Review

Research evidence and patient perspective on the impact of lifestyle factors in patients with Sjögren's disease

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ABSTRACT

Modification of lifestyle factors can prevent the development or worsening of chronic diseases and decrease mortality. Optimising lifestyle behaviour can complement pharmacological treatment and enable patients to play an active role in their own care. In this article, we summarise the current research evidence together with the patient perspective on the impact of lifestyle factors in patients with Sjögren's disease (SjD), with focus on physical activity, diet, stress, sleep, mental well-being and participation.

Our findings regarding (modifiable) lifestyle factors underline their importance in the management of patients with SjD. A holistic, biopsychosocial approach to disease management, incorporating lifestyle adaptation and psychosocial support, is necessary to address the full spectrum of patient needs and to alleviate the multidimensional burden of the disease.

Introduction

"*Current considerations of a healthy lifestyle are not much different than the six non-naturals considered by ancient Greek physician in the Hippocratic tradition as the basis of health*". This statement was made by the reviewer of our recent article about physical activity in patients with Sjögren's disease (SjD). In ancient Greek medicine (1), six non-naturals were considered crucial for maintaining health and well-being: level of physical activity (including balance between exercise and adequate rest), food and drink (quantities and types), balance between sleep and wakefulness, evacuation and repletion (body's natural processes of eliminating waste and maintaining fullness), passions of the mind (strong emotions, maintaining emotional balance) and environment (air quality). In the current global rise of lifestyle-related conditions, specific attention for modifiable lifestyle factors and their impact on disease may be even more important.

In general, modification of lifestyle factors can prevent the development or worsening of chronic diseases and decrease mortality. So far, probably most research data is available on physical activity, followed by dietary patterns. A recent analysis in 4 multinational mega cohorts demonstrated that the association between physical activity and mortality risk is consistent across the adult lifespan, which indicates that promotion of regular physical activity is essential at all stages of adult life (2). Sedentary behaviour can have broad physiological impact. Prolonged time spent sitting versus interrupting sedentary behaviour influences the cardiovascular and respiratory systems, musculoskeletal system, central nervous system, body weight and adiposity, as well as immunity and inflammatory responses (3). Furthermore, physical activity has been shown to prevent or ameliorate lifestyle-related diseases, facilitate healthy ageing, enhance physical function, and reduce the burden of chronic diseases (4). Regarding nutrition, a large population-based study demonstrated that long-term adherence to a healthy diet during mid-life is associated with greater odds of healthy aging. More detailed analysis on dietary factors within dietary patterns showed positive associations with healthy ageing for higher intakes of fruits, vegetables, whole grains, unsaturated fats, nuts, legumes and low-fat dairy products and negative associations for higher intakes of trans fats, sodium, sugary beverages and red or processed meats (5).

In the management of rheumatic diseases, medical attention for prevention

and healthy lifestyle is also important. Based on large databases from the Nurses' Health Studies, physical inactivity, unhealthy (ultra-processed) food, obesity, smoking and chronic stress were significantly associated with increased risk of rheumatoid arthritis (RA) and systemic lupus erythematosus (SLE) among women (6-12). The European League Against Rheumatism (EULAR) recommendations regarding lifestyle behaviours and work participation stated that modifiable lifestyle factors can prevent progression of rheumatic and musculoskeletal diseases (RMDs). These 2021 EULAR recommendations considered six lifestyle exposures (exercise, diet, weight, alcohol, smoking, work participation) and seven RMDs (osteoarthritis, RA, axial spondyloarthritis, psoriatic arthritis, SLE, systemic sclerosis, gout) (13). Five overarching principles and 18 specific recommendations were defined based on available evidence. According to the formulated overarching principles, lifestyle behaviours are important to implement in daily clinical practice: 1. Lifestyle improvements complement medical treatment and do not replace it. 2. Lifestyle improvements are an essential part of RMD management and add to overall health benefits. 3).orld Health Organization recommendations for a healthy lifestyle are also applicable to people with RMDs. 4. Lifestyle recommendations for each individual with an RMD depend on factors such as age, sex, health condition, pregnancy and comorbidities. 5. There should be regular discussions between people with RMDs and health professionals regarding lifestyle factors (13).

