

## Evaluation of quality of life and use of photobiomodulation in the management of pain in a patient with Eagle's Syndrome: A case report

Avaliação da qualidade de vida e emprego da fotobiomodulação no manejo da dor na Síndrome de Eagle: Um relato de caso

Evaluación de la calidad de vida y empleo de la fotobiomodulación en el manejo del dolor en el Síndrome de Eagle: Un reporte de caso

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### Abstract

Eagle's Syndrome (ES) is characterized by the manifestation of the symptomatology caused by an abnormal elongation of the styloid process or calcification of the stylohyoid ligament. The condition is rare, with a probable multifactorial etiology, affecting a small percentage of the population and its symptoms include odynophagia, dysphagia, orofacial pain and a foreign body sensation in the throat. Diagnosis is made through clinical assessment and imaging tests, and treatment is traditionally performed either surgically or conservatively, with the possibility of using photobiomodulation. This study aimed to report the case of a 53-year-old Brazilian woman diagnosed with ES who was seen at the Orofacial Pain Control Service of the Hospital Universitário Lauro Wanderley (HULW) in João Pessoa-PB. Epidemiological and clinical data and the patient's Quality of Life (QoL) were analyzed, with information collected through in-person questionnaires, and then compared with existing literature. In addition, the application of photobiomodulation using Light Emitting Diode (LED) was analyzed in 10 sessions as a complementary treatment for pain management in a patient with ES and its intensity was assessed before and after the sessions using the Visual Analogue Pain Scale (VAS). The analysis of the data obtained was consistent with the literature and suggests the multifaceted nature of the impact of ES on a patient's QoL. The LED therapy intervention seemed to improve aspects of the physical domain, but the data collected should be interpreted with caution due to the limitations of the study. It is concluded that LED therapy had beneficial effects in reducing pain in the patient and highlighted the potential efficacy of photobiomodulation as a promising intervention for pain management in SE.

**Keywords:** Temporal Bone; Quality of Life; Low-Level Light Therapy; Chronic Pain.

## Resumo

A Síndrome de Eagle (SE) é caracterizada pela manifestação sintomatológica provocada pelo alongamento anormal do processo estilóide ou calcificação do ligamento estilo-hioideo. A condição é rara, com etiologia provavelmente multifatorial, afetando uma pequena porcentagem da população e sua sintomatologia inclui odinofagia, disfagia, dor orofacial e sensação de corpo estranho na garganta. O diagnóstico é feito através da avaliação clínica e exames de imagem, sendo o tratamento tradicionalmente executado por via cirúrgica ou conservadora, podendo ser utilizada a fotobiomodulação. O presente estudo teve como objetivo relatar o caso de uma mulher brasileira de 53 anos com diagnóstico de SE captada no Serviço de Controle da Dor Orofacial do Hospital Universitário Lauro Wanderley (HULW) em João Pessoa-PB. Foi realizada uma análise de dados epidemiológicos, clínicos e a Qualidade de Vida (QV) da paciente, com as informações obtidas e registradas por meio de questionários aplicados de forma presencial, sendo comparadas posteriormente com a Literatura já existente. Além disso, foi analisada a aplicação de fotobiomodulação empregando Luz Emitida por Diodo (LED) em 10 sessões como tratamento complementar para o gerenciamento da dor em pacientes com SE e sua intensidade foi avaliada antes e após as sessões utilizando a Escala Visual Analógica da Dor (EVA). Os resultados foram compatíveis com a Literatura e sugerem o caráter multifacetário do impacto da SE na QV dos pacientes. A intervenção com LEDterapia pareceu melhorar aspectos do domínio físico, contudo os dados coletados devem ser interpretados com cautela, devido às limitações do Estudo. Ademais, conclui-se que a LEDterapia teve efeitos benéficos na redução da dor na paciente e destacou a potencial eficácia da fotobiomodulação como uma intervenção promissora para o manejo da dor em SE, mas enfatizou a necessidade de estudos adicionais com amostras maiores para confirmar esses achados.

**Palavras-chave:** Osso Temporal; Qualidade de Vida; Terapia com Luz de Baixa Intensidade; Dor Crônica.

## Resumen

El Síndrome de Eagle (SE) se caracteriza por la manifestación sintomatológica provocada por el alargamiento anormal del proceso estilóide o la calcificación del ligamento estilohioideo. La condición es poco frecuente, con etiología probablemente multifactorial, afecta a un pequeño porcentaje de la población y su sintomatología incluye odinofagia, disfagia, dolor orofacial y sensación de cuerpo extraño en la faringe. El diagnóstico se establece mediante evaluación clínica y exámenes de imagen. El tratamiento tradicionalmente puede ser quirúrgico o conservador, pudiendo ser utilizada la fotobiomodulación. El presente estudio tiene como objetivo reportar el caso de una mujer brasileña de 53 años con diagnóstico de SE, atendida en el Servicio de Control del Dolor Orofacial del Hospital Universitario Lauro Wanderley (HULW) en João Pessoa-PB. Se realizó un análisis de datos epidemiológicos, clínicos y de la Calidad de Vida (QV) de la paciente, utilizando cuestionarios aplicados de forma presencial. Los datos obtenidos fueron comparados posteriormente con la literatura existente. Además, se analizó la aplicación de fotobiomodulación empleando Luz Emitida por Diodo (LED) en 10 sesiones como tratamiento complementario para el manejo del dolor en pacientes con SE y su intensidad fue evaluada antes y después de las sesiones utilizando la Escala Visual Analógica del Dolor (EVA). El análisis de los datos obtenidos fue compatible con la literatura y sugiere el carácter multifacético del impacto de la SE en la QV de los pacientes. La intervención con LEDterapia pareció mejorar aspectos del dominio físico; sin embargo, los datos recolectados deben ser interpretados con cautela, debido a las limitaciones del Estudio. Además, se concluye que la LEDterapia tuvo efectos benéficos en la reducción del dolor en la paciente y destacó la potencial eficacia de la fotobiomodulación como una intervención prometedora para el manejo del dolor en SE, pero enfatizó la necesidad de estudios adicionales con muestras más grandes para confirmar estos hallazgos.

**Palabras clave:** Hueso Temporal; Calidad de Vida; Terapia por Luz de Baja Intensidad; Dolor Crónico.

## 1. Introduction

The styloid process (SP) is a bone projection located on the underside of the petrous part of the temporal bone, with a typical length of between 20 and 30 mm. When this dimension exceeds this range, it may indicate possible bone alterations. Recent studies estimate that between 2 and 28% of the population has radiographic evidence of styloid process elongation (Martello et al., 2020). Although most individuals with an elongated styloid process or calcified stylohyoid ligament remain asymptomatic, these conditions can, in certain cases, trigger a set of signs and symptoms that characterize Eagle's Syndrome (ES) (Jadav et al., 2022).

The etiology of ES is not yet well established, and it is suggested that its cause is multifactorial. There is evidence that points to reactive and ossifying hyperplasia of the styