend to present with suboptimal general health and negative oral health practices, as supported by epidemiological research.[11]

Trisomy 21, widely known as Down syndrome (DS), is a genetic condition caused by the presence of an extra chromosome on the 21st pair, leading to developmental impairment. This phenotype is linked with immune dysfunction and a proinflammatory state, which reduce the body's ability to fight infections. DS accounts for the majority of hereditary intellectual disabilities, occurring at a frequency of approximately one in every 650 to 1,000 live births. It contributes to 12–15% of learning disabilities in emerging nations.

Journal of Chemical Health Risks
www.jchr.org
JCHR (2025) 15(5), 2319-2330 | ISSN:2251-6727

Trisomy of chromosome 21 constitutes the genetic basis in 95% of cases, while 4% show translocation and about 1% present with mosaicism. In India, the prevalence of Down syndrome is significant due to its large population and high rates of consanguinity, affecting around 21,400 out of 495,000 newborns with congenital anomalies each year.[13,14]

Periodontitis, a long-term inflammatory condition with multiple contributing factors, is linked to an imbalanced microbiota and is characterized by gradual and irreversible damage to periodontal tissues such as the cementum, periodontal ligament, and alveolar bone. Although uncommon in childhood, its prevalence ranges from 0.84% to 26.9%, based on limited reports. Oral health concerns such as dental caries and periodontal disease are common among children with neurodevelopmental disorders, including those with autism spectrum disorder (ASD). Evidence on the frequency of periodontal problem and gingivitis in DS children remains limited and inconsistent.[12] Central growth deficit and mild to severe delayed mental and physical development are hallmarks of Down syndrome. Additionally, issues with hand dexterity may result in poor oral hygiene, which may cause debris and plaque to build up and promote the development of periodontal disease and tooth cavities.[15] In fact, Dow et al.(1951) observed that a considerable proportion of students with Down syndrome in the Polk Lake School cohort presented with periodontitis, a finding that has since been corroborated by other researchers in different cohorts of children and adolescents with DS. Similar findings have now been reported by other writers in various cohorts of DS children and teenagers. Plaque accumulation has been shown to increase periodontal risk in adults and adolescents with DS, but it is still difficult to find a comparable relationship in DS children. These patients may have a particularly upsetting experience with periodontitis, which can result in problems including decreased food intake and an unwillingness to practice proper dental hygiene.[12]

An increasing body of research have demonstrated that young individuals with Down syndrome when compared to healthy controls have craniofacial and dentoalveolar abnormalities, which are restricted to the craniofacial region. The most frequently reported of these are anterior open bite, Angle's class III malocclusions, and posterior crossbite. Most of the existing research has been conducted on human developmental populations. However, given the substantial changes that takes place in the occlusion can result in succedaneous improvements of all the parameters mentioned, data collected from younger population accurately represent the broader DS population after growth and development are complete. Furthermore, the chances and changes in the malocclusion level are known to be influenced by ethnic variables. Hence, the aim of the present research was to assess the prevalence of malaligned teeth in the DS patients when compared to the control group of the same age.[16]

Because they preserve salivary pH, salivary flow rate and buffering capacity are important factors in the structure of oral microbiota. However, the defensive function of saliva on the tooth surface can be diminished in people with DS due to physiological differences in salivary flow rate and its components, which serve as the foundation for colonies of microbial count. The present research assessed the significance, role of salivary flow rate on supporting tissues in DS children, taking into account the influence and correlation between flow rate and buffering capacity on supporting tissue as well as more chances of periodontitis in these subjects beginning at an early age.[17]

Numerous studies have focused on how stressed-out families with impaired children are, how they cope, what supports them, and what coping mechanisms they employ. It is a very personal process to deal with a child who has a physical or intellectual disability, and there is evidence that some families may never fully adapt to this situation. To effectively cope with a circumstance, one must reevaluate it cognitively.[1]

Parental stress in raising such children primarily arises from the chronic nature of the condition, societal and familial disapproval of the child's behavior, and insufficient professional support. Parents are more likely to experience stress when a kid with disabilities is born. It was discovered that women were more stressed than fathers due to their child's poor physical development, behavioral issues, and lack of self-sufficiency.[4]

Antonovsky's (1987) salutogenic theory is a psychological approach that has gained popularity in the past 20 years. Unlike the conventional pathogenic model, this approach adopts a unique perspective. Salutogenesis,

Journal of Chemical Health Risks
www.jchr.org
JCHR (2025) 15(5), 2319-2330 | ISSN:2251-6727

from the Latin roots *saluto* meaning health and *genesis* meaning origin, emphasizes distinguishing disease-risk factors from health-promoting factors. The central element, sense of coherence (SOC), describes how individuals connect health outcomes to life's stressors.[8]

