BIOSCIENCE JOURNAL

IMPACT OF THE SENSE OF COHERENCE, STRESS, AND TMD SYMPTOMS ON THE ORAL HEALTH-RELATED QUALITY OF LIFE OF ADULT WOMEN

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How to cite: FIGUEREDO, J.F., et al. Impact of the sense of coherence, stress, and TMD symptoms on the oral health-related quality of life of adult women. *Bioscience Journal*. 2024, **40**, e40056. https://doi.org/10.14393/BJ-v40n0a2024-75120

Abstract
The objective was to evaluate how the sense of coherence works in perceiving the impact on women's oral health-related quality of life (OHRQoL) and its association with temporomandibular disorder (TMD) symptoms and perceived stress. This cross-sectional study with 314 adult women (mean age 27 years) assessed the effect on OHRQoL using the Oral Health Impact Profile (OHIP-14). This questionnaire, recommended by the American Academy of Orofacial Pain, assessed TMD symptoms, and the SOC-13 scale analyzed the sense of coherence. The Perceived Stress Scale (PSS-10) evaluated perceived stress. The analyses used descriptive statistics and multiple logistic regression ($p<0.05$). The findings showed significant associations, such as a higher impact on physical pain and social disadvantage in women over 27 years old. OHRQoL was more affected in women over 27 years with a low sense of coherence, TMD symptoms, and perceived stress.

Keywords: Adult. Quality of life. Sense of coherence. TMJ disorders.

1. Introduction

Individuals with temporomandibular disorder (TMD) symptoms usually present pain and more significant somatic and psychological involvement (Schiffman et al. 2014; Kmeid et al. 2020; Filho et al. 2020). The most frequent TMD signs and symptoms are restricted mandibular movements, pain in the pre-auricular region, headache, otalgia, asymmetries, limited mouth opening, joint noises, and muscle fatigue (Lemos et al. 2015; Gomes et al. 2018; Filho et al. 2020; Emodi-Perlman et al. 2020). TMD implications may significantly affect essential functions, such as speech and mastication, increasing the risk of probable cognitive dysfunction and inadequate nutrition (Manfredini et al. 2009; Luz et al. 2019).

Hence, the sense of coherence may help understand an individual's ability to adapt to stressful situations (Watt, 2002; Lima et al. 2021). The literature emphasizes the importance of exploring the correlations between health, stress, and coping (Bäck et al. 2020; Lima et al. 2021) to assess the individual's ability to use existing resources to overcome and cope with stressful conditions and maintain well-being (Bäck et al. 2020).

Pain from TMD symptoms limits daily functions and activities, harming oral health-related quality of life (OHRQoL) (Blanco-Aguilera et al. 2017; Grossi et al. 2018; Filho et al. 2020). The symptoms manifest more

frequently in young and middle-aged individuals. Also, women, due to sexual hormones and hormonal issues mainly during the reproductive age, have a moderating potential of the pain threshold (Warren and Fried, 2001; Macfarlane et al. 2009; Bereiter and Okamoto, 2011; Ferreira et al. 2016; Filho et al. 2020).

Considering that women may be more susceptible to pain and that a certain pain level is necessary to seek professional care, we suggest that the differences in TMD prevalence between sexes may be partially due to the painful sensation (Lai et al. 2020). This perspective reinforces that women are more likely to report TMD symptoms during clinical investigations, well documented in populations worldwide (Pedroni et al. 2003; Progiante et al. 2015; Ferreira et al. 2016). A recent systematic review confirmed a higher rate of women with TMD symptoms (37.0%) than men (29.3%) across 11 studies using the RDC/TMD or DC/TMD as a diagnostic tool to measure the prevalence of these symptoms (Melo et al. 2023).

This context justifies the need to understand the influence of TMD symptoms and the sense of coherence on women's OHRQoL from an epidemiological perspective. Thus, this study hypothesized that a low sense of coherence may harm OHRQoL perception in women with TMD symptoms. It aimed to evaluate how the sense of coherence works in perceiving the impact on women's OHRQoL and its association with TMD symptoms and perceived stress.

2. Material and Methods

Study design

This cross-sectional study was approved by the Human Research Ethics Committee (#63496822.0.0000.5385) and performed according to the STROBE statement (von Elm et al. 2008). The research question was: Did the sense of coherence help women with TMD and stress perceive OHRQoL? The present study answered this question by evaluating the influence of the sense of coherence, TMD symptoms, and perceived stress on the OHRQoL of adult women.