Overall, we think that most EULAR recommendations on lifestyle behaviours are also applicable for patients with SjD. Unfortunately, SjD was not specifically included in the recommendations, possibly due to the relatively small number of studies available, despite the fact that it is one of the most common RMDs after RA and that SjD can occur in association with another systemic autoimmune disease (associated SjD) (14). However, it aligns well with the patient perspective represented by Sjögren Europe, a European federation of national associations representing Sjögren's patients (15). Optimising lifestyle behaviour can complement pharmacological treatment and enable patients to play an active role in their own care. Here, we summarise the available evidence from research together with the patient perspective on the impact of lifestyle factors in patients with SjD, with focus on physical activity, diet, stress, sleep, mental wellbeing and participation.

Physical activity

The 2021 EULAR recommendations state that regular exercise is beneficial for many health outcomes. Patients with RMDs should exercise because of the beneficial effects on pain, function and quality of life. It is recommended to avoid physical inactivity and to perform both aerobic and muscle strengthening exercises aiming for at least moderate intensity. Based on exercise intervention studies in RMDs, exercise is safe and it is never too late to start exercising (13). In the context of SjD, a recent systematic review and meta-analysis of 5 randomised controlled trials showed that exercise interventions significantly improved pain, fatigue, quality of life and aerobic capacity compared to no-treatment controls. Resistance exercise was found to be particularly effective (16).

The modified Short QUestionnaire to Assess Health-enhancing physical activity (mSQUASH) has been developed and validated to measure physical activity in all relevant domains: 1. commute to/from work or school and other destinations, 2. work or school/study, 3. household activities, 4. leisure time and sports and exercise, in patients with RMDs (17, 18). Our recent study demonstrated that the mSQUASH is a feasible, valid and reliable questionnaire to measure physical activity in patients with SjD (19). Subsequently, compliance with the World Health Organization (WHO) recommendations for physical activity was investigated using the mSQUASH in 245 patients from the REgistry of Sjögren's disease LongiTudinal (RESULT) cohort. Almost all (92%) patients with SjD performed aerobic physical activity (≥150 minutes of moderate-intensity). The muscle strengthening component (≥2 days a week) and functional balance component (≥3 days a week) was fulfilled by 31% and 7% of patients, respectively. In addition to aerobic activities such as walking and cycling, SjD patients could integrate more muscle strengthening activities and functional balance activities, to enhance functional capacity and to prevent falls, to further benefit from the positive effects of physical activity. Higher levels of physical activity were significantly associated with better health-related quality of life, with the strongest association for physical functioning and role limitations due to physical health (20).

To implement physical activity recommendations, more research on identifying disease-specific barriers and facilitators for the different components of physical activity is very relevant. A large survey within the People with Arthritis and Rheumatism (PARE) network from EULAR, among which 49 patients with SjD, nicely indicated that the main barriers that stop people with RMDs to do more physical activity, fatigue (61%), pain (54%) and painful/swollen joints (51%), are the ones that can be significantly improved through physical activity engagement (21). Physical fatigue characterises patient experience of SjD. In an open-label trial, before the start of rituximab treatment, SjD patients rated the need to reduce their physical fatigue symptoms as very high, reflected by median score of importance of 10 (on a scale of 0 to 10). Interestingly, the vast majority of patients (86%) reported physical fatigue as most eligible for improvement, more than symptoms of pain and dryness (22).

Patient perspective

Effective patient education on physical activity is essential, particularly in the context of SjD. Pain and fatigue are commonly reported barriers to exercise, and the disease frequently alters a patient's perception of their body and physical capacity. These shifts often contribute to maladaptive beliefs, such as the expectation that movement will exacerbate pain, which can reinforce

avoidance behaviours. This psychological response is part of a self-reinforcing cycle that undermines functional ability and overall well-being.

