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Mother's Sense of Coherence and Oral Health of Children and Adolescents With Cerebral Palsy—Matched Cross-Sectional Study

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ABSTRACT

Background: The sense of coherence (SOC) is important for the well-being, especially mothers of children and adolescents with cerebral palsy (CP).

Objective: This study aimed to investigate the relationship between Mother's SOC and oral health status in children/adolescents with and without CP.

Materials and Method: A paired cross-sectional study was conducted with 102 children/adolescents with CP, 102 without CP, and their respective mothers. Participants were aged between 3 and 17 years, matched by sex and age. Antonovsky's SOC questionnaire (SOC-13) was answered by mothers from both groups, characteristics and the oral status of the children were investigated. Clinical type of CP, Gross Motor Function (GMFCS), oral hygiene quality (OHI-S), and dental caries experience (DMFT/dmft) were evaluated.

Results: The CP condition of the children was significantly associated with Mother's SOC ($P < 0.001$). Mothers of children with CP had lower SOC scores (mean: 27.6 [±3.0]) than mothers of children without CP (mean: 30.2 [±7.7]). In the CP group, level IV, V of Gross Motor function was associated with lower mother's SOC scores ($p = 0.001$). In both groups, dental caries experience was associated with lower mother's SOC scores, CP group ($p < 0.001$), without CP group ($p = 0.002$). Regarding the individual characteristics, CP group presented with lower-quality of oral hygiene ($p < 0.001$) and high prevalence of dental caries ($p = 0.001$). Regarding marital status, mothers of CP group were majority single, separated, or divorced ($p < 0.001$), and presented more difficulties in finding a dentist for their child ($p < 0.001$).

Conclusion: Mother's SOC was statistically significantly associated with the presence of dental caries in children/adolescents with and without CP. Mothers of children/adolescents with CP presented with lower values of SOC.

1 | Introduction

Cerebral palsy (CP) encompasses a group of permanent and nonprogressive disorders that affect the developing or infant brain. They are related to movement and posture and result in restrictions in daily activities. CP is the leading cause of physical disability in childhood [1–3], with a worldwide prevalence of 2–4 per 1000 live births [4].

According to clinical types, CP can be classified as spastic, dyskinetic, or ataxic. The spastic type is the most common movement disorder, accounting for 80% of cases [5, 6]. For the assessment of gross motor function, the Gross Motor Function Classification System (GMFCS) is classified into five levels, where Level I represents mild disability and Level V represents severe disability [7, 8]. The ability of self-care in these individuals is impaired due to lack of manual dexterity and/or intellectual disabilities resulting from dysfunction of the upper limbs and gross motor function, thus, maintaining oral hygiene is a challenge [9].

Individuals with CP exhibit suboptimal oral hygiene habits. Risk factors such as excessive consumption of sugary foods, continue use of sugary medications [10], diet, presence of cariogenic bacteria [11], and salivary osmolarity [12] contribute to the increased prevalence of dental caries in this population [13]. Other factors should also be considered, such as socioeconomic status [13], caregiver's level of education, and limited access to dental care procedures [10, 14], making them vulnerable to oral diseases [15, 16] and all these factors can interfere with daily activities, impacting oral health, well-being, and quality of life [17].

Chronic disorders in individuals with CP are managed at home by their caregivers. These tasks are emotionally and physically exhausting [18]. Parents of children with disabilities experience high levels of depression [19], stress, and anxiety [20]. Predominantly, the mother is the primary caregiver [14, 21, 22], responsible for all care, including performing oral hygiene alone and, therefore, facing difficulties. They also encounter challenges with transportation, accessibility, and finding professionals to care for their children [21].