Sample characterization

The study was conducted in Brazil from August to December 2022, including a sample of adult women enrolled in undergraduate courses at the Hermínio Ometto Foundation (Araras, São Paulo, Brazil). The sample size calculation considered the prevalence of TMD symptoms (37%) (Luz et al. 2019) at a 5% significance level, 80% test power, and a 2.0 minimum detectable odds ratio.

Eligibility criteria

The study included women over 18 years old without a history of head and neck surgeries and/or tumors. Those who did not completely respond to the questionnaire and were younger than 18 were excluded.

According to the snowball method, participants were contacted via social media, e-mail addresses, and WhatsApp numbers. They were invited to respond to previously validated questionnaires (OHRQoL, TMD symptoms, sense of coherence, and perceived stress) through an electronic form on the Google Forms platform.

Study variables

All questionnaires were self-administered, considering OHRQoL and its respective domains as outcome variables, while age, TMD symptoms, sense of coherence, and perceived stress were independent variables.

The Oral Health Impact Profile (OHIP-14) determined OHRQoL (Oliveira and Nadanovsky, 2005). The OHIP-14 has two items in each domain: functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability, and social disadvantage. The total OHIP-14 score is the sum of the following response points: 0 = never, 1 = rarely, 2 = sometimes, 3 = often, and 4 = always.

A score was obtained for each of the 14 items of the OHIP-14 according to individual responses. The total score was the sum of all these points, ranging from 0 to 56 (Oliveira and Nadanovsky, 2005; Isiekwe et al. 2016; Filho et al. 2020; Vianna Pereira et al. 2023).

The TMD symptom assessment used a self-explanatory questionnaire to screen for orofacial pain and TMD, as the American Academy of Orofacial Pain recommends (De Leeuw, 2008; Franco-Micheloni et al. 2014). The questionnaire has ten questions with yes/no answers. Seven questions refer to TMD symptoms, and the others regard the occurrence of trauma, occlusion, and TMD treatment type. The presence of TMD symptoms was an affirmative answer to at least one of the seven questions related to this item (Filho et al. 2020).

The short Sense of Coherence Scale (SOC-13) assessed women's sense of coherence. It has 13 items with response options on an ordinal scale (Almoznino et al. 2015; Bitiniene et al. 2018; Bäck et al. 2020; Celeste et al. 2022). The responses followed a seven-point Likert scale from one (extremely negative) to seven (extremely positive). The total score might vary from 13 to 91 points, with higher values corresponding to better stress adaptability. The SOC-13 was categorized into major and minor based on the median data. Values greater than or equal to the median represented high SOC, and those below the median were low SOC (Bitiniene et al. 2018; Bäck et al. 2020; Vianna Pereira et al. 2023).

The Perceived Stress Scale (PSS-10) assessed women's self-perception of stress over the last month (Botelho et al. 2020). Each PSS-10 item was rated on a five-point Likert scale, and each question was scored as 0 = never, 1 = almost consistently, 2 = sometimes, 3 = often, and 4 = very often. The PSS-10 comprises two domains: six items formulated positively (items 1, 2, 3, 6, 9, and 10) and four negatively (items 4, 5, 7, and 8, requiring reversal). Thus, the responses to these questions were reversed with a positive connotation. Total scores ranged from zero to 40, with higher scores indicating higher perceived stress levels (Botelho et al. 2020).

Data analysis

Descriptive analyses included frequencies and percentages for each outcome to each independent variable. Logistic regression models were adjusted between each variable and the outcomes. The variables showing $p \leq 0.20$ in the individual analyses were tested in multiple logistic regression models, remaining in the final models presenting $p \leq 0.05$. These models estimated crude and adjusted odds ratios with their respective 95% confidence intervals. The Akaike Information Criterion (AIC) assessed model fit. The R Program (R Foundation for Statistical Computing, Vienna, Austria) hosted the analyses at a 5% significance level.

3. Results

Table 1 presents the frequency distribution of independent variables to the outcomes. The impact on OHRQoL was high when evaluating the seven domains separately. A rate of 86.3% of women reported an effect on the "psychological discomfort" domain, 80.6% on "psychological disability," 79.3% on "social disability," 79.0% on "physical pain," 56.7% on "physical disability," 55.7% on "social disadvantage," and 55.4% on "functional limitation." Also, 50% of women showed a low sense of coherence, 77.4% had TMD symptoms, and 42% had higher perceived stress.

Table 2 presents the analysis of associations with the outcomes. Women over 27 years were 2.68 and 2.33 times more likely to show an impact on the "physical pain" (95% CI: 1.49-4.83) and "social disadvantage" (95% CI: 1.43-3.81) domains ($p < 0.05$), respectively. Women with a low sense of coherence were 1.70 times more likely to show an impact on the "social disadvantage" domain (95% CI: 1.04-2.79) ($p < 0.05$). TMD symptoms were associated with 2.63, 2.77, 2.77, and 1.79 times higher odds of an impact on the "psychological discomfort" (95% CI: 1.33-5.19), "psychological disability" (95% CI: 1.65-4.64), "social disability" (95% CI: 1.65-4.64) domains, and total OHRQoL score (95% CI: 1.02-3.16) ($p < 0.05$), respectively. Women with higher stress scores were 2.00, 2.05, and 2.29 times more likely to experience an impact on the "functional limitation" (95% CI: 1.26-3.17), "social disadvantage" (95% CI: 1.25-3.35) domains, and total OHRQoL score (95% CI: 1.44-3.65) ($p < 0.05$), respectively.

Table 1. Frequency distribution of independent variables related to the outcomes (n = 314) - Araras, São Paulo, Brazil.

Variable	Global	Frequency (%) of participants with impact							
		Functional limitation	Physical pain	Psychological discomfort	Physical disability	Psychological disability	Social disability	Social disadvantage	[1]OHIP total
Global	314 (100.0%)	174 (55.4%)	248 (79.0%)	271 (86.3%)	178 (56.7%)	253 (80.6%)	249 (79.3%)	175 (55.7%)	148 (47.1%)
Age (years)									
≤27[2]	166 (52.9%)	95 (57.2%)	119 (71.7%)	139 (83.7%)	91 (54.8%)	131 (78.9%)	128 (77.1%)	81 (48.8%)	77 (46.4%)
>27	148 (47.1%)	79 (53.4%)	129 (87.2%)	132 (89.2%)	87 (58.8%)	122 (82.4%)	121 (81.8%)	94 (63.5%)	71 (48.0%)
Sense of coherence (SOC)									
≤58.5[2]	157 (50.0%)	97 (61.8%)	123 (78.3%)	132 (84.1%)	89 (56.7%)	128 (81.5%)	123 (78.3%)	97 (61.8%)	84 (53.5%)
>58.5	157 (50.0%)	77 (49.0%)	125 (79.6%)	139 (88.5%)	89 (56.7%)	125 (79.6%)	126 (80.3%)	78 (49.7%)	64 (40.8%)
TMD symptoms									
No	71 (22.6%)	34 (47.9%)	50 (70.4%)	54 (76.1%)	34 (47.9%)	46 (64.8%)	47 (66.2%)	33 (46.5%)	24 (33.8%)
Yes	243 (77.4%)	140 (57.6%)	198 (81.5%)	217 (89.3%)	144 (59.3%)	207 (85.2%)	202 (83.1%)	142 (58.4%)	124 (51.0%)
Perceived stress									
≤29[2]	182 (58.0%)	88 (48.4%)	141 (77.5%)	158 (86.8%)	95 (52.2%)	142 (78.0%)	143 (78.6%)	88 (48.4%)	69 (37.9%)
>29	132 (42.0%)	86 (65.2%)	107 (81.1%)	113 (85.6%)	83 (62.9%)	111 (84.1%)	106 (80.3%)	87 (65.9%)	79 (59.8%)

[1]OHIP total above the median (median=16); [2]Sample median

Table 2. Analyses of associations with the impact on oral health on quality of life (n = 314) - Araras, São Paulo, Brazil.