According to the salutogenetic approach, it is impossible to predict the effects of a particular stressor on a person's health without first understanding how that person views the world and themselves. Instead of concentrating on stressors alone, Antonovsky highlighted the role of personality traits in shaping health. Over time, repeated encounters with various stressors foster the development of a strong SOC. Individuals with higher SOC levels tend to recognize the circumstances creating stress as less threatening and demonstrate greater adaptability compared to those with weaker SOC. The person with a strong SOC is likely to appraise a stressor as happier, less contentious, or less dangerous than one with a weak SOC.[9]

The current study revealed that mean dmft and DMFT scores was low in the DS children in contrast to the controls, consistent with several previous investigations. Martins et al.(2022) attributed this finding to delayed tooth eruption and bruxism, which promote self-cleaning, while Silva et al.(2020), Areias et al.(2012) and Cheng et al.(2011) in similar surveys cited dental anomalies such as microdontia, midline diastema and delayed eruption as protective factors contributing to this observation.[18,19,20,21] Al-Habashneh et al.(2012) highlighted dental extractions, which was a frequently employed treatment, responsible for inflating the DMFT values in these children.[5] Areias et al.(2012) and Cheng et al.(2011) further suggested that congenitally missing teeth, spaced dentition and higher salivary pH & bicarbonate levels may help in explaining why the dental caries status was low in these population.[20,21]

Contrasting reports were witnessed by Anusha et al.(2022), Shanmugam et al.(2021), Gufran et al.(2019) and Asokan et al.(2008), who documented higher caries prevalence in DS children. Anusha et al.(2022) and Shanmugam et al.(2021) attributed the increased incidence to inadequate oral hygiene practices, irregular dietary habits, frequent sucrose intake, limited awareness of preventive dental care and lack of fluoridated water, responsible for such findings.[22,23] Gufran et al.(2019) and Asokan et al.(2008) emphasized that manual dexterity difficulties, poor oral hygiene practices, lack of preventive measures and dietary negligence contribute to accelerated plaque accumulation and caries development in the DS children.[15,24]

Our study revealed that the mean PI and GI scores were significantly on higher level in DS children compared to normal children, which was in accordance with the research carried out by Al-Sufyani et al.(2014), Amira et al.(2019), Andreeva et al.(2020), Anusha et al.(2022), and Vergier et al.(2025). Immune dysregulation, together with its interaction with oral microbiota, may underlie the increased gingival inflammation observed in children with DS, as suggested by Vergier et al.(2025). Anusha et al.(2022) and Amira et al.(2019), with similar results suggested that periodontal disease in DS is linked more to a compromised host response than to the presence of specific pathogens, governed the poor periodontal status among them, unlike in healthy children.[12,22,25]

Similar scenario was observed by Andreeva et al. (2020), who discovered that the PI score was much higher among children with Down syndrome when compared to the control group. This was attributed to the fact that in mixed dentition, due to the eruption of permanent teeth, it was normal to have deeper periodontal pockets.[26] Reduced manual dexterity, looseness of joints combined with difficulties in comprehending oral hygiene practices as a result of intellectual challenges among DS children were enlisted as possible reasons by Al-Sufyani et al.(2014) in their survey.[6]

In view of mean unstimulated salivary flow rate, this research revealed low reading in DS children when compared with the counterparts, which is alike previous survey reports. Chandra et al. (2023) observed similar scenario and correlated the reduced salivary flow with the hydration levels and poorer periodontal conditions in DS subjects.[17] Zietek et al.(2015), Franco et al.(2014) and Chaushu et al.(2007) confirmed the pronounced salivary flow reduction, which measured upto 90% decrease in whole saliva secretion compared to controls.[27,28,29]

As per Soham et al.(2016), constant salivary flow plays a critical role in diluting bacterial metabolic products, which is crucial to ensure decreased mutans

Journal of Chemical Health Risks
www.jchr.org
JCHR (2025) 15(5), 2319-2330 | ISSN:2251-6727

streptococci (MS) concentration.[30] Lower number of MS in saliva contributes notably to less prevalence of dental caries in children with DS, notwithstanding the reports of decreased salivary flow.[20] On the other hand, Siqueira et al.(2005) highlighted decreased salivary flow, in conjunction with sugar consumption and motor impairment, which increases caries susceptibility in this population.[31]

The present study revealed that posterior crossbite was significantly more prevalent among DS children (82.0%) compared to healthy controls (22.1%), a finding supported by previous literature. Alessandri-Bonetti et al.(2023) highlighted that DS children who have got adenotonsillar hypertrophy, commonly show obstructive sleep apnea (OSA) and is a major contributing factor to the high prevalence of malocclusion.[32] Similarly, Al-Habashneh et al.(2012) reported open bite in 35.9% of DS children versus 4.9% in controls, attributing this to mid-face hypoplasia that predisposes to narrow maxilla and dental crowding.[5]

In line with these observations, Alkawari et al.(2021) and Ghaith et al.(2019) documented a higher occurrence of Class III malocclusion in DS individuals, largely explained by midfacial underdevelopment and mandibular prognathism. They further noted that mesial step relationships in the primary dentition often progress into Class III malocclusion during molar transition as mandibular growth continues.[33,34] Collectively, these findings underscore the significant burden of malocclusion in DS children, driven by craniofacial growth patterns and airway-related comorbidities.