Understanding health from a biopsychosocial perspective, research investigates why some people become ill while others do not suffer any collapse from the same type of event. The sense of coherence (SOC) can assist in this clarification. This tool is the central concept of the Salutogenic Theory, proposed by Antonovsky, which consists of three variables: comprehensibility (the ability to understand an event), manageability (the ability to handle or resolve an event), and meaningfulness (the meaning attributed to this event). The more the individual perceives the world as predictable, manageable, and meaningful, the less likely they are to experience states of anxiety [23–26]. Research associates the mother's SOC with her child's oral health, making it an important psychosocial determinant of oral health status [27–29]. Understanding the relationship between Mother's SOC and oral health in children/adolescents with CP can help promote oral health in this population.

This study aimed to investigate the relationship between Mother's SOC and oral health status in children/adolescents with and without CP. Within that, the hypothesis of the present study was that children/adolescents with CP presented poor oral health and their mothers lower SOC values when compared to a group without CP.

2 | Materials and Methods

2.1 | Ethical Considerations

The study was approved by the Research Ethics Committee of the Cruzeiro do Sul University, São Paulo, Brazil (protocol number: 27030119.5.0000.8084) and by the Research Ethics Committee of the Hospital and Rehabilitation Center of the Association for Assistance to Disabled Children (AADC) (protocol number: 5.621.371). All participants agreed to sign informed consent and assent forms.

This article was written based on the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines [30, 31].

2.2 | Study Design

A paired cross-sectional observational quantitative study was conducted between 2022 and 2023.

2.3 | Population and Sample

The population of this study consisted of a convenience sample of children/adolescents with and without CP. The CP group comprised patients diagnosed with CP and without other neurological conditions. These participants were selected from the AACD and the special patient's clinic of the University of Dentistry Cruzeiro do Sul (Liberdade—SP, Brazil). The group without CP comprised normative patients from the pediatric dentistry clinic of the University Cruzeiro do Sul, in the same district and under the same health practices at the time of data collection, totaling 102 for each group. Data collection took place in a dental care room or clinic at the previously selected institutions, in the dental chair under artificial light. It was carried out solely by the principal researcher over a period of 1 year.

For comparison purposes, the group of children/adolescents without CP did not present any neurocognitive or neuromotor impairment. The groups were matched for sex and age (1:1).

For both groups, the inclusion criteria were children/adolescents with age between 3 and 17 years, mothers and children/adolescents who agreed to participate in the study, and those participants that signed the Informed Consent and the Assent Forms. The exclusion criteria were individuals wearing orthodontic appliances, due to the likely bias of only those with good oral conditions being eligible for treatment [32], or those who had used antibiotics in the last month, due to the possible bias of alterations in periodontal inflammation and oral microbiota composition [33], those unable to answer

the questionnaire, or those who did not allow the clinical examination.

2.4 | Calibration

Before the start of the research, a calibration process was conducted, consisting of theoretical and clinical phases. Initially, the researcher involved in data collection conducted a detailed review of the diagnostic and clinical criteria to be used. Subsequently, theoretical training was provided using figures and slides. This phase occurred in two sessions, with a 7-day interval between meetings. In the second stage, practical calibration of the examiner took place, following the gold standard diagnosis (a specialist in Pediatric Dentistry—NCRC, with experience in epidemiological studies) and with a 7-day interval between the two moments of the clinical examination [34]. Calibration occurred randomly according to the scheduling of patients seen at the Dentistry clinic of AACD and Cruzeiro do Sul University who agreed to participate in the research, totaling ten patients. Based on the obtained Kappa (0.70–1.0), it was verified that the examiner was trained to conduct data collection [35].

2.5 | Data Collection

Measurable data were collected through oral examinations of children/adolescents with and without CP, and through questionnaires administered to their respective mothers.