OHIP	Variables	Crude effect		Adjusted effect (final model)	
		OR (CI95%)	p-value	OR (CI95%)	p-value
Functional limitation	Age (Ref: ≤ 27 years)	0.86 (0.55-1.34)	0.4933	-	-
	Sense of coherence (Ref: high)	1.68 (1.07-2.63)	0.0236	-	-
	TMD symptoms (Ref: no)	1.48 (0.87-2.52)	0.1482	-	-
	Perceived stress (Ref: lower)	2.00 (1.26-3.17)	0.0033	2.00 (1.26-3.17)	0.0033
AIC	-	-	-	empty model= 433.61; final model= 426.78	
Physical pain	Age (Ref: ≤ 27 years)	2.68 (1.49-4.83)	0.0010	2.68 (1.49-4.83)	0.0010
	Sense of coherence (Ref: high)	0.93 (0.54-1.59)	0.7818	-	-
	TMD symptoms (Ref: no)	1.85 (1.01-3.38)	0.0462	-	-
	Perceived stress (Ref: lower)	1.24 (0.71-2.17)	0.4416	-	-
AIC	-	-	-	empty model= 324.92; final model= 315.29	
Psychological discomfort	Age (Ref: ≤ 27 years)	1.60 (0.83-3.11)	0.1632	-	-
	Sense of coherence (Ref: high)	0.68 (0.36-1.31)	0.2524	-	-
	TMD symptoms (Ref: no)	2.63 (1.33-5.19)	0.0054	2.63 (1.33-5.19)	0.0054
	Perceived stress (Ref: lower)	0.90 (0.47-1.73)	0.7588	-	-
AIC	-	-	-	empty model= 252.81; final model= 247.49	
Physical disability	Age (Ref: ≤ 27 years)	1.18 (0.75-1.84)	0.4792	-	-
	Sense of coherence (Ref: high)	1.00 (0.64-1.56)	1.000	-	-
	TMD symptoms (Ref: no)	1.58 (0.93-2.69)	0.0902	-	-
	Perceived stress (Ref: lower)	1.55 (0.98-2.45)	0.0600	-	-
AIC	-	-	-	-	
Psychological disability	Age (Ref: ≤ 27 years)	1.25 (0.71-2.20)	0.4322	-	-
	Sense of coherence (Ref: high)	1.13 (0.65-1.98)	0.6688	-	-
	TMD symptoms (Ref: no)	3.12 (1.71-5.71)	0.0002	2.77 (1.65-4.64)	0.0001
	Perceived stress (Ref: lower)	1.48 (0.83-2.67)	0.1814	-	-
AIC	-	-	-	empty model= 311.20; final model= 299.99	
Social disability	Age (Ref: ≤ 27 years)	1.33 (0.77-2.31)	0.3111	-	-
	Sense of coherence (Ref: high)	0.89 (0.52-1.54)	0.6761	-	-
	TMD symptoms (Ref: no)	2.52 (1.39-4.56)	0.0024	1.91 (1.15-3.20)	0.0131
	Perceived stress (Ref: lower)	1.11 (0.64-1.94)	0.7086	-	-
AIC	-	-	-	empty model= 322.26; final model= 315.42	
Social disadvantage	Age (Ref: ≤ 27 years)	1.82 (1.16-2.87)	0.0090	2.33 (1.43-3.81)	0.0007
	Sense of coherence (Ref: high)	1.64 (1.04-2.56)	0.0313	1.70 (1.04-2.79)	0.0352
	TMD symptoms (Ref: no)	1.62 (0.95-2.76)	0.0757	-	-
	Perceived stress (Ref: lower)	2.06 (1.30-3.28)	0.0021	2.05 (1.25-3.35)	0.0042
AIC	-	-	-	empty model= 433.16; final model= 415.56	
Quality of life (OHIP total)	Age (Ref: ≤ 27 years)	1.07 (0.68-1.66)	0.7785	-	-
	Sense of coherence (Ref: high)	1.67 (1.07-2.61)	0.0241	-	-
	TMD symptoms (Ref: no)	2.04 (1.18-3.54)	0.0114	1.79 (1.02-3.16)	0.0420
	Perceived stress (Ref: lower)	2.44 (1.54-3.86)	0.0001	2.29 (1.44-3.65)	0.0005
AIC	-	-	-	empty model= 436.26; final model= 421.15	

OR: Odds ratio; CI: Confidence interval.

4. Discussion

This study demonstrated an impact on the OHRQoL of women over 27 years old with a low sense of coherence, TMD symptoms, and high stress levels, reinforcing the influence of these variables on OHRQoL.

Among the strengths of this study is the homogeneous sample of adult women. The literature shows that the age group between 20 and 50 manifests TMD symptoms the most frequently. Additionally, women's reproductive period and hormonal changes favor them as the most affected group (Chisnoiu et al. 2015; Gillborg et al. 2017; Filho et al. 2020). The primary reproductive hormone at the referred age is estrogen, which is essential for pain modulation, including in masticatory muscles, and for developing TMD and its symptoms (Sherman et al. 2005; Bereiter et al. 2011; Ferreira et al. 2016; Filho et al. 2020).

