Abstract: Aim: This study examines the prevalence and severity of orofacial disorders in patients with fibromyalgia syndrome (FMS). The research assesses the correlation with the Fibromyalgia Assessment Status (FAS) index. The goal is to improve the clinical approaches to these patients.

Methods: A cross-sectional study was conducted using a structured questionnaire focused on the correlation between FMS and orofacial problems. The research involved 107 rheumatology patients diagnosed with FMS. Statistical analyses, including Spearman’s correlation, were utilized to investigate the relationships between the FAS index scores and various orofacial symptoms.

Results: Of the participants, 11.2% responded that they were aware of the correlation between fibromyalgia and oral health. The statistical analysis showed statistically significant correlations between the FAS index and symptoms such as gum bleeding, teeth grinding during the day, and neck pain ($p < 0.05$). The correlation between the FAS index and joint noise upon opening the mouth, as well as dissatisfaction with one’s smile, also proved to be highly significant ($p < 0.001$). Conclusion: The outcomes demonstrate that, as the FAS index increases, the likelihood of developing orofacial disorders also increases among FMS patients. This highlights the importance of a multidisciplinary treatment approach.

Keywords: FMS; orofacial pain; temporomandibular disorders; fatigue syndrome; oral health; FMS assessment status

1. Introduction

Fibromyalgia syndrome (FMS) is a chronic rheumatic disease, affecting at least 2% of the adult world population, females being higher in percentage, characterized by multifocal pain, fatigue, cognitive dysfunction, sleep disturbances, irritable bowel syndrome, headache, and mood disorders [1–3]. The symptoms are commonly multiple, fluctuant, and misleading [4].

The etiopathogenesis is still debated. It could be attributed to a genetic predisposition, personal experiences, emotional–cognitive factors, the mind–body relationship, and a biopsychological ability to cope with stress [3]. Comorbid conditions, such as functional somatic syndromes, psychiatric diagnoses, and rheumatologic conditions, may be present [5].
The diagnostic criteria are the following [6]:

- Multi-site pain defined as six or more pain sites from a total of nine possible sites.
- Moderate to severe sleep problems or fatigue.
- The multi-site pain plus fatigue or sleep problems must be present for at least three months.

In order to improve the diagnostic methods, the objective examination should constitute a fundamental moment in the diagnostic process, and it should include the research for tender points, walking performance tests, hand grip force, and autonomic tests [7].

In the diagnostic process, it is crucial to rule out the use of psychotropic substances and the presence of concurrent conditions such as sleep apnea, depression, and anxiety, along with an examination of the tender points. It is mandatory to consider the absence of a biomarker that may lead the physician to the final diagnosis. Because of this, additional laboratory tests are necessary to rule out other diseases like Systemic Lupus Erythematosus, Spondylarthritis, and Sjogren syndrome [4]. A multidisciplinary approach (rheumatologist, neurologist, physiotherapist, and psychologist) with nonpharmacologic therapies and medications to address the problematic symptoms is the most effective treatment [3]. Patient education, cognitive behavior therapy, and exercise should be integrated into the treatment plan. The medications that are effective for FMS are duloxetine, milnacipran, pregabalin, amitriptyline, non-steroidal anti-inflammatory drugs, and opioids. Pharmacological therapy is symptomatic and is not a curative treatment [3].

Nowadays, fibromyalgia is considered an example of nociceplastic pain. Increased pain perception at the central nervous system level and sensory processing with altered pain modulation may explain the mechanism of nociceplastic pain [8].

Nociceplastic pain is described by the international community of pain researchers as a third category of pain, in which the other two are nociceptive pain (caused by a lesion or tissue damage) and neuropathic pain (expressed as damage to the peripheral nervous system) [9].

FMS impacts the whole organism, including the musculoskeletal system, gastrointestinal tract (GIT), eyes, and mouth. The literature investigated oral problems in FMS patients, such as Sjogren syndrome, oral ulcerations, and orofacial pain, with Temporomandibular Disorders (TMDs) being the most significant association [10–12]. FMS and TMD share many epidemiological, clinical, and pathophysiological features, particularly muscle pain [13]. FMS can be an etiologic or aggravating factor, or it could represent a general vulnerability to pain disorders [12,14].

Given the high prevalence of TMD among FMS patients, TMD should be considered in the diagnosis and treatment planning of FMS to enhance the therapeutic outcomes [14]. The link between TMD and FMS could be explained by the disfunction of the descending pain inhibitory system, suggesting that FMS is a likely risk factor for TMD [12].