2.5.1 | Oral Clinical Data

Oral clinical examinations were conducted under artificial light (Sirus Sensor Reflector 5 LEDs Gnatus, Brazil). The examiner used appropriate personal protective equipment, mouth mirrors (Duflex No. 5), manually crafted wooden mouth openers, community periodontal index probe (Golgran, São Paulo, SP, Brazil), and disposable gauze. They were used to assess:

1. Caries experience, using the DMFT and dmft index, according to the WHO Oral Health Surveys manual (number of teeth with cavitated caries lesion [36].
2. Quality of oral hygiene assessed using the Simplified Oral Hygiene Index (OHI-S) [37]. For the permanent dentition, the labial surfaces of the upper right (tooth 11) and the lower left central incisors (tooth 31) were examined. The buccal surfaces of the first permanent upper molars (teeth 16 and 26) and the lingual surfaces of the first permanent lower molars (teeth 36 and 46) were inspected. While for deciduous teeth, a modified version of the OHI-S has been addressed [38]. The upper right second deciduous molar (tooth 55), the upper right central deciduous incisor (tooth 51), the upper left second deciduous molar (tooth 65), the lower right second deciduous molar (tooth 85), the lower left central deciduous incisor (tooth 71), and the lower left second deciduous molar (tooth 75) were examined. Participants were classified as having unsatisfactory oral hygiene according to the presence of plaque (score >1).

2.5.2 | General Clinical Data

The general clinical data were collected by the evaluator using standardized and validated instruments. They served to evaluate:

1. Neuromotor impairment of children/adolescents with CP, considering clinical topography, according to the classification of hemiplegia, diplegia, or tetraplegia [5, 6].
2. Motor function of children/adolescents with CP, according to the GMFCS [7, 8].

2.5.3 | Nonclinical Data

Two questionnaires were administered to the mothers for the collection of nonclinical data. The first questionnaire was structured and addressed socioeconomic, individual, and behavioral issues related to their children.

The second instrument assessed Maternal SOC, adapted and used by various authors [28, 29, 39]. Mother's SOC was obtained through a validated questionnaire in Brazil in a short version (SOC-13), consisting of 13 items, with each item offering 5 response options. The total score ranges from 13 to 65 points. Each question is scored with a score that is summed up at the end. The higher the score, the higher the SOC (greater ability to cope with stressful situations, leading to improved health and well-being), [23, 25, 40].

2.6 | Statistical Analysis

The data were analyzed using the Statistical Package for Social Sciences (SPSS for Windows, version 26.0, SPSS IBM Corp., Armonk, NY, USA). Univariate and bivariate analyses were conducted ($p < 0.005$). The parametric paired *t*-test was used to describe the relationship between the presence of CP and SOC. The nonparametric Kruskal–Wallis test was used to identify the association between the type of CP and Mother's SOC. The nonparametric Chi-square (χ^2) association test was used to identify the association between CP Motor Classification and Mother's SOC. Parametric *t*-test and nonparametric Mann–Whitney test were used to determine associations between Mother's SOC and other questionnaire variables, as well as clinical outcome variables. The primary outcome variable was the oral health of children/adolescents with CP, measured by dental caries and oral hygiene. The secondary outcomes were the GROSS Motor Function, the type of CP, difficulty finding a dentist for the child, and marital status.

3 | Results

3.1 | Characteristics of Study Participants

From a sample of 208 participants, there was a loss of 4 participants. The reasons were the lack of signature on the Informed Consent Form, refusal to undergo clinical examination, and inability to understand the questionnaire ques-