We found that women with a low sense of coherence reported an impact on the "social disadvantage" domain. The lower the sense of coherence, the more difficult coping with daily stressors, thus supporting our findings (Luz et al. 2019). A higher sense of coherence may improve an individual's adaptive behavior and resilience (Luz et al. 2019; Davolgio et al. 2020), suggesting it may protect against this impact. Including a sense of coherence in the multidimensional assessment of patients, especially women, may help health professionals understand patients' chief complaints.

TMD symptoms harmed OHRQoL, corroborating other studies (Trize et al. 2018; Natu et al. 2018; Paulino et al. 2018; Tay et al. 2019). The literature suggests an association of moderate to severe TMD symptoms with higher psychological distress levels, including anxiety, depression, and stress, which directly correlate to worse OHRQoL, particularly for perceiving psychological and social well-being (Almoznino et al. 2015; Tay et al. 2019; Lei et al. 2021; Quamar et al. 2023). These findings highlight the social influence of TMD on women's daily lives, with pain and discomfort in the craniofacial regions as relevant factors that aggravate the impact on quality of life (Trize et al. 2018; Natu et al. 2018; Paulino et al. 2018; Bueno et al. 2018; Tay et al. 2019; Bäck et al. 2020).

Older women with TMD symptoms showed significantly impaired OHRQoL, often associated with high psychological distress levels. Orofacial pain is crucial for worsening OHRQoL, and our findings agree with the literature (Oberoi et al. 2014; Bitiniene et al. 2018; Filho et al. 2020; Cavina et al. 2021). Furthermore, the prevalence and impact of TMD symptoms may vary according to age, showing higher intensity in middle-aged and older women (Oberoi et al. 2014; Ferreira et al. 2016; Sójka et al. 2019; Filho et al. 2020; Bäck et al. 2020). Similarly, our study found that women older than 27 reported a higher negative impact. Therefore, it is crucial to consider physical and psychological aspects when treating older women with TMD symptoms to improve their overall quality of life, as studies indicate that individuals exposed to stressful situations experience a negative impact on physical health (Sójka et al. 2019; Silva et al. 2019).

Thus, our findings reinforce the need to change health practices aimed at adult women. Treatment is often directed toward clinical outcomes without considering OHRQoL and the sense of coherence, ignoring the objectives of promoting health globally. A sense of coherence may ally women with TMD and stress. The effort to direct oral health actions toward a global understanding, considering beliefs, social, economic, and cultural contexts, may aid humanization and oral health care and, consequently, long-term maintenance.

This study showed that adult women with a low sense of coherence, TMD symptoms, and perceived stress comprise a group at significant risk of negative impacts on OHRQoL. Therefore, managing these psychological and emotional factors is essential to improve the OHRQoL of this population. However, further studies are required because the cross-sectional design does not allow for establishing a cause-and-effect relationship, highlighting the importance of longitudinal monitoring of this group for developing effective strategies. The limitations of this study regard the use of an electronic form, which may have compromised the accuracy of responses despite the validated and adequate questionnaires to assess the variables. It also showed losses due to incomplete or incorrectly answered questionnaires, impairing the response rate in the study.

5. Conclusions

Young adult women over 27 years old with a low sense of coherence, TMD symptoms, and perceived stress showed a higher impact on OHRQoL.

Authors' Contributions: FIGUEREDO, J.F.: Conceptualization, Investigation, Funding acquisition, Writing – original draft. CARNEIRO, D.P.A.: Conceptualization, Investigation, Funding acquisition, Writing – original draft. MORAES, C.N.: Conceptualization, Writing – original draft. GOMES, S.L.: Investigation, Writing – original draft. BASTOS, C.N.: Investigation, Writing – original draft. VEDOVELLO-FILHO, M.: Data curation,

Supervision, Supervision, Writing – review & editing. MENEGHIM, M.C.: Data curation, Supervision, Supervision, Writing – review & editing. VEDOVELLO, S.A.S: Conceptualization, Data curation; Methodology, Supervision, Writing – review & editing.

Conflicts of Interest: The authors declare no conflicts of interest.

Ethics Approval: The study was approved by the Research Ethics Committee of the Araras Dental School, University Center of Hermínio Ometto Foundation - FHO (#5.684.872) in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

Acknowledgments: The authors thank the volunteers, for allowing the research carried out.

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Received: 30 August 2024 | **Accepted:** 24 November 2024 | **Published:** 23 December 2024