TMD and FMS share some regional and central mechanisms in common [14]. TMD and FMS show overlapping features, which may be defined as an amplified response of the central nervous system (CNS) to sensory stimuli and peripheral nociception, characterized by hyperexcitability in the dorsal horn neurons in the spinal cord, which ascend through the spinothalamic tract [15]. Gui et al. established that 86.7% of FMS patients present TMD [13]. Ayouni et al. pointed out the high prevalence of TMD in FMS patients, with muscle tenderness on palpation, muscle pain, and temporomandibular joint pain as the most common symptoms [12]. Sahbaz et al. demonstrated possible correlations between FMS and parafunctions, such as bruxism, tooth grinding, or masseter hypertrophy [16].

The TMD symptoms in FMS patients do not differ from the symptoms of those patients that are not affected: muscle pain, temporomandibular joint pain, and muscle tenderness on palpation [14,17]. Assuming that FMS could be an etiological or aggravating factor of TMD, patients with FMS should be followed by a dentist to treat TMD and to improve the outcomes in FMS treatments with a multidisciplinary approach.

The objective of this research is to evaluate the correlation between orofacial disorders using the FAS (Fibromyalgia Assessment Status) index in patients suffering from fibromyalgia. The hypothesis is that, as the FAS index increases, so does the rate of orofacial
problems reported by the patient. The second outcome is to evaluate the level of awareness of patients regarding the correlations between fibromyalgia and the typical pathologies of the stomatognathic system, with the chance of improving the therapeutic precision. The hypothesis is that patients suffering from fibromyalgia are not aware of the correlation between the pathology and orofacial disorders.

2. Materials and Methods

A literature analysis was performed to underline the main coexisting factors between fibromyalgia syndrome and orofacial diseases. The studied diseases in the research were TMD, orofacial pain, bruxism, and periodontitis. In the last 20 years, an increasing amount of studies have been focusing on TMD and orofacial pain, while periodontitis and bruxism have been studied much less. Based on these results, we decided to draw up a questionnaire in order to check the real correlation between the syndrome and the orofacial sphere and the possible connection with the severity of the disease.

A dentist and a rheumatologist created an anonymous 10-question questionnaire that consisted of 10 items: 2 items regarded demographic details (age and sex), 1 item focused on understanding if the patient was aware of the correlation between the pathology and orofacial disorders, and 8 items gathered insights on oral health (Supplementary Material 1).

The questionnaire asked the following questions:

1. Sex.
2. Age.
3. Are you aware of the correlation between fibromyalgia and oral health?
4. Do your gums bleed when you brush your teeth?
5. Do you suffer from facial pain?
6. Do you experience noises when opening your mouth?
7. Do you grind your teeth when you sleep?
8. Do you grind your teeth during the day?
9. Do you find yourself waking up with fatigued facial muscles or headaches?
10. Do you suffer from neck pain?
11. How satisfied are you with your smile on a scale from 1 to 5?

The questionnaire was submitted to consecutive patients with diagnosis of fibromyalgia in the outpatient clinic at the Rheumatology Unit of Papardo Hospital in Messina, Italy. The naïve patients at first examination were diagnosed as fibromyalgia patients after a detailed clinical examination, which included exclusion of peripheral or axial arthritis, other mimics diseases such as LES, connective diseases etc., and research on tender points. Check-up visit patients underwent a rheumatological examination after completing the questionnaire.

The FMS Assessment Status (FAS), a patient assessment tool based on pain, fatigue, and sleep disturbance symptoms, was assigned to each patient by an expert rheumatologist [18,19]. The FAS index was calculated adding a set of questions relating to non-articular pain (Self-Assessment Pain Scale; range 0 to 10), fatigue (range 0 to 10), and the quality of sleep (range 0 to 10) divided by three, providing a measure of disease activity ranging from 0 to 10.

The questionnaire was written in Italian and compiled anonymously by patients suffering from fibromyalgia. The research was conducted in accordance with the Declaration of Helsinki, and a brief written description of the study objective and privacy law on data collection was also administered. Before participating in the study, written informed consent was obtained from all subjects involved. Participants were thoroughly informed about the objectives of the research, the procedures used, and the potential benefits. They were guaranteed complete anonymity in the publication of the results, ensuring that the information collected would be used exclusively for scientific purposes. Each participant had the opportunity to ask questions and withdraw from the study at any time without any consequences. Upon completion, questionnaires were submitted to staff when completed by an inpatient. Refusal to complete the questionnaire did not affect the medical care
received. The questionnaires completed by the patients were subsequently assigned to a third operator to analyze the results.