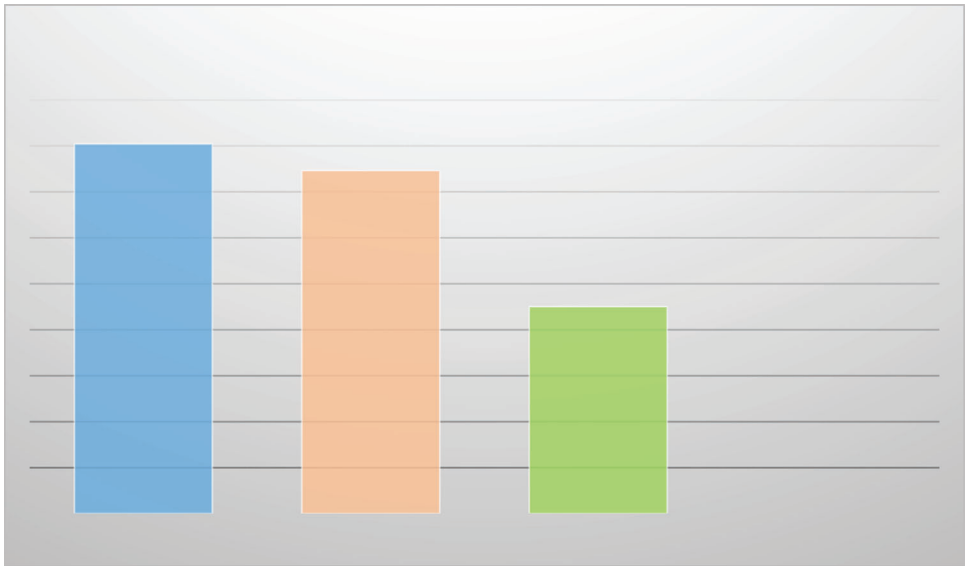
TABLE 1 | Distribution of the sample according to sociodemographic, individual, and clinical characteristics ($n = 204$).

Sample characteristics	Group		Total *n* (100.0%)	*p*[a] value	Odds ratio (CI)[b]
	With CP *n* (%)	Without CP *n* (%)			
Children/adolescents					
Sex					
Female	51(50.0)	51 (50.0)	102	1.000	1
Male	51(50.0)	51 (50.0)	102		1
Age (years)					
3–12	73(50.0)	73 (50.0)	102	1.000	1
13–17	29(50.0)	29 (50.0)	102		1
Quality of oral hygiene					
Poor	30(93.8)	2 (6.3)	32	**< 0.001**	**2.24 (1.83–2.72)**
Satisfactory/Regular	72(41.9)	100 (58.1)	172		**1**
Dental caries					
Present	29 (74.4)	10 (25.6)	39	**0.001**	**1.68 (1.30–2.16)**
Absent	73 (44.2)	92 (55.8)	165		**1**
Mothers					
Age (years)					
21–40	62 (61.0)	65 (64.0)	102	0.772	1.16 (0.67–2.36)
41–76	40 (39.0)	37 (36.0)	102		1
Education (years)					
< 8 anos	18 (52.9)	16 (47.1)	34	0.707	1.07 (0.75–1.52)
≥ 8 anos	84 (49.4)	86 (50.6)	170		1
Marital status					
Single, separated, or divorced	71 (61.7)	44 (38.3)	115	**< 0.001**	**1.89 (1.35–2.65)**
With partner	28 (32.6)	58 (67.4)	86		**1**
Difficulty finding a dentist for the child					
yes	59 (98.3)	1 (1.7)	60	**< 0.001**	**3.16 (2.14–4.14)**
No	37 (31.1)	82 (68.9)	119		**1**

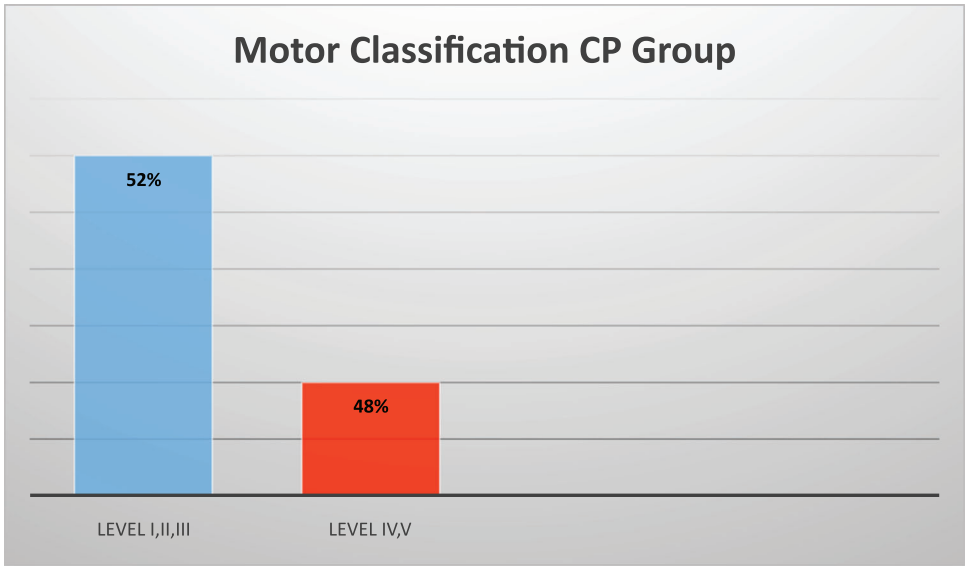
[a]X^2 Test (5% significance level).
[b]CI-Confidence Interval.

tions. Thereby, the final sample comprised 204 participants (102 with CP and 102 typically developing), along with their respective mothers. The mean age of the children/adolescents was 9.5 years (±4.5/median: 9.0 years). Regarding the mothers, the mean age among them was 38.3 years (±8.2/median: 38.0 years).

Table 1 displays the sociodemographic characteristics of the sample. Comparison between the groups with and without CP showed a significant association between oral hygiene ($p < 0.001$) and caries lesion ($p = 0.001$). A child/adolescent identified with poor/deficient oral hygiene was approximately two times more likely to belong to the CP group (OR 2.24; CI: 1.83–2.72). The likelihood of a participant diagnosed with dental caries belonging to the CP group was 1.68 times higher (CI: 1.30–2.16). Additionally, concerning the mothers, the assessment between the two groups revealed a statistical association between marital status ($p < 0.001$) and difficulty in finding a dentist for their child ($p < 0.001$). When comparing mothers from both groups, the chance of a mother of a child/adolescent with CP stating not having a partner (being single, separated, divorced, or widowed) was nearly twice as high (OR 1.89; CI: 1.35–2.65). The mother who reported difficulty in finding a dentist to attend to their child has a 3.16 times higher chance of belong to the group of children/adolescents with CP (CI: 2.14–4.14).



GRAPH 1 | Distribution of the sample according to the clinical type of CP ($n = 102$).



GRAPH 2 | Distribution of the sample according to the motor function of children and adolescents with CP ($n = 102$).

Considering the topographical classification of CP, the most frequent clinical type was Diplegia (40.2%/n = 41), followed by Tetraplegia (37.3%/n = 38) and Hemiplegia (22.5%/n = 23) (Graph 1).

Graph 2 shows the distribution of the CP group regarding the GMFCS of children and adolescents with CP.

