The Effects of DHA and EPA On Skin Dryness and Arthritis Joint Pain in Patients With Sjogren's Syndrome

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ABSTRACT

Introduction: Sjogren's syndrome is an autoimmune disease that affects exocrine glands, causing dryness of the skin, eyes, and mouth, as well as joint pain. Conventional therapies mainly manage symptoms. Omega-3 fatty acids, particularly DHA and EPA, possess anti-inflammatory properties that may improve skin and joint conditions. This study aimed to determine the effects of DHA and EPA supplementation on skin dryness and joint pain in patients with Sjogren's syndrome.

Methods: A randomized controlled trial with a pretest-posttest control group design was conducted on 44 Sjogren's syndrome patients at Dr. Moewardi Hospital. Participants were divided into intervention (DHA+EPA) and control groups. The intervention group received DHA 500 mg and EPA 500 mg twice daily for two months. Skin dryness was assessed using the Overall Dry Skin (ODS) score and joint pain using the Numeric Rating Scale (NRS). Data were analyzed using the Wilcoxon Signed Rank and Mann-Whitney U tests.

Results: The intervention group showed significant reductions in ODS ($p=0.000$) and NRS ($p=0.000$) scores, while the control group showed no significant changes ($p>0.05$). Between-group analysis revealed significant differences ($p<0.05$), indicating that DHA and EPA supplementation effectively reduced skin dryness and joint pain.

Conclusions: DHA and EPA supplementation significantly improve skin dryness and reduce joint pain in patients with Sjogren's syndrome, suggesting their potential as a safe and effective adjunct therapy to enhance patients' quality of life.

Keywords: DHA; EPA; Sjogren's syndrome; dry skin; joint pain.

INTRODUCTION

Sjogren's syndrome (SS) is a systemic autoimmune disease that primarily affects the exocrine glands, causing dryness of the skin, eyes, and mouth, as well as joint pain due to arthritis. SS is classified as primary SS if it occurs in isolation, and secondary SS if it is associated with other systemic autoimmune diseases such as rheumatoid arthritis or systemic lupus erythematosus [1]. This disease generally occurs in individuals aged 45–55 years with a female-to-male ratio of approximately 9:1 [2].

To date, there is no curative therapy for SS, and conventional treatment remains focused on symptom control. Long-term immunosuppressive therapy can cause severe adverse effects, including infections and organ damage [3]. On the other hand, topical therapies used to alleviate dryness are merely local and do not address the underlying systemic disturbances.

Omega-3 fatty acids, specifically docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA), possess anti-inflammatory effects that have been proven to improve skin and joint conditions through the modulation of the immune system [4]. Previous studies have shown that omega-3 fatty acids reduce inflammation in autoimmune diseases such as rheumatoid arthritis [5]. However, no studies have yet assessed the specific effects of DHA and EPA on skin dryness and joint pain in patients with SS.

The objective of this study was to determine the effect of DHA and EPA administration on skin dryness and arthritis joint pain in Sjogren's syndrome patients at Dr. Moewardi Hospital.

METHODS

This study was a Randomized Controlled Trial (RCT) with a pretest-posttest control group design conducted at Dr. Moewardi Hospital, Surakarta, from March to September 2025. The study population comprised patients with Sjogren's syndrome undergoing treatment at Dr. Moewardi Hospital.

Subjects were selected based on established inclusion and exclusion criteria. The inclusion criteria were: patients diagnosed with Sjogren's syndrome according to the 2016 ACR/EULAR classification; aged between 18 and 65 years; experiencing symptoms of dry skin (xerosis) and joint pain (in at least one joint for more than one week); and willing to participate as respondents. The exclusion criteria were patients who discontinued therapy or had an allergy to omega-3 supplements.

The sample comprised 44 patients, randomly assigned to two groups. The intervention group received DHA 500 mg and EPA 500 mg twice daily for two months, while the control group did not receive omega-3 supplementation. The independent variable was DHA and EPA supplementation, and the dependent variables were skin dryness, measured using the Overall Dry Skin (ODS) score, and joint pain, measured using the Numeric Rating Scale (NRS).

The study procedure began with the collection of baseline data, including age, gender, and pre-intervention ODS and NRS scores. The intervention group was then administered DHA and EPA supplements for two months. After the intervention period ended, ODS and NRS scores were reassessed in both groups to determine whether there were any changes.