Targeted education is therefore critical. Although patients are generally aware that physical activity is recommended, many lack understanding regarding the rationale, appropriate modalities, and how to initiate or sustain an exercise routine. Guidance from healthcare professionals is essential to ensure that physical activity is tailored to the individual's condition and introduced gradually to prevent frustration or flare-ups. Peer support also plays a pivotal role. Patient organisations can serve as valuable adjuncts to clinical care by offering peer-led encouragement, real-world advice, and lived experience that validates the challenges of the disease. Testimonies from fellow patients may enhance adherence by reinforcing professional guidance in a relatable and trustworthy manner.

Moreover, it is important to demystify the concept of "physical activity" for patients. Many equate it with high-intensity or structured exercise, which may feel inaccessible. Clear communication is needed to emphasise that moderate activities, such as brisk walking or gardening, are both beneficial and acceptable forms of exercise.

In this context, patient associations serve as an important bridge between patients and healthcare providers, providing credible, experience-based support that complements clinical recommendations and empowers patients to engage actively in their own care

Diet

The 2021 EULAR recommendations state that a healthy, balanced diet is integral to lifestyle improvement for people with RMDs. People with RMDs should be informed that consuming specific food types is unlikely to have large benefits for RMD outcomes (13). The 16-week 'plants for joints' multidisciplinary lifestyle program substantially decreased disease activity, with a mean difference of -0.9 in DAS-28 compared to the control group, and improved metabolic status in patients with RA with low to moderate disease activity. This lifestyle program is based on a whole-food plant-based diet, physical activity and stress management (23).

In SjD, dry mouth and related problems including poor dental status, swallowing problems and loss of taste or smell can be association with malnutrition. According to the Global Leadership Initiative on Malnutrition (GLIM) criteria, malnutrition can be present in two different phenotypes: 1. undernutrition defined as the presence of unintentional weight loss, low BMI (underweight ≤18.5 kg/m^2) or reduced muscle mass in combination with reduced food intake/assimilation or inflammation/disease burden, and 2. sarcopenic obesity defined as obesity (BMI ≥30 kg/m^2) in combination with reduced muscle mass. Both phenotypes may be present in SjD. For these patients, the combination of dietary treatment and physical activity is recommended (24).

In a cross-sectional study, 39 patients with SjD completed the Dutch Healthy Diet Food Frequency Questionnaire (DHD-FFQ), which evaluates intake of physical activity, vegetables, fruit, dietary fiber, saturated fatty acids, trans fatty acids, consumption occasions with acidic drinks and foods, sodium and alcohol. At group level, the mean DHD-FFQ score was 56±12 in SjD patients (25), which is lower than mean scores reported in the general Dutch population (69±16 and 79±16 for men and women, respectively) (24). Research on dietary patterns in SjD is limited, but adherence to a Mediterranean diet has been associated with a lower likelihood of SjD. Among dietary components, the strongest association was seen with fish (odds ratio (OR): 0.44, 95% confidence interval (CI) 0.24–0.83) (26). A recent cross-sectional study in 114 patients with SjD from France showed an association between lower ocular dryness severity in patients with SjD and adherence to the Mediterranean diet, particularly the components related to polyunsaturated fatty acids consumption (27). A Turkish study showed that 31%, 61% and 8% of 91 patients with SjD had good, median and poor adherence to the Mediterranean diet over the previous year, respectively, according to the PREvencion con DIeta MEDiterranea (PREDIMED). No differences regarding demographic data, disease activity and cardiovascular risk factors were identified between adherence groups. However, only few patients had an overall healthy lifestyle also including physical activity and adequate sleeping time. The PREDIMED score was inversely correlated with disease activity measured by EULAR Sjögren Syndrome disease activity index (ESSDAI; rho=-0.27). Fish consumption was associated with lower prevalence of hypertension (28). Another study using the Energy-Adjusted Dietary Inflammatory Index in 102 patients with SjD from Turkey found that an anti-inflammatory diet was associated with lower anthropometric measurements (body weight, BMI, waist circumference, hip circumference, and body fat mass) and reduced blood lipids (total cholesterol, triglycerides, and low-density lipoprotein cholesterol concentration), but its relationship with disease activity and inflammation remained unclear (29).