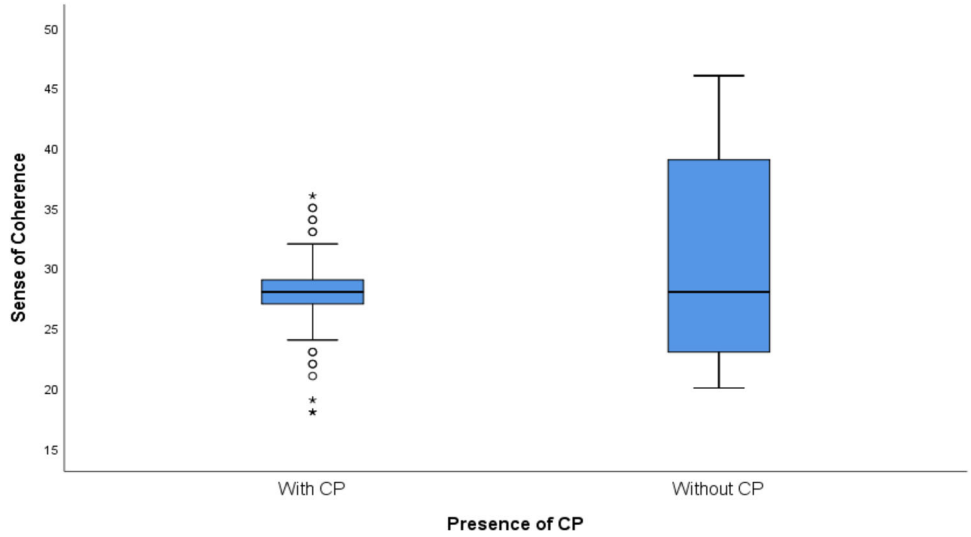
3.2 | Mother's SOC Scores

Mother's SOC scores ranged from 18 to 46 (mean: 28.9 ± 5.9; median: 28.0). Bivariate analysis showed that having CP or not was statistically associated with Mother's SOC values (Graph 3). Mothers of children/adolescents with CP had lower SOC values (mean: 27.6 [+3.0]/median: 28.0), compared to mothers of children/adolescents without CP (mean: 30.2 [+7.7]/median: 28.0], ($p < 0.001$).

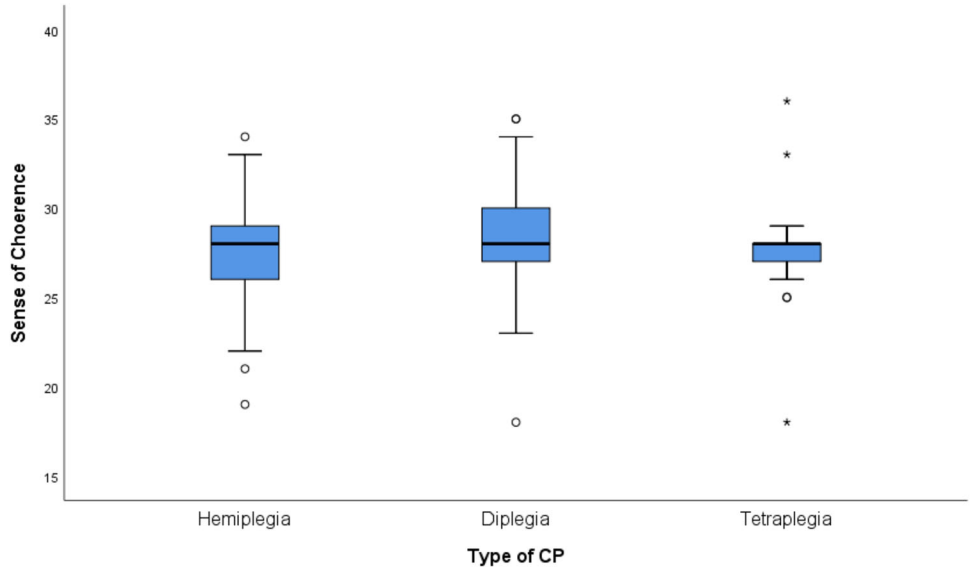
There was no statistically significant association between the type of CP and Mother's SOC ($p = 0.669$). (hemiplegia [$N = 23$; mean: 26.9 +3.5]/diplegia [$N = 41$; mean: 28.0 +3.2]/tetraplegia [$N = 38$; mean: 27.5 +2.4]), (Graph 4).

Table 2 describes the association between the motor function (GMFCS) of children/adolescents with CP and Mother's SOC. SOC values were lower in the group of mothers with children identified with motor function level IV or V (24.2 [+2.6]) than for children/adolescents classified with motor function level I, II, or III (28.0 [+3.4]), ($p < 0.001$).

Table 3 describes the association between the caries experience of children/adolescents with CP and Mother's SOC. SOC values



GRAPH 3 | Distribution of the sample from groups with and without CP and Mother's SOC ($n = 204$). Paired t-test: $p < 0.001$.



GRAPH 4 | Distribution of the sample according to the clinical type of CP in children/adolescents and Mother's SOC ($n = 102$). Kruskal-Walli's test: $p = 0.669$.

TABLE 2 | Mother's SOC result and the motor function (GMFCS) of the children/adolescents with CP ($n = 102$).

	N	Mean (SD)	Standard error	*p* value[a]
Motor function (GMFCS)				
Level IV, V	49	24.2 (±2.6)	0.3	**< 0.001**
Level I, II, III	53	28.0 (±3.4)	0.5	

[a]Mann–Whitney Test.

were lower in the group of mothers with children identified with caries experience (26.7 [+2.1]) than for children/adolescents identified without caries experience (28.8 [+3.7]), ($p < 0.001$).

Table 4 also shows the statistically significant association between the caries experience of children/adolescents without CP and Mother's SOC. Mother's SOC values were lower among children/adolescents with caries experience (29.5 [+7.9]) compared to those identified without caries experience (32.8 [+6.2]), ($p < 0.002$).

4 | Discussion

The results of the present study showed a statistical association between mother´s SOC of children/adolescents with and without

TABLE 3 | Mother's SOC result and outcome variables of individuals with CP ($n = 102$).

	N	Mean (SD)	Standard error	*p* value
Mother's age (years)				
21–38	55	27.7 (±2.7)	0.3	0.748[a]
39–76	47	27.5 (±3.4)	0.5	
Mother's education				
< 8 years of study	18	28.5 (±3.6)	0.8	0.156
≥ 8 years of study	84	27.4 (±2.9)	0.3	
Mother's marital status				
Single, separated, or divorced	71	27.7 (±3.1)	0.3	0.723[a]
With partner	28	27.9 (±2.1)	0.4	
Difficulty finding a dentist for the child				
Yes	59	27.7 (±3.1)	0.4	0.505[a]
No	37	27.3 (±3.0)	0.5	
Oral hygiene				
Unsatisfactory	30	27.4 (±2.1)	0.3	0.860[b]
Satisfactory	72	27.6 (±3.4)	0.4	
Caries experience of the child/adolescent (DMFT/dmft)				
≥ 1	61	26.7 (±2.1)	0.2	**<0.001**[a]
Zero	41	28.8 (±3.7)	0.6	

[a]*t*-test.
[b]Mann–Whitney.

CP and dental caries, measured by DMFT/dmft. Also, mothers of children/adolescents with CP presented with lower SOC values compared with the group without CP. The literature regarding Mother's SOC and oral health status of children/adolescents with CP is scarce. However, studies involving children with and without other special needs have demonstrated the importance of Mother's SOC for maternal well-being, as it is linked to how they cope with stressful situations, thereby keeping their children healthy [27–29].

Regarding caries experience, the results presented herein showed that having caries experience is associated with a lower mother's SOC for both groups. This is in accordance with previous studies carried out with children with and without disabilities [29, 41, 42]. The literature suggests that a strong SOC in mothers is associated with better health outcomes in their children, including oral health. Mothers with a high SOC are more likely to engage in positive health behaviors, such as maintaining regular dental visits, promoting healthy eating habits, and practicing proper oral hygiene routines. These behaviors can significantly reduce the risk of dental caries in their children. On the other hand, mothers with a lower SOC may experience higher levels of stress and struggle to implement preventive health practices, potentially leading to an increased likelihood of dental caries in their children.

In the present study children/adolescents with CP presented with poor quality oral hygiene and higher prevalence of dental caries when compared with the group without CP. The literature has already stated that this can occur due to the specificities involved in the CP disease, such as altered muscle tone, involuntary movements, motor coordination, and behavioral changes (non-compliance). These are significant factors that interfere with their daily abilities, including performing oral hygiene [9]. Regarding dental caries, the result of the present study corroborates with the previously published literature [43]. A study conducted with preschool children concluded that nine out of ten children with CP experienced dental caries. They attributed this result to high carbohydrate consumption and low brushing frequency [43].

Mothers of children/adolescents with CP have also reported more difficulty in finding a dentist who can attend their children when compared with the group without CP. The literature states that this may be due to some barriers to accessing the services provided by these professionals, such as difficulty in communication, professional empathy, architectural, and instrumental barriers, among others [44] Another result that is important to highlight is that most CP mothers reported that they are single, separated, divorced, or widowed. The birth of a child with special needs alters the psychological development of the family, their independence, and overall satisfaction level. This frustration influences

TABLE 4 | Mother's SOC outcome and variables of individuals without CP ($n = 102$).

