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Exploring Factors Associated With Psychological Resilience in Sjögren's Disease

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ABSTRACT

Aim: This study aimed to examine the factors associated with psychological resilience in Sjögren's disease.

Methods: This cross-sectional study included 83 patients (F/M: 79/4). Hyposalivation was observed in 41%, while Schirmer's test positivity was observed in 84.3% of patients. Scores of the Brief Resilience Scale, self-reported general health, self-reported oral health, EULAR Sjögren's Syndrome Patient Reported Index (ESSPRI), and physician global assessment for disease activity were noted. A mediation analysis was performed to examine the relationships among these variables.

Results: Lower BRS scores were associated with Schirmer's test positivity and reduced salivary flow rate, higher scores of ESSPRI, physician and patient global assessments of disease activity ($p < 0.05$). In the simple mediation analysis, a lower BRS score as the dependent variable was directly associated with a higher physician-assessed global disease activity as the independent variable and indirectly associated with the higher ESSPRI score as a mediator variable ($p < 0.05$).

Conclusions: Since ocular dryness, lower salivary flow rates, physician global assessment of disease activity, and ESSPRI reflecting patient-reported symptom severity were identified as key contributors to lower levels of psychological resilience in Sjögren's disease, these measures may offer clinicians valuable guidance for tailoring more effective, patient-centered integrated multidisciplinary care strategies for patients with SjD.

1 | Introduction

Sjögren's disease (SjD), a systemic autoimmune disorder, is characterised by dry mouth and dry eyes, resulting from inflammation and pathological changes in exocrine glands, especially the lacrimal and salivary glands. The presence of disease-specific autoantibodies (SSA), together with focal lymphocytic infiltration of the salivary glands, is among the main classification criteria for SjD (Negrini et al. 2022; Ramos-Casals et al. 2020; Shiboski et al. 2017). Considering the disease reduces salivary flow rates, it impairs oral functions such as tasting, chewing, swallowing, and speaking in patients with SjD (Plemons

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et al. 2014). The decrease in the amount of saliva increases oral health problems by paving the way for infection foci due to the inability of saliva to perform its cleaning function (Chandra Nayak et al. 2025; Saleh et al. 2015). Since oral health problems and oral dryness directly affect patients' daily lives and quality of life in SjD (Sevimli et al. 2024; Yalcinkaya et al. 2020; Yenissoy et al. 2024), limitations in oral functions and the need for recurrent dental treatments could place a continuous emotional burden on patients.

At the global level, oral diseases represent a significant health burden comprising dental caries, periodontal diseases, tooth loss, oral mucosal disorders, oropharyngeal cancers, HIV/AIDS-associated oral manifestations, and orodental trauma (Petersen et al. 2005). From this perspective, Oral Disease Burden (ODB) is a practical objective tool for the assessment of normative treatment needs. Since it encompasses the four main oral health problems including dental caries, tooth loss, the need for dental prostheses, and periodontal conditions, it assesses multiple treatment needs (De Lucena et al. 2021). Although normative treatment needs are evaluated by dentists through objective criteria, self-reported oral health status is also assessed by patients to improve disease management and provide clues to clinicians (Ngo and Thomson 2021; Šijan Gobeljić et al. 2020).

In chronic disease management, clinicians evaluate the progression of the symptoms not only through objective clinical parameters but also by incorporating patient-reported outcome measures (PROMs). This approach facilitates an empathetic understanding of patients' needs, experiences, and preferences, enabling the coordination of continuous care aimed at alleviating symptoms and supporting the development of patient empowerment strategies in this process (Berry et al. 2024; Bonsel et al. 2024; Tran et al. 2021). From this perspective, the level of psychological resilience which supports coping with health challenges and adherence to treatment, is also a highly significant factor in SjD (Rojas et al. 2018; Sevimli et al. 2024). In addition to oral health problems, hyposalivation and ocular dryness significantly affect patients' lives (Sevimli et al. 2024; Vujovic et al. 2023), suggesting that disease-related manifestations may reduce patients' capacity to cope with the disease. From this perspective, identifying oral health indicators, patient-reported outcomes and disease-specific factors related to psychological resilience are essential for guiding both treatment decisions and patient empowerment strategies in disease management. Accordingly, this study aimed to examine factors associated with psychological resilience in SjD. The null hypothesis was that organ involvement, disease activity, symptom severity and oral health status would not be significantly associated with psychological resilience in individuals diagnosed with SjD.