In the present research, the mothers of DS children had significantly lower mean SOC scores (49.5) in contrast to mothers of normal children (59.9). These findings were similar with the researches carried out by Iyer et al. (2024), Farhadi et al.(2022), Prakash et al.(2019), Shah et al.(2019) and Kurniandini et al.(2018), which collectively highlights that the influence of caregivers' SOC on oral status of child outcomes and caregivers' psychosocial well-being.[35,36,1, 37,38]

Previous evidence demonstrates that higher SOC among guardians is associated with favorable oral health behaviors in children, including reduced sugary drink consumption, greater utilization of dental services and increased toothbrushing frequency.[35,38] Conversely, weaker SOC scores, as observed in guardians of children with Down syndrome or intellectual disabilities, are linked to impaired coping ability and a negative impact on children's oral health practices.[1]

Beyond oral health, maternal SOC plays an important role in psychosocial adjustment. In similar studies done by Farhadi et al.(2022) and Kurniandini et al.(2018), the scientists concluded that mothers with lower SOC are more vulnerable to stress and reduced coping ability.[36,38] Caregivers' SOC is the most crucial factor that shows the influence on oral health, their psychological behavior and stress-coping capacity, particularly those who care for special child. Strengthening social and psychological support systems may therefore be essential in enhancing maternal SOC and, in turn, improving both maternal well-being and child oral health outcomes.[35]

Interestingly, despite the chances of dental caries being lower in DS children as compared to healthy children—a finding consistent with previous reports attributing reduced caries to delayed tooth eruption, congenitally missing teeth, microdontia, and salivary factors by Shyama et al.(2003), Macho et al.(2022)—caregivers of DS children had significantly lower SOC scores than caregivers of healthy controls. This suggests that biological and developmental characteristics may partly protect DS children from caries, but the weaker SOC among caregivers may limit coping abilities and oral health–related practices, resulting in more severe disease when caries does occur.[39,40]

Since, compromised manual dexterity and communication difficulties already predispose these children to periodontal problems, the additional influence of low caregiver SOC further exacerbates their susceptibility. Strengthening caregiver SOC through psychosocial support and tailored oral health education could thus play a crucial role in improving plaque control and gingival health in this vulnerable population.

**Conclusion:**

Drawing from the results, observations, and data analysis, the study yields the following conclusions:

- Dental caries was significantly lower amongst subjects of the study group, when compared to the healthy subjects.

Journal of Chemical Health Risks

www.jchr.org

JCHR (2025) 15(5), 2319-2330 | ISSN:2251-6727

- Presence of plaque and gingival bleeding was significantly higher amongst subjects of the study group, when compared to the healthy subjects.
- Presence of malocclusion was significantly higher amongst subjects of the study group, when compared to the healthy subjects.
- Salivary flow rate was significantly lower amongst subjects of the study group, when compared to the healthy subjects.
- Caregiver's SOC was significantly lower amongst subjects of the study group, in comparison with the healthy subjects. A statistically significant positive correlation existed between the children's oral health status and the caregiver's SOC score.

**Clinical significance:**

Parents' actions play a critical role in shaping the behaviors and habits of their children. As primary role models, caregivers significantly influence children's oral health, and dental caries experience has been shown to be strongly associated with caregivers' sense of coherence (SOC). The family environment is therefore an important factor to consider when developing strategies aimed at promoting or maintaining children's oral health.

A mother's SOC, in particular, can serve as a vital resource that improves children's oral health either directly or indirectly through a positive perception of overall health. This highlights a logical connection between SOC and oral health outcomes. The salutogenic framework, which emphasizes health promotion alongside the learning process, supports this approach. Strengthening mothers' SOC could thus be incorporated into oral health promotion initiatives to create healthier family environments and improve pediatric oral health.

**List of abbreviations:**

- ASD: Autism Spectrum Disorder;
- DMFT/dmft: Decayaed, Missing, Filled Teeth;
- DS: Down Syndrome;
- GI: Gingival Index;
- PI: Plaque Index;
- PUFA/pufa: Pulpal involvement, Ulceration, Fistula and Abscess;
- SHCNs: Special Healthcare Needs;
- SOC: Sense of Coherence;
- SPSS: Statistical Package for Social Sciences;
- WHO: World Health Organization.

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