	N	Mean (SD)	Standard error	*p* value
Mother's age (years)				
21–38	51	30.1 (±7.5)	1.0	0.858[a]
39–76	51	30.3 (±7.8)	1.1	
Mother's education				
< 8 years of study	16	30.1 (±8.6)	2.1	0.979[a]
≥ 8 years of study	86	30.2 (±7.5)	0.8	
Mother's marital status				
Single, separated, or divorced	44	29.8 (±7.6)	1.1	0.655[a]
With partner	58	30.5 (±7.7)	1.0	
Difficulty finding a dentist for the child				
yes	4	25.5 (±5.1)	2.5	0.231[b]
No	79	30.7 (±7.8)	0.8	
Oral hygiene				
Unsatisfactory	2	29.5 (±10.6)	7.5	0.892[a]
Satisfactory	100	30.2 (±7.7)	0.7	
Caries experience (DMFT/dmft)				
≥ 1	22	29.5 (±7.9)	0.8	**0.002**[b]
Zero	80	32.8 (±6.2)	1.3	

[a] *t*-test.
[b] Mann–Whitney.

marital dissatisfaction and quality. Divorce is directly linked to marital dissatisfaction [45]. This can lead to an overload of care for disabled children on mothers, who end up having custody of their children.

The results of the present study also showed that Mother's SOC values were lower among mothers of children/adolescents with CP compared with the group without CP. This is possibly due to the workload, high demand for daily care, and lack of assistance in task division, with oral health taking a back seat. The literature highlights that SOC is considered a significant factor in how people cope with stressful situations. A positive and optimistic view of life is commonly characteristic of a person with a strong SOC, who handles situations better, which in turn reflects in better preventive health habits [46]. Several studies establish the relationship between Mother's SOC and oral health [27–29]. As mothers are, predominantly responsible for the general care of their children with CP, it is important that they receive psychological assistance in order to strengthen their perceptions and ways of dealing with life and daily routines. [14, 21–22]

Considering only the CP group, the average SOC of mothers was lower among those whose children presented with higher GMFCS levels (IV and V). This can be explained by the fact that individuals with more severe impairments are affected by greater abnormalities and require more healthcare, impacting the psychological state of their primary caregiver. There is a relationship observed between the child's gross motor function, maternal stress, self-control, and depression, suggesting rehabilitation interventions to improve or maintain children's functionality levels or to increase maternal self-control levels [47]. Data from a systematic review and meta-analysis demonstrated that interventions to improve the psychological well-being of parents of children with CP were effective [48].

On the other hand, the type of CP was not statistically associated with mothers SOC values. After receiving the diagnosis of having a child with some type of disabilities, parents enhance a process of fear parallel to the process of changing the dynamics and routine of daily life. Then, it culminates in the subsequent acceptance and structuring of an adapted family routine [49]. This may be the reason why this result did not present with a significant statistical association. The severity of the disease presents a greater impact on mothers than the type of the disease, as their child will require more constant care and therapies.

Some limitations of this study should be considered. The population belongs to the same district, which does not represent a suitable cross-sectional cut of this community, and the nonrandom sampling type. Also, a convenience sample

of children/adolescents with CP was chosen considering the specificity of the group. However, a comparison group without CP, matched by sex and age, was included to minimize possible influence of these characteristics on the association between the dependent and independent variables.

Understanding the relationship between maternal SOC and oral health in children/adolescents with CP can help promote oral health in this population.

5 | Conclusions

Mothers of children/adolescents with CP had lower SOC values. Furthermore, lower mother's SOC was associated with the presence of dental caries in children/adolescents with and without CP. Considering only the CP group, the mother's SOC was lower among those whose children had higher GMFCS levels. A multidisciplinary approach to actions to improve SOC in mothers should be the objective of policies to promote oral health and quality of life.

Acknowledgments

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Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

Data sharing is not applicable to this article as no datasets were generated or analyzed during the current study.

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