Statistical Analysis

The numerical data were expressed as mean and standard deviation and the categorical variables as absolute frequencies and percentage.

The non-parametric approach was used since variables were not normally distributed, as verified by Kolmogorov–Smirnov test. The Spearman correlation test was applied to assess the possible correlations between FAS index and other variables.

To assess the existence of significant differences between male and female subjects, the Mann–Whitney test was applied with reference to numerical parameters (age and FAS index) and the chi-squared test for categorical variables (sex, etc.). Some boxplots were realized to better visualize the data.

Statistical analyses were performed using SPSS 27.0 for Windows package. A p-value lower than 0.05 was considered to be statistically significant.

3. Results

The questionnaire was submitted to 107 sequential patients and completed by 100% of them. No patient refused to fill it out. Moreover, 7.5% of the patients were male, and 92.5% of the patients were female. The mean age of the patients who filled out the questionnaire was 51 years (18 to 72).

Only 11.2% of the participants responded that they were aware of the correlation between fibromyalgia and oral health; 60.4% said they suffered from gum bleeding during oral hygiene procedures; 89.7% of the participants reported suffering from pain in the facial muscles; 44.9% of the patients experience noises in the temporomandibular joint when opening or closing the mouth; 71% of the patients grind their teeth at night, and 30.8% during the day; 98.1% of the patients reported waking up with tired or sore facial muscles; and 98.1% of the patients reported suffering from pain in the cervical area.

The average FAS index value of the patients was 25, with a minimum of 19 and a maximum of 32. The statistical analysis showed statistically significant correlations between the FAS index and symptoms such as gum bleeding, teeth grinding during the day, and neck pain (p < 0.05). The correlations between the FAS index and joint noise upon opening the mouth, as well as dissatisfaction with one’s smile, also proved to be highly significant (p < 0.001).

The results of questions 3 to 11 of the questionnaire are summarized in Table 1 and Figure 1.

Table 1. Questionnaire results regarding oral health.

<table>
<thead>
<tr>
<th>Question</th>
<th>n, (%)</th>
<th>Yes</th>
<th>No</th>
<th>I Do Not Know</th>
</tr>
</thead>
<tbody>
<tr>
<td>(3) Are you aware of the correlation between fibromyalgia and oral health?</td>
<td></td>
<td>12, (11.2)</td>
<td>95, (88.8)</td>
<td>0</td>
</tr>
<tr>
<td>(4) Do your gums bleed when you brush your teeth?</td>
<td></td>
<td>64, (59.8)</td>
<td>42, (39.3)</td>
<td>1, (0.9)</td>
</tr>
<tr>
<td>(5) Do you suffer from facial pain?</td>
<td></td>
<td>96, (89.7)</td>
<td>11, (10.3)</td>
<td>0</td>
</tr>
<tr>
<td>(6) Do you experience noises when opening your mouth?</td>
<td></td>
<td>48, (44.9)</td>
<td>58, (54.2)</td>
<td>1, (0.9)</td>
</tr>
<tr>
<td>(7) Do you grind your teeth when you sleep?</td>
<td></td>
<td>76, (71)</td>
<td>31, (29)</td>
<td>0</td>
</tr>
<tr>
<td>(8) Do you grind your teeth during the day?</td>
<td></td>
<td>33, (30.8)</td>
<td>72, (67.3)</td>
<td>2, (1.9)</td>
</tr>
<tr>
<td>(9) Do you find yourself waking up with fatigued facial muscles, or headaches?</td>
<td></td>
<td>105, (98.1)</td>
<td>2, (1.9)</td>
<td>0</td>
</tr>
<tr>
<td>(10) Do you suffer from neck pain?</td>
<td></td>
<td>105, (98.1)</td>
<td>2, (1.9)</td>
<td>0</td>
</tr>
</tbody>
</table>
Figure 1. Patients’ smile satisfaction (1 being completely unsatisfied and 5 being completely satisfied).

The distribution of the statistically significant correlations between the FAS index and the symptoms is represented in the boxplots in Figures 2–5.