A gluten-free diet has been tested in SjD patients with coeliac disease (CD) and indicated modest improvements (30). This may thus be useful for this subgroup with CD, but not for all patients, in the context of the increased cardiovascular risk in SjD. The overall prevalence of CD of 7.06% was higher in SjD patients in comparison to a wide control population (31).

Microbiome studies showed that patients with SjD have alterations in gut and oral microbiota composition compared to the general population (25, 32). This may negatively influence the digestion and other (immunological) processes, which warrants further investigation.

Patient perspective

We face two problems here. The first is the lack of studies on SjD, which makes it difficult for healthcare professionals to take a clear stance and promote a certain type of diet in the absence of scientific data. As mentioned earlier, there are strong indications, and in any case, the Mediterranean diet seems the most suitable for patients suffering from RMDs.

The second challenge pertains to communication. Patients often associate

the term "diet" with weight loss, which can trigger feelings of judgment and lead to dismissal of clinical advice when not supported by clear, evidence-based explanations. Many patients do not fully understand the relationship between nutrition, body weight, and disease activity in RMDs. Given time constraints during consultations, healthcare professionals may be unable to provide detailed education regarding the negative impact of excess weight or highly processed food consumption. Nonetheless, consistent and clear communication about dietary recommendations and their potential health benefits remains essential.

Although further research specific to SjD is warranted to substantiate the role of diet in disease modulation, current empirical evidence supports continued promotion of a Mediterranean-style diet for its general health benefits. Additional barriers to dietary adherence must also be considered. The physical symptoms of SjD, particularly fatigue and joint pain, can significantly impair a patient's ability to prepare meals from scratch. Even basic tasks, such as peeling vegetables, may be burdensome due to musculoskeletal discomfort. Fatigue itself is a strong deterrent to meal preparation, often leading patients to rely on processed foods for convenience. Moreover, the financial strain associated with chronic illness may limit access to fresh, unprocessed ingredients, with the Mediterranean diet sometimes perceived as cost-prohibitive.

Other lifestyle factors

There are many other lifestyle factors that can be considered in the context of healthy ageing, amongst others stress management, sleep and mental wellbeing. Like physical activity and dietary patterns, these lifestyle factors are (at least partly) modifiable to facilitate prevention of the development and worsening of SjD.

Stress. Stressful life events can have impact on the pathogenesis of SjD. In a large Swedish retrospective cohort study of exposed patients with stress-related disorders, diagnosis of stress-related disorders was significantly associated with an increased risk of autoimmune disease (hazard ratio (HR): 1.36, 95% CI: 1.33-1.40) including SjD, in comparison to matched unexposed individuals and full siblings (33). A systematic review on risk factors for SjD demonstrated that experiencing a larger number of negative stressful life events increased the risk of SjD onset (34). A recent study evaluating the impact of stressful events within 12 months prior to the diagnosis in 50 patients with SjD and 50 control patients with osteoarthritis showed that patients with SjD had a significantly higher total score on the modified Holmes-Rahe stress scale. Furthermore, SjD patients reported more commonly a subjectively perceived correlation between stressful events and the occurrence of disease symptoms (50% vs. 12%). The Holmes-Rahe stress scale at the time of the assessment correlated with ESSDAI and Sjögren Syndrome Disease Damage Index (SSDDI) (35).