Data analysis was performed using the Shapiro-Wilk test to assess normality and Levene’s test to assess homogeneity. As the data were not normally distributed, analysis was continued using the Wilcoxon Signed Rank Test for paired data (pre-post within groups) and the Mann-Whitney U Test for comparisons between groups. This study obtained ethical clearance from the Health Research Ethics Committee of Dr. Moewardi Hospital with the number: 123/II/2025.

RESULTS

This study involved 44 patients with Sjögren's Syndrome who met the inclusion criteria. Respondents were divided into two groups: the intervention group that received DHA and EPA supplementation and the control group. The majority of respondents were in the productive adult age range and female, consistent with the epidemiology of this disease.

Table 1. Respondent Characteristics

Characteristics	egory	ervention Group (n=22)	ntrol Group (n=22)
Age	18-44 years	15 (71.4%)	14 (63.6%)
	45-54 years	4 (19.0%)	2 (9.1%)
	55-65 years	2 (9.5%)	6 (27.3%)
	Mean (Median)	39.5 (40)	42.6 (41)
Gender	Male	1 (4.8%)	0 (0%)
	Female	21 (95.2%)	22 (100%)

Before hypothesis testing, a normality test was conducted using *Shapiro-Wilk* and a homogeneity of variance test using *Levene's Test*. The results showed that ODS and NRS data were not normally distributed ($p<0.05$) but had homogeneous variances ($p>0.05$). Therefore, the analysis continued with non-parametric statistical tests.

Table 2. Results of Normality (Shapiro-Wilk) and Homogeneity (Levene Test)

Variable	Normality (Pre) P-value	Normality (Post) P-value	Homogeneity P-value	Remarks
ODS (Skin)	0.000	0.000	0.820	Not Normal, Homogeneous
NRS (Pain)	0.010	0.010	0.244	Not Normal, Homogeneous

Analysis using the *Wilcoxon Signed Rank Test* showed a significant decrease in *Overall Dry Skin* (ODS) scores in the group given DHA and EPA. Conversely, there were no significant changes in the control group.

Table 3. Mean Overall Dry Skin (ODS) Scores Before and After Intervention

Group	Pre-test Mean	Post-test Mean	Difference (Delta)	p-value
Control	1.73	1.50	0.23	0.102
Intervention (DHA+EPA)	2.33	1.19	1.14	0.000

For the joint pain variable, the intervention group showed a drastic and statistically significant decrease in NRS scores. The control group only experienced a slight, non-significant decrease.

Table 4. Mean Joint Pain (NRS) Scores Before and After Intervention

Group	Pre-test Mean	Post-test Mean	Difference (Delta)	p-value
Control	3.32	3.18	0.14	0.083
Intervention (DHA+EPA)	5.38	2.43	2.95	0.000

To determine the effectiveness of the intervention compared to the control, a *Mann-Whitney U Test* was performed on the *post-test* data. The results showed significant differences in both variables, proving that DHA and EPA supplementation is more effective than no supplementation.

Table 5. Mann-Whitney Test Results (Comparison of Difference/Final Between Groups)

Variable	Comparison	p-value	Interpretation
ODS	Intervention vs Control	0.014	Significant difference found
NRS	Intervention vs Control	0.020	Significant difference found

DISCUSSION

The characteristics of the respondents in this study indicated that the majority of participants belonged to the middle-aged adult group, specifically those aged 18–44 years in the intervention group (71.4%) and the control group (63.6%). These findings are consistent with the literature stating that Sjogren's syndrome is more frequently encountered in middle-aged women, particularly those over the age of 40. The mean ages in the intervention group (39.5 years) and the control group (42.6 years) were relatively similar, indicating a homogeneous age distribution that minimizes age-related bias. The predominance of women in both groups (95.2% and 100%) is consistent with the characteristics of this disease, considering the influence of estrogen and the tendency for immune system hyperactivation in women, which play a role in the pathogenesis of Sjogren's syndrome [6].

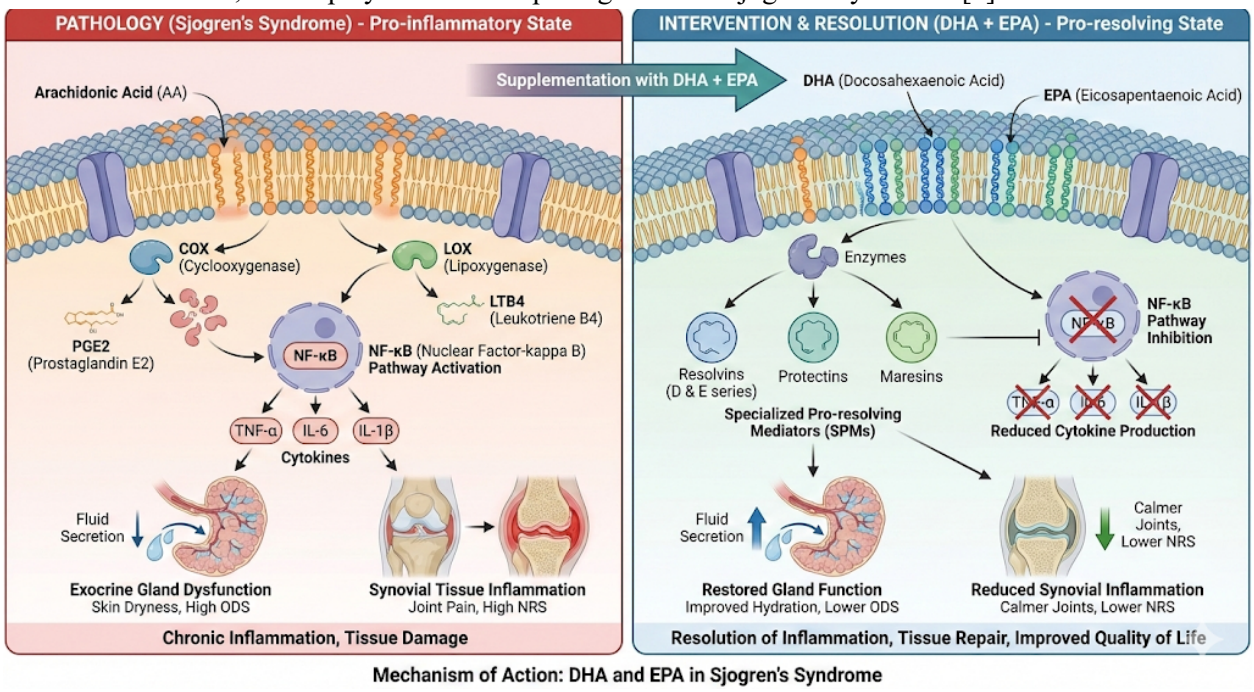

Figure 1. Proposed mechanism of action of DHA and EPA supplementation in the modulation of inflammation and clinical improvement in Sjogren's syndrome. The diagram contrasts the pathological pro-inflammatory state (left), driven by arachidonic acid (AA) metabolism and NF-κB pathway activation that triggers cytokine release (TNF-α, IL-6, IL-1β) and tissue dysfunction, with the resolution phase (right) induced by DHA and EPA intervention. Upon supplementation, DHA and EPA are incorporated into cell membranes, displacing AA and serving as substrates for the biosynthesis of Specialized Pro-resolving Mediators (SPMs)—specifically resolvins, protectins, and maresins. These mediators, combined with the direct inhibition of NF-κB signaling, suppress pro-inflammatory cytokine production, thereby promoting the restoration of exocrine gland function (reduced ODS) and the alleviation of synovial inflammation (reduced NRS).

This study demonstrated a significant reduction in ODS scores following two months of DHA and EPA supplementation (p=0.000), whereas the control group showed no significant difference. The decrease in the mean ODS score from 2.33 to 1.19 in the intervention group indicates that omega-3 supplementation is effective in improving dry skin symptoms in patients with Sjogren's syndrome. This aligns with the disease pathogenesis, in which immune cell infiltration of exocrine glands reduces secretion, resulting in xerosis [7,8]. EPA and DHA are

known to possess anti-inflammatory effects by inhibiting the production of pro-inflammatory cytokines such as TNF-alpha and IL-6, and by increasing resolvins and protectins, which play a role in tissue healing and skin hydration [9,10]. A study by Barcelos et al. supports these findings, showing that fish oil can improve dry skin conditions in animal models [11]. Furthermore, Singh et al. [12] reported that omega-3 may reduce dryness symptoms in patients with Sjogren's syndrome.

Regarding joint pain, the intervention group showed a significant decrease in NRS scores from 5.38 to 2.43 ($p=0.000$), while the control group showed no significant reduction. Arthralgia in Sjogren's patients is caused by immunologically mediated inflammatory processes in the synovial tissue [13,14], and the anti-inflammatory effect of omega-3 works through the inhibition of the NF-κB pathway, reduction of pro-inflammatory prostaglandins and leukotrienes, and upregulation of resolvins that accelerate inflammation resolution [15,16]. Previous studies in patients with rheumatoid arthritis have also shown that omega-3 fatty acids can reduce joint pain and stiffness [17]. Findings by Morales et al. indicated that omega-3 is associated with reduced systemic inflammation in patients with Sjogren's syndrome [18].

The effectiveness of DHA and EPA supplementation can be explained through their biological mechanisms. In the skin, EPA and DHA enhance hydration by increasing lipid levels in the stratum corneum and reducing transepidermal water loss (TEWL) [19]. Additionally, omega-3 improves the skin barrier by increasing ceramides, cholesterol, and free fatty acids [20]. In joint tissue, DHA and EPA suppress pro-inflammatory cytokines such as IL-1beta, TNF-alpha, and IL-6, and inhibit NF-kappaB activation [21,22]. Omega-3 also serves as a precursor to resolvins and protectins, which play a crucial role in the inflammatory resolution phase, thereby accelerating tissue recovery and relieving pain [5].

The findings of this study are consistent with prior studies. Rajaei et al. reported that omega-3 fatty acids may reduce pain and reduce the need for NSAIDs in patients with rheumatoid arthritis [17]. A study by Kostoglou-Athanassiou et al. showed that omega-3 supplementation reduced levels of inflammatory cytokines IL-6 and TNF-alpha [16]. Research by Barcelos et al. proved the positive influence of omega-3 on skin hydration [11]. However, Balić et al. reported that skin improvement occurred only after 8–12 weeks of supplementation, suggesting that the duration of the intervention influences the results [21]. Differences between studies may be influenced by dosage, duration, omega-3 source, and subject characteristics

These results are consistent with the biological mechanisms of omega-3 described by Simopoulos and Gutierrez, namely the replacement of arachidonic acid in cell membranes, which lowers the production of pro-inflammatory eicosanoids such as PGE2 and LTB4 [5]. Omega-3 also increases the resolution of inflammation mediators, such as resolvins, protectins, and maresins. In the context of Sjogren's pathogenesis, these findings align with the theory proposed by Brito-Zerón, which posits that chronic activation of T and B cells drives exocrine gland damage and tissue inflammation [23].

This study has clinical, theoretical, and practical implications. Clinically, the results suggest that DHA and EPA may be considered supportive therapies for managing dry skin and joint pain in patients with Sjogren's syndrome. Theoretically, these results strengthen the understanding of immune response modulation by omega-3 in autoimmune diseases. Practically, these findings can be used by healthcare professionals as a basis for educating Sjogren's patients regarding the benefits of anti-inflammatory nutrition

CONCLUSIONS

DHA and EPA supplementation significantly reduced skin dryness (ODS) and joint pain (NRS) in patients with Sjogren's syndrome at Dr. Moewardi Hospital. DHA and EPA have the potential to serve as safe and effective adjunctive therapies to improve the quality of life in patients with Sjogren's syndrome.

Author Contributions

Conceptualization, S.D.W. and A.N.; methodology, S.D.W.; software, D.N.P.; validation, A.N.; formal analysis, S.D.W.; investigation, S.D.W. and D.N.P.; resources, S.D.W.; data curation, D.N.P.; writing—original draft preparation, S.D.W.; writing—review and editing, A.N.; visualization, D.N.P.; supervision, A.N.; project administration, S.D.W. All authors have read and agreed to the published version of the manuscript.

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Institutional Review Board Statement

The study was conducted in accordance with the Declaration of Helsinki, and approved by the Health Research Ethics Committee of Dr. Moewardi Hospital (protocol code 123/II/2025).

Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

Data Availability Statement

The data presented in this study are available on request from the corresponding author.

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Conflicts of Interest

The authors declare no conflict of interest.

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