2 | Materials and Methods

This cross-sectional study included 83 patients with SjD (F/M: 79/4; mean age: 57.7 ± 11.3 years) who fulfilled the 2016 American College of Rheumatology and the European League Against Rheumatism (ACR–EULAR) classification criteria. The patients were followed up in the Sjögren's Disease Outpatient Clinic of the Department of Rheumatology at Marmara University Medical School. Schirmer's test positivity was defined as a result of ≤ 5 mm/5 min in either eye measured without topical anaesthesia. Systemic involvement was defined as the presence of at least one active EULAR primary Sjögren's syndrome disease activity index (ESSDAI) clinical domain (e.g., musculoskeletal, pulmonary and renal involvement) (Shiboski et al. 2017). Patients were selected using a simple random sampling method that ensured equal selection probability for all eligible individuals and minimised selection bias. First, a sampling frame was created comprising all eligible patients who attended the rheumatology clinic between 2023 and 2024 ($n = 224$). Each patient was assigned a sequential ID number from 1 to 224 in an excel file. A random number generator, Excel RAND, was then used to select the required sample size. The process was conducted without researcher influence.

Inclusion criteria were being 18 years of age or older, receiving regular medical supervision, and providing consent to participate in the study. Patients were excluded if they did not meet the diagnostic criteria, failed to adhere to their prescribed medications, or had mental health disorders, uncontrolled chronic diseases, or other concomitant rheumatic diseases, sarcoidosis, known hepatitis infection, acquired immune deficiency syndrome, graft versus host disease, a history of lymphoma, or had undergone radiotherapy to the head and neck region.

2.1 | Sample Size

A pilot study involving 30 patients who were randomly selected from the SjD patient group at the clinic by using Excel RAND was conducted to determine the required sample size. The calculation was based on psychological resilience (Brief Resilience Scale, BRS score) as the primary outcome. The mean and standard deviation of BRS score were found to be 3.6 ± 2.4 in the pilot study ($n = 30$). Consistent with prior literature defining low resilience as BRS score < 3 and based on our earlier results (Sevimli et al. 2024; Smith et al. 2008, 2012; Rojas et al. 2018), reference value was used as 2.8 for BRS. The effect size (Cohen's $d = 0.33$) was estimated based on the difference in mean BRS scores observed in the pilot study. Sample size estimation was performed using G*Power version 3.1, applying a two-tailed one sample t-test with $\alpha = 0.05$ and a statistical power of 85%. Under these parameters, the minimum required sample size was determined to be 83 participants.

Data was collected through clinical examinations performed by dentists and rheumatologists. Socio-demographic characteristics (age and gender), disease-related factors (ocular and salivary gland involvement, autoantibody positivity, systemic involvement, and symptoms), treatments, and frequency of daily toothbrushing were noted in the clinical examination. Stimulated and unstimulated salivary flow rates were measured during the same visits. The questionnaire assessing PROMs was administered through face-to-face interviews. Trained interviewers (B.P.A., N.S.K., G.M.) provided information about the study protocol and assisted patients who had visual or reading difficulties during the administration of the questionnaire.

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2.2 | Measurement of Salivary Flow Rate and Assessment of Oral Disease Burden

Salivary flow rates were measured, and objective treatment needs of patients were assessed by calibrated dentists (BPA and GM). Patients were instructed to refrain from eating, drinking, or smoking for at least 2 h prior to saliva collection. During the measurement of unstimulated whole salivary flow rate (U-SFR, mL/min), patients continuously expectorated saliva into a graduated tube over a 15-min period, conducted in the morning between 9:00 and 11:00 a.m.

Following this procedure, the stimulated salivary flow rate (S-SFR) was measured using the paraffin chewing method. Stimulated saliva was collected in a tube during a 5-min chewing period. Both unstimulated and stimulated whole salivary flow rates were expressed in mL/min. Hyposalivation was defined as a U-SFR of ≤ 0.1 mL/min and S-SFR of < 0.7 mL/min (Jensen and Vissink 2014; Navazesh and Kumar 2008; Shiboski et al. 2017).

During the intraoral examination, the numbers of natural teeth, extracted teeth, dental caries, and fixed prostheses were recorded. Bleeding on probing was assessed by gently probing the gingival sulcus and observing the presence of bleeding within a few seconds which was considered gingival inflammation. Clinical attachment level (CAL) was measured as the distance from the cementoenamel junction to the base of the periodontal pocket, providing a reliable estimate of periodontal tissue loss (Heitz-Mayfield 2024; Lang and Tonetti 2003). The plaque index (PI) was used to evaluate dental biofilm accumulation around teeth and was scored from 0 (no accumulation) to 3 (abundant accumulation). The biofilm accumulation around teeth composed of bacteria, their products, and salivary proteins is the main etiologic factor for the development of oral health problems (Chapple et al. 2018; Heitz-Mayfield 2024; Silness and Löe 1964).

The ODB variable is made up of four components: dental caries, tooth loss, need for a dental prosthesis, and periodontal status (including gingival bleeding, calculus, and periodontal pockets). Each component is coded as "0" if the condition is absent and "1" if it is present. As the ODB score is derived from these four components, the total score ranges from 0 (absence of all assessed conditions) to 4 (presence of all evaluated conditions). Accordingly, higher scores indicate greater treatment need due to reflecting poorer health status (De Lucena et al. 2021).

Since the Oral Disease Burden (ODB) score has not been previously validated in Sjögren's disease populations, the analyses were presented as an exploratory, internal validation conducted within the same sample in this study. An expert panel of dentists from different disciplines (BPA, ÖM, GM, FF, UK, SCA) evaluated the scoring procedure. To test the construct validity, the associations between ODB score and dental and periodontal indices were examined. The concurrent validity was evaluated by self-reported oral health status (scored from 1: very poor to 5: excellent). This was followed by the assessment of inter-rater reliability for ODB in 20 patients at the same session, which demonstrated strong agreement ($r = 0.941$, (95% Confidence Intervals: 0.853–0.977) $p < 0.001$).

2.3 | Patient-Reported Outcome Measures

The ESSPRI (Seror et al. 2011, 2015), the BRS for assessing psychological resilience (Smith et al. 2008, 2012), and self-reported general health status (scored from 0: very poor to 100: excellent), self-reported disease activity (scored from 0: no activity to 100 points: very active), and self-reported oral health status (scored from 1: very poor to 5: excellent) were used as PROMs in the study.

The BRS is a six-item tool used to evaluate psychological resilience (Sevimli et al. 2024; Smith et al. 2008, 2012). The scale was validated in Turkish in patients with SjD by Sevimli et al. (2024). Higher scores on the BRS, as well as on self-reported general and oral health status are considered to reflect a more favourable overall health status. However, the ESSPRI allows for the systematic assessment of disease symptoms from the patient's perspective, encompassing key domains such as dryness, fatigue, and pain. Patients evaluate these symptoms on a scale of 0 (no symptoms) to 10 (worst symptoms during the previous 2 weeks), with higher scores indicating worse conditions (de Wolff et al. 2022; Negrini et al. 2022; Seror et al. 2011, 2015).

The Physician Global Assessment (PGA) was recorded using a 100-mm visual analogue scale, with clinicians rating overall disease activity (0 = no activity; 100 = very active) and general health status (0 = very poor; 100 = excellent).

The study was conducted in accordance with the principles of the Declaration of Helsinki and received approval from the Ethics Committee of Marmara University Medical School (09.2023.1736). Prior to participation, written informed consent was obtained from all individuals.

2.4 | Statistical Analysis

Normality of continuous variables was tested using the Shapiro–Wilk test. Data analysis was conducted using SPSS version 28 (IBM, Chicago, Illinois, USA). Given the non-normal distribution of the variables, non-parametric tests, including the Mann–Whitney *U* test and Spearman correlation analysis, were applied. The significance level was taken as 0.05.

2.5 | Mediation Analysis

Mediation analysis assesses whether a third variable explains the association between an independent and a dependent variable (Hayes 2017; Hayes and Rockwood 2017). In the present study, this mediation model tested whether the relationship between PGA for disease activity and BRS score was mediated by ESSPRI score as symptom severity. The analysis was performed by using PROCESS Model 4 PROCESS macro adopted in SPSS.

Given the cross-sectional design of the study, the mediation model was applied as an exploratory, hypothesis-generating analysis and is not intended to imply causal relationships, but rather to examine potential associations and pathways between disease activity, symptom severity, and psychological resilience. The mediation analysis was conducted without the inclusion of

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covariates such as age, sex, disease duration, treatment status, or psychological comorbidities.

3 | Results

In this cross-sectional study, the profile of the patients with SjD (F/M: 79/4; age: 57.7 ± 11.3 years; education level: 7.73 ± 4.70 years) is presented in Table 1. The mean disease duration and the ESSDAI scores were 8.61 ± 6.97 years and 2.63 ± 1.82 respectively. The proportions of Schirmer test positivity and hyposalivation were found to be 84.3% and 41%, respectively. Articular involvement was the most common extra-glandular involvement ($n = 56$, 67.5%). The major organ involvements were interstitial lung disease in 11 patients (13.3%) and interstitial nephritis in 3 (3.6%) (Table 1). The mean frequency of toothbrushing was 2.36 ± 0.54 times per day in the whole group (Table 2).

The mean BRS score was 2.35 ± 0.81 and correlated positively with U-SFR (0.22 ± 0.31; $r = 0.30$, $p = 0.025$) and with PGA for general health status (65.50 ± 10.13, $r = 0.29$, $p = 0.012$), and correlated inversely with ESSPRI score (6.20 ± 1.69; r = −0.43, $p = 0.001$), each ESSPRI domain (all $p < 0.05$), patient-self-reported disease activity score (52.79 ± 18.21; $r = -0.52$, $p = 0.001$), and PGA for disease activity score (41.86 ± 14.47, $r = -0.45$, $p < 0.001$) (Tables 2 and 3).

Following the correlation analyses, all variables that showed a significant association with BRS scores were included in the mediation analyses. In the simple mediation analysis, a lower BRS score as the outcome variable was directly mediated by higher physician global assessment of disease activity, the independent variable. In addition, a lower BRS score was indirectly associated with higher ESSPRI scores through the mediation pathway ($p < 0.05$). When these relationships were examined in detail, the physician global assessment for disease activity (X) showed a significant direct negative effect on psychological resilience (BRS score; Y) (c′ path, $p = 0.043$). The disease activity was also positively associated with symptom severity (ESSPRI score; M) (a path, $p < 0.001$). In addition, the higher ESSPRI scores were associated with lower BRS scores (b path, $p = 0.021$). The indirect effect of disease activity on

TABLE 1 | The profile of patients with Sjögren's disease.

	n	%
Female	79	95.2
Male	4	4.8
Schirmer's test positivity	70	84.3
Hyposalivation (≤0.1 mL/min)	34	41
ANA (+)	46	55.4
RF (+)	22	26.5
Anti-SSA (+)	52	62.6
Anti-SSB (+)	26	31.3
Arthralgia	56	67.5
Arthritis	24	28.9
Interstitial lung disease	11	13.3
Interstitial nephritis	3	3.6
Treatments		
Isolated hydroxychloroquine	44	53
Oral immunosuppressives[a]	23	27.7
Rituximab	4	4.8
No medication	12	14.5
	Mean	**SD**
Age (years)	57.7	11.3
Education level (years)	7.73	4.70
Disease duration (years)	8.61	6.97
ESSDAI	2.63	1.82

[a]Including methotrexate, azathioprine, MMF and leflunomide.

TABLE 2 | The distributions of oral health and disease related factors.

	Mean	**SD**
Oral disease burden score	2.23	1.04
Plaque index score	0.90	0.72
Unstimulated salivary flow rate	0.22	0.31
Stimulated salivary flow rate	0.84	0.73
Self-reported oral health status	2.81	0.70
Number of carious teeth	1.30	2.13
Number of extracted teeth	9.60	8.87
Number of natural teeth	18.39	8.87
Bleeding on probing (%)	30.51	44.46
Clinical attachment level (mm)	2.56	1.01
Number of teeth with fixed denture	4.88	7.05
Frequency of daily toothbrushing	2.36	0.54
ESSPRI	6.20	1.69
ESSPRI-dryness control	6.51	2.01
ESSPRI-fatigue	6.31	2.02
ESSPRI-pain	5.91	2.17
BRS score-whole group	2.35	0.81
BRS score-Schirmer test (+)*	2.25	0.80
BRS score-Schirmer test (−)	2.91	0.69
Self-reported general health status	60.64	12.04
Self-reported disease activity	52.79	18.21
Physician global assessment for general health status	65.50	10.13
Physician global assessment for disease activity	41.86	14.47

Note: Mann–Whitney *U* test.
*$p = 0.006$.

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TABLE 3 | Correlations among salivary flow rate, psychological resilience, oral disease burden and patient reported outcome measures.

		r	*p*
ODB	Self-reported oral health status	−0.30	0.003
	Plaque index score	0.23	0.033
Self-reported oral health status	Plaque index score	−0.26	0.018
Number of teeth with fixed denture	Number of teeth with carious teeth	−0.30	0.007
Frequency of daily toothbrushing (in patients receiving dental care)	Number of teeth with carious teeth	−0.49	0.030
	Number of teeth with fixed denture	0.64	0.002
BRS	Unstimulated salivary flow rate	0.30	0.025
	ESSPRI	−0.43	0.001
	ESSPRI-Dryness	−0.22	0.048
	ESSPRI-Fatigue	−0.49	< 0.001
	ESSPRI-Pain	−0.37	< 0.001
	Self-reported disease activity	−0.52	0.001
	Physician global assessment for disease activity	−0.45	< 0.001
	Physician global assessment for general health status	0.29	0.012
	Frequency of toothbrushing (patients with hyposalivation)	0.40	0.028
U-SFR	ESSPRI-Dryness	−0.50	< 0.001
	Extracted teeth	−0.28	0.029
	Self-reported disease activity	−0.46	0.004
	Self-reported general health status	0.30	0.024
	Self-reported oral health status	0.30	0.015
	Stimulated salivary flow rate	0.76	0.001

TABLE 4 | Mediation analysis for BRS score with disease activity and ESSPRI score.

Effect type	Coefficient (B)	SE	*p*	95% LLCI	95% ULCI
a (Physician global assessment for disease activity → ESSPRI score)	0.0536	0.0119	< 0.001	0.0298	0.0774
b (ESSPRI score → BRS score)	−0.1246	0.0529	0.021	−0.2301	−0.0191
c′ (Direct effect: Physician global assessment for disease activity → BRS score)	−0.0122	0.0059	0.043	−0.0240	−0.0004
a × b (Indirect effect via ESSPRI)	−0.0067	0.0033	—	−0.0139	−0.0011

Abbreviations: B, unstandardized regression coefficient; SE, standard error of B.

psychological resilience through ESSPRI (a × b) was statistically significant, as the bootstrap confidence interval did not include zero (Table 4, Figure 1).

Patients with a negative Schirmer's test (over 5 mm/5 min at both eye) (2.91 ± 0.69 vs. 2.25 ± 0.80) had higher BRS score compared to those with positive test results (≤ 5 mm/5 min) ($p = 0.006$) (Table 2). Increased toothbrushing frequency (2.36 ± 0.54) was moderately correlated with BRS scores ($r = 0.40$, $p = 0.028$) in patients with hyposalivation (Table 3). Moreover, patients receiving dental care had higher BRS scores (2.80 ± 0.87 vs. 2.16 ± 0.71) than the others ($p = 0.006$).