Sleep

A global population-based retrospective cohort study using electronic health records identified that impaired sleep significantly increased the risk for several autoimmune diseases including SjD (HR: 1.84; 95% CI: 1.64–2.07). This study highlights the important role of sleep in maintaining immune homeostasis, which involves the autonomic nervous system, immune signalling pathways, and endocrine regulation (36). An actigraphy study in 14 women with SjD indicated that sleep was less efficient compared to 25 women with RA. Greater discomfort in the evening was followed by poorer reported quantity/quality of sleep, worse sleep efficiency and more fatigue in the following day (37). In the United Kingdom Primary Sjögren's Syndrome Registry (UKPSSR) cohort of 857 patients with SjD, daytime hyper-somnolence was prevalent and positively correlated with fatigue. To explore sleep disturbances further, sleep diary data were examined from a cohort of 30 SjD patients presenting to a fatigue clinic. Self-reported sleep disturbances comprised difficulties in maintaining sleep, frequent awakenings throughout the night and difficulties in returning back to sleep (38). Aspects as dry mouth and frequent micturition are symptoms often mentioned as having a negative influence on sleep quality.

Mental wellbeing

A recent large case-control study in the Taiwan's National Health Insurance Research Database found significant associations between a history of mental illnesses and several autoimmune diseases, with the strongest association for SjD (OR: 2.35, 95% CI, 2.28–2.42) (39). An earlier study using this database observed significantly increased incidences of depressive disorder (adjusted incidence rate ratio (aIIR): 2.11, $p<0.001$), anxiety disorder (aIIR: 2.20, $p<0.001$), and sleep disorder (aIIR: 1.76, $p=0.012$) in patients with SjD (40). A systematic review and meta-analysis with a secondary analysis of 3 studies on mental health well-being showed that anxiety and depression was more common in women with SjD compared to control subjects (41). A study on fatigue in patients with SjD from UKPSSR cohort identified pain, depression and daytime sleepiness scores as factors most closely associated with both physical and mental fatigue (42).

Patient perspective

Patients are generally aware of the importance of managing stress, maintaining sleep hygiene and supporting mental health, principles applicable to the general population. However, SjD presents unique challenges, as the condition itself contributes significantly to psychological distress, reduced well-being, and poor sleep quality.

Many patients report that insufficient sleep exacerbates both emotional distress and depressive symptoms, highlighting the bidirectional relationship between physical symptoms and mental health. SjD remains an under-recognised, insidious condition with no currently approved treatment. Its invisibility and lack of public and clinical awareness often lead to feelings of isolation and misunderstanding, both from healthcare professionals and the patient's social network.

The core symptom triad of the disease (chronic pain, fatigue and mucosal dryness) often creates a self-perpetuating cycle that significantly impacts quality of life. When compounded by systemic manifestations, the burden becomes even more substantial.

It is essential that healthcare professionals demonstrate empathy and guide patients toward appropriate management strategies when necessary. Whether the intervention is pharmacological or psychological, patients should consistently be offered support, given the complexity of living with this condition. The impact of SjD on mental health must not be underestimated, patients are not experiencing symptoms as a result of depression; rather, their depressive symptoms arise from the persistent clinical manifestations of the disease

Participation

The National Sjögren's Foundation survey in the USA identified sex life (53%), participating in hobbies/social activities/extracurricular activities (52%), and job/career or ability to work (49%) as the top-three aspects of quality of life which are most impaired in SjD (43). Therefore, it seems very relevant to consider these factors as well.

A systematic review and meta-analysis of 6 studies demonstrated that women with SjD had significantly lower scores in all domains of the Female Sexual Function Index (FSFI). Lubrication showed the largest decline, followed by pain, arousal, orgasm, satisfaction, and desire (41). Questionnaire research in 46 women with SjD and 43 age-matched healthy controls found that 56% of patients had sexual dysfunction. Women with SjD had impaired sexual function, experienced more sexual distress and were sexually active less frequently than controls. The majority of patients reported not discussing sexual concerns with their rheumatologist, despite experiencing impaired sexual function (44). In-depth interviews with 11 females and 9 males with SjD from the Netherlands confirmed the unmet need for support, advice and treatment of sexuality-related symptoms related to SjD. In both sexes, six themes were identified as important in sexual experience and functioning: chronic stress in life, symptoms of SjD (affecting sexual experience), invisible suffering of SjD, impact of illness perception on coping strategies for sexuality-related symptoms, quality of (sexual) partner relationship and taboo of sexuality (45).