Figure 2. Boxplot graph regarding the correlation between gum bleeding and FAS index.
Figure 2. Boxplot graph regarding the correlation between gum bleeding and FAS index.

Figure 3. Boxplot graph regarding the correlation between temporomandibular joint noises and FAS index.

Figure 4. Boxplot graph regarding the correlation between teeth grinding and FAS index.

Figure 5. Boxplot graph regarding the correlation between cervical pain and FAS index.
4. Discussion

Collecting epidemiological information using a questionnaire as part of a research study is now common practice [20–22]. Questions are also often asked about participants’ knowledge and attitudes toward various lifestyle and disease predisposing factors [20].

In this research, the questionnaire was filled out by the patients in the presence of a doctor, who could provide assistance and check the questionnaire for completeness.

The mean age of the patients was 51 years (range 18–72), in accordance with the data expressed in the Italian fibromyalgia registry (mean of 51.9) [23]. It should be highlighted how the age prevalence overlaps to other conditions with similar symptoms, such as TMD (18–60 years), TMJ osteoarthritis (usually peaks at 50–60 years of age), or other rheumatic conditions, thus not always allowing this parameter to be used to exclude/propose an FMS diagnosis [24–26].

Numerous studies have demonstrated the correlation between fibromyalgia disorders and orofacial disorders [27–31]. However, it is not clear from what factor this painful symptomatology affecting the muscles originates [11]. The current most-accrued hypothesis takes into consideration the similarities in the pathogenesis of the muscle impairment typical of both TMD and the pain related to fibromyalgia [13]. In fact, in patients suffering from fibromyalgia, the onset of TMD is more likely to happen. In these patients, the increased severity of the temporomandibular dysfunction could be justified by the amplification effect of the central nervous system. Even in patients not affected by fibromyalgia but who present “fibromyalgia-like” symptoms (fatigue, headache, joint pain and stiffness, and sleep disorders), as the severity of the disorders increases, the incidence and severity of the painful and dysfunctional symptoms affecting the temporomandibular joint increase, therefore presenting a pain centralization effect [32]. The centralization effect of pain, characterized by the abnormal processing of painful stimuli at the central nervous system level, triggers greater sensitivity at the muscular level, although without causing histological damage to the tissue involved [33]. The altered processing by the central nervous system can be attributed to the reduced expression of the enzyme glutamic acid decarboxylase.
(GAD), whose production and activity are regulated by lifestyle, physical activity, and stress [34]. The reduced activity or production of this enzyme can cause an imbalance in the concentration of GABA and glutamate, thus affecting the excitatory pathways responsible for pain [35].

As regards teeth grinding, 71% and 30.8% of the patients reported nightly grinding and daily grinding, respectively. Despite these data being significantly correlated to the FAS index, they are indeed self-reported data. As proposed by Lobbezoo et al. in an international consensus, only “possible sleep/awake bruxism is based on self-report”, while “definite sleep bruxism” and “definite awake bruxism” are defined by self-report and, respectively, polysomnography and electromyography [36]. It is then possible to overestimate the true extent of bruxism activities. Nonetheless, self-reported assessment of sleep or awake bruxism continues to be the primary tool in bruxism research and clinical practice [36].

Despite the widespread evidence stressing the importance of TMD assessment and its relationship with FMS, the current guidelines on fibromyalgia do not include a TMJ physical examination. A comprehensive evaluation should include, as per the Diagnostic Criteria for Temporomandibular Disorders (DC-TMDs), the assessment of the pain level spreading or patterns with muscle and joint palpation, and the evaluation and history of headache, mouth opening, and joint noises [37]. Not only TMJ and masticatory muscle evaluation but also any physical examination pieces of evidence in general are not currently used as diagnostic factors in the latest 2016 guidelines [6,38]. On the other hand, while in the 2010 diagnostic criteria a Widespread Pain Index (WPI) was considered, the “Jaw” area cannot suffice to explore or diagnose TMD [38]. The consensus debate on the diagnostic criteria is still ongoing among medical professionals, attempting to balance the exclusion of similar overlapping symptomatic illnesses and the inclusion of scores encompassing the varying symptomatology that these patients experience.