The mean ODB score as a normative treatment need was found to be 2.23 ± 1.04 in patients with SjD (Table 2). During the validation process, correlations between the ODB score and oral indices regarding the number of carious teeth ($r = 0.51$, $p < 0.001$) and natural teeth ($r = 0.46$, $p < 0.001$), extracted teeth ($r = -0.37$, $p < 0.001$), fixed denture-bearing teeth ($r = 0.25$, $p = 0.022$), bleeding on probing score reflecting gingival inflammation

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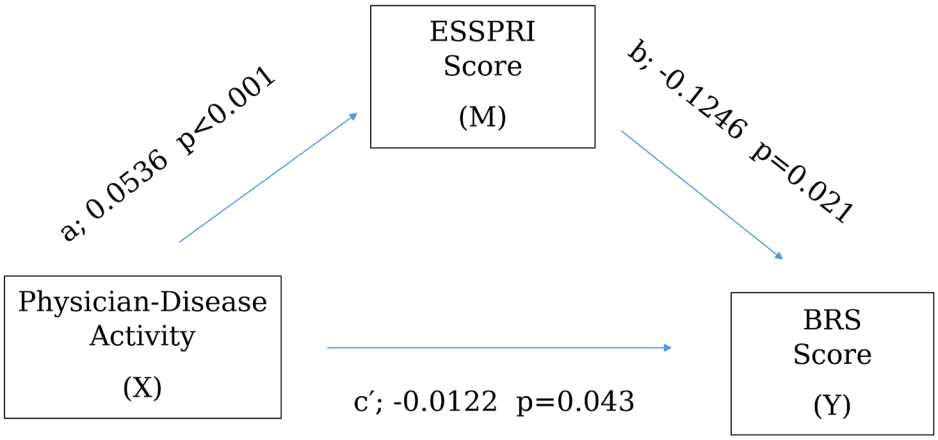

FIGURE 1 | A mediation analysis for BRS score with disease activity and ESSPRI.

($r=0.44$ $p<0.001$), clinical attachment level for periodontal tissue loss ($r=0.34$, $p=0.015$) and increased plaque scores indicating biofilm accumulation around teeth ($r=0.23$, $p=0.033$) were used in order to test construct validity. Moreover, elevated ODB score correlated with lower self-reported oral health scores (2.80 ± 0.70) ($r=-0.30$, $p=0.003$) confirming the concurrent validity.

The ODB score and PI score were significantly higher in patients receiving dental treatment ($n=26$; 3.03 ± 0.97; 1.30 ± 0.78) compared to others ($n=57$; 1.85 ± 0.87; 0.71 ± 0.61) ($p<0.001$ for both). In patients receiving dental care, the frequency of daily toothbrushing was correlated with both the number of carious teeth ($r=-0.49$, $p=0.030$) and the number of fixed denture-bearing teeth ($r=0.64$, $p=0.002$) (Table 3).

In the whole group, a decrease in self-reported oral health status was associated with elevated PI score ($r=-0.26$, $p=0.018$). Additionally, a higher number of fixed denture-bearing teeth was correlated with a lower number of decayed teeth ($r=-0.30$, $p=0.007$) (Table 3).

A decrease in U-SFR (0.22 ± 0.31 mL/min) was associated with higher scores of ESSPRI-Dryness (6.51 ± 2.01; $r=-0.50$, $p<0.001$) and self-reported disease activity ($r=-0.46$, $p=0.004$), an increased number of extracted teeth (9.60 ± 8.87; $r=-0.28$, $p=0.029$) and lower scores of self-reported general health status (60.64 ± 12.04; $r=0.30$, $p=0.024$) and self-reported oral health scores (2.81 ± 0.70; $r=0.30$, $p=0.015$). Significant relationships were also observed between U-SFR and stimulated salivary flow rate (0.84 ± 0.73) ($r=0.76$, $p=0.001$) (Table 3).