Limited research on work participation has shown increased disability among SjD patients compared to the general population. Questionnaire research in 195 patients with SjD found lower employment rates and higher disability compensation rates in the SjD population compared to the general Dutch population. Furthermore, health-related quality of life was lower in patients eligible for disability compensation (46). Another study in 252 patients with SjD from Argentina also found a compromise in all domains of the work productivity and activity impairment (WPAI) questionnaire. The average percentage of time lost due to health was 15.7±30.1 hours, decrease in work productivity was 27.2±30.2%, total disability was 33.7±35.8% and ADL deterioration was 34.2±30.9% (47). Social participation is also crucial aspect, but research in this area is limited, with the existing data proving only basic information that social participation in SjD patients is within range for United States normative values, but that fatigue strongly predicts social participation in SjD patients (48).

During the development of the Sjögren's Related Quality of Life (SRQoL) questionnaire, 20 participants were interviewed about the patient experience of SjD. Concepts were categorised in eight domains: emotional well-being (*e.g.* worry and stress), sleep (*e.g.* daytime sleepiness and waking up during the night), activities of daily living (*e.g.* difficulty looking at screens and difficulty driving), cognition (*e.g.* concentration difficulties and word finding difficulties), physical functioning (*e.g.* difficulty walking and difficulty exercising), social and family functioning (*e.g.* dependent on others and relationship difficulties), work, and sexual functioning (49). This research nicely demonstrates the holistic impact of SjD and underlines the importance of lifestyle factors and their impact on disease.

Patient perspective

It is critical to acknowledge the significant impact SjD on patients' sexual health, a domain often overlooked once vaginal dryness is addressed by gynaecological evaluation. This topic must no longer be considered taboo; rather, it should be fully integrated into the broader assessment of disease burden. Patients frequently report experiences of invalidation or minimisation of their symptoms in this area. However, the consequences are both physically distressing (pain due to mucosal dryness, increased susceptibility to infections, persistent discomfort) and psychologically detrimental. Many patients describe strain or deterioration in their intimate relationships, often leading to mutual dissatisfaction and emotional distress.

Sexual health remains surrounded by stigma, particularly in chronic illness contexts. As noted previously, patients are often reluctant to raise this topic with their rheumatologist. In the best-case scenario, vaginal dryness may be managed by a gynaecologist, but this leaves gaps in care, especially for male patients, and fails to address broader contributors such as systemic pain, severe fatigue, and poor mental health, all of which negatively affect sexual well-being.

It is essential that healthcare professionals initiate discussions around sexual health in a sensitive, inclusive, and structured manner. This may include designating a nurse or other allied health professional as a point of contact, offering patients a safe space to express concerns and receive holistic support. Relationships are often deeply affected, and lack of understanding can quickly erode communication and connection between partners. Patients must be empowered to speak openly with both their care team and their partners in order to prevent further deterioration of an already impaired quality of life.

Conclusion

In this article, we provide a comprehensive overview of current research evidence and patient perspectives highlighting the importance of lifestyle factors in SjD. It should be noted that for some

lifestyle aspects, evidence is extrapolated from studies in other rheumatic diseases, as high-quality randomised controlled trials for SjD are scarce. Therefore, further research is needed and it is too early to use standardized methodology for assessing the quality or strength of evidence, for example based on the Grading of Recommendations Assessment, Development and Evaluation (GRADE) system for systematic reviews and clinical guidelines.

Current research evidence together with the patient perspective on the impact of physical activity, diet, stress, sleep, mental well-being and participation underline the importance of (modifiable) lifestyle factors in the management of patients with SjD. A holistic, biopsychosocial approach to disease management, incorporating lifestyle adaptation and psychosocial support, is necessary to address the full spectrum of patient needs and to alleviate the multidimensional burden of the disease.

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