There is no research available in the literature relating orofacial disorders to the FAS index of patients suffering from FMS. The analysis of the data collected from our research demonstrates the correlation between the FAS index and some of the orofacial disorders analyzed by us. In particular, the correlation between FAS and gum bleeding during oral hygiene procedures, teeth grinding during the day, and the presence of neck pain was statistically significant (p < 0.05). Furthermore, the correlation between the FAS index and the presence of joint noises was highly significant (p < 0.001). The only correlation so far confirmed by the literature among those investigated in this research concerns the correlation between FMS and TMD; the data we analyzed agree with what has already been stated in the literature [39]. The results indicate that, as the FAS index increases, the probability of experiencing these symptoms increases.

Finally, a highly significant correlation (p < 0.001) was identified between the FAS index and the degree of dissatisfaction with one’s smile. The primary cause of tooth loss in the industrialized world is periodontitis, and gingival bleeding is a possible precursor sign of it [40]. Furthermore, 59.8% of patients have indeed reported gum bleeding during oral hygiene maneuvers, although the causes and consequences of this sign may vary widely [41–43].

These data may be useful to the clinician who, when visiting a patient suffering from FMS, could predict the evolution of the orofacial symptoms. As the FAS index increases, it is therefore possible that the demand for multidisciplinary treatments involving other branches of medicine outside of rheumatology will increase.

Considering the results obtained from this research, the authors recommend that clinicians incorporate early and regular screenings for orofacial disorders in the management of patients with FMS. This proactive measure is crucial as it enables the early detection of symptoms that may initially present subtly. Timely identification and intervention can prevent these symptoms from becoming severe, thereby mitigating the need for more invasive treatments.
The secondary outcome of this research investigates the awareness of the patients regarding the correlation between FMS and orofacial diseases. Indeed, 95% of the patients stated that they were not aware of the correlation between orofacial disorders and fibromyalgia at the time of completing the questionnaire. The patient’s knowledge of the pathology in detail could allow the patient to evaluate the possibility of carrying out a multidisciplinary treatment for the resolution of the symptoms or at least for their management. According to De Rossi et al., FMS causes diffuse masticatory muscle pain and disorders, and they could be resolved using FMS drugs [44]. A lack of awareness could lead to a lack of a multidisciplinary approach in the care of these patients, excluding a medical figure (the dentist) from the context of a systemic pathology that has demonstrably harmful repercussions on the stomatognathic system.

After completing the questionnaire, the patients were instructed by the professional regarding all the details of the current pathology and the correlations with all the aspects of the organism. Clinicians are advised to ensure that patients are well-informed about the common symptoms of orofacial disorders and their association with FMS. Educating patients to recognize the early signs, such as facial muscle pain or temporomandibular joint issues, is essential for prompt and effective management. Furthermore, clinicians should equip patients with self-management techniques, including muscle relaxation exercises and stress reduction strategies, empowering them to manage their symptoms effectively. This education should also extend to proper oral hygiene and advice on avoiding behaviors that exacerbate pain, such as the consumption of hard foods or excessively chewing gum.

Considering that the nociplastic pain present in patients suffering from fibromyalgia is a process of central sensitization in which chronicity plays a key role, the importance of the early diagnosis of possibly manifesting orofacial disorders and their early connection is underlined. As a result, the presence of the dentist and maxillofacial surgeon in the multidisciplinary team for the treatment of fibromyalgia is crucial.

Limitations

The use of a questionnaire can introduce interviewer bias. Patients’ answers may not be as truthful as a clinical examination carried out by a professional. The patients answered dental questions but were not visited by a dentist. The questionnaire used is not validated and is based on a self-report process. Moreover, due to the preliminary inquiry on the subject, no control group data were assessed. Another limitation is the restricted geographical origin of the sample: the patients came from the city of Messina and the neighboring provinces. Multicenter, multinational case-control studies are needed to confirm the results obtained.

5. Conclusions

The results we obtained confirm the correlation between fibromyalgia and some orofacial disorders such as bleeding gums, joint noises, teeth grinding during the day, neck pain, and dissatisfaction with one’s smile. These disorders become more frequent the higher the FAS index. Finally, most of the patients were unaware of the correlation between FMS and orofacial disorders.

The authors, considering the results obtained, want to emphasize the importance of a multidisciplinary approach to fibromyalgia syndrome in order to improve the outcome of fibromyalgia symptomatic therapy.

A prospective study on these patients, before and after dental treatments to check the improvement in fibromyalgia syndrome, may express a future research direction.

Also, developing dental devices that are able to improve the outcomes of some clinical aspects related to fibromyalgia syndrome orofacial pain presents a direction.
Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/app14166908/s1.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study. Written informed consent has been obtained from the patients to publish this paper.

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