4 | Discussion

Psychological resilience is a key factor in managing chronic illnesses, as it supports emotional stability, treatment adherence, and long-term coping strategies. Since SjD, as a chronic disease, affects salivary and lacrimal glands, this study aimed to assess the relationships between salivary and lacrimal gland involvement, disease activity, symptom severity, and psychological resilience in patients with SjD.

In the present cross-sectional study, psychological resilience levels were significantly associated with ocular dryness, reduced U-SFR, higher physician and patient global assessments for disease activity, and greater symptom severity as reflected by ESSPRI scores.

In the mediation analysis, a higher score of PGA for disease activity was linked to increased symptom severity, which in turn was associated with lower psychological resilience. Moreover, PGA for disease activity remained directly associated with BRS scores even after controlling for ESSPRI, suggesting both direct and indirect associations between disease activity, symptom burden, and psychological resilience. Overall, salivary and lacrimal gland involvement, disease activity, and symptom severity were significantly related to psychological resilience in this study group. In lacrimal gland involvement, burning sensation, frequent use of lubricating drops, light sensitivity and foreign body sensation are main complaints that could negatively affect patients' lives. Moreover, these symptoms can be worsened by dry environments. In salivary gland involvement, oral functions, quality of life and daily life are commonly affected by dysphagia, burning sensation, pain and altered taste (Negrini et al. 2022; Yalcinkaya et al. 2020; Yenissoy et al. 2024).

Lower psychological resilience levels were observed in patients with isolated ocular dryness as well as in those experiencing recurrent parotitis attacks associated with hyposalivation in our previous study (Sevimli et al. 2024). In addition, greater psychological resilience has been shown to be correlated with better perception of general health as well as reduced fatigue (Priori et al. 2021). Taken together, these findings highlight clinically relevant associations that may assist healthcare professionals in better understanding the factors contributing to differences in psychological resilience among patients with SjD.

Since psychological resilience plays a crucial role in coping with chronic health challenges, these results may provide clues to assist health professionals in the treatment planning and in developing strategies to enhance patient resilience in SjD (Sevimli et al. 2024).

Interestingly, higher BRS scores were observed among patients receiving dental care and among those who reported more

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frequent toothbrushing, particularly in the presence of hyposalivation. Enhancing psychological resilience may improve oral health by enabling patients to cope with both chronic illness and oral health problems (Christensen et al. 2001; Jensen and Vissink 2014; Lopez-Pintor et al. 2015). Yet, given the cross-sectional nature of the study, the observed association should not be interpreted as indicating a protective or beneficial effect of dental treatment on psychological resilience. Rather, it should be considered a concurrent association.

Symptomatic patients who received dental care exhibited higher ODB and plaque index scores reflecting increased biofilm accumulation. They were also associated with lower self-reported oral health status in the group. Covering tooth surfaces with fixed prostheses may reduce the risk of caries, and increased toothbrushing frequency was associated with fewer carious lesions in this study. The ODB reflects the need for multiple dental treatments, with a higher score indicating more extensive treatment requirements (De Lucena et al. 2021). Oral biofilm plays a pivotal role in the development of oral health problems, particularly in areas less protected by salivary cleansing (Fasoulas et al. 2019). Therefore, maintaining oral health is a critical component of disease management in Sjögren's disease (Glavina et al. 2023; Ngo and Thomson 2021; Reckelkamm et al. 2024; Rojas et al. 2018) because reduced salivary flow further increases oral vulnerability by weakening these protective mechanisms (Glavina et al. 2023; Ngo and Thomson 2021; Reckelkamm et al. 2024; Rojas et al. 2018).

When considering the connection between oral health and systemic health is considered, impaired oral health can trigger both local and systemic inflammatory responses through bacteria and their products in the oral environment by infiltrating the bloodstream and spreading throughout the body (Chandra Nayak et al. 2025). Therefore, the delivery of oral hygiene instructions by dental professionals, along with patients' compliance with these recommended practices and patient empowerment strategies (Fasoulas et al. 2019), play crucial roles in minimising the burden of oral diseases (Oliveira et al. 2021).

Given that biofilm often shares the same colour as teeth, its removal can be challenging, potentially compromising dental and periodontal health (Fasoulas et al. 2019; Oliveira et al. 2021). Considering that both salivary gland involvement and toothbrushing frequency are key components of oral health in SjD, rheumatologists could encourage patients to attend regular dental visits and maintain good oral hygiene habits as a part of a multidisciplinary treatment strategy (Christensen et al. 2001; Ramos-Casals et al. 2020; Stankeviciene et al. 2024).

Both lower U-SFR and higher ODB scores were significantly associated with lower self-reported oral health status as PROMs. As anticipated, reduced U-SFR was associated with higher ESSPRI-Dryness scores. Reduced salivary flow rate, a key factor contributing to oral health problems, underscores the importance of assessing oral health status and glandular involvement (Glavina et al. 2023; Pedersen et al. 2005). Since salivary flow rate and the ODB score are objective clinical measures, combining this with the patient-reported oral health status provides additional information in regard to the unmet treatment needs and the glandular involvement in routine Rheumatology practise (Christensen et al. 2001; Chuang et al. 2020; Fernandez Castro et al. 2021; Glavina et al. 2023; Lopez-Pintor et al. 2015; Vujovic et al. 2023).

Evidence supporting the development of concise and memorable key messages highlighting critical considerations for both physicians and patients in health education aimed at patient empowerment are essential for effective, patient-centred management of chronic diseases (Berry et al. 2024; Hickmann et al. 2022). In the context of oral and dental care, patient activation and adherence to treatment require active collaboration between physicians and the patients, which play a pivotal role in reinforcing these processes (Vainauskienė and Vaitkienė 2021). Furthermore, the identification of facilitators and drivers of behavioural change is vital for the design of more robust and impactful patient education strategies (Berry et al. 2024; DiMatteo et al. 2025).

This study provided descriptive evidence of associations between psychological resilience, salivary and lacrimal gland involvement, disease activity and symptom severity in SjD, which represents a key strength of the work. However, the single-centre, cross-sectional design limits causal inference and generalizability. These results should be interpreted as exploratory and hypothesis-generating rather than confirmatory. Moreover, the mediation model was not intended to support causal inference. It illustrated potential associations and possible pathways linking disease activity, symptom severity, and psychological resilience. Therefore, future longitudinal studies are necessary to assess causal relationships among these variables. Observed associations, such as the relationship between receiving dental care and psychological resilience, may be associated with unmeasured confounding factors, including health-seeking behaviour as well as disease severity. Accordingly, we will need multi-centre longitudinal studies to confirm these results and to better inform patient empowerment strategies.

In conclusion, since glandular involvement, particularly lacrimal gland involvement, lower salivary flow rates, physician-defined disease activity and higher ESSPRI scores reflecting patient-reported symptom severity were identified as key contributors to lower levels of psychological resilience in SjD, these measures may offer clinicians valuable guidance for tailoring more effective, patient-centered integrated oral and rheumatological care strategies in SjD.

Author Contributions

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Umit Karacayli: formal analysis, writing – review and editing, writing – original draft. **Meral Yay:** writing – original draft, writing – review and editing, formal analysis. **Farida Fortune:** writing – original draft, writing – review and editing, formal analysis. **Nevsun Inanc:** conceptualization, methodology, data curation, formal analysis, writing – original draft, writing – review and editing. **Gonca Mumcu:** conceptualization, methodology, writing – original draft, writing – review and editing, formal analysis, data curation.

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Ethics Statement

The study was conducted in accordance with the principles of the Declaration of Helsinki and received approval from the Ethics Committee of Marmara University Medical School (09.2023.1736).

Consent

Complete written informed consent was obtained from the patient for the publication of this study and accompanying images.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Peer Review

For transparency, the peer review documents associated with this article are available at https://doi.org/10.1111/odi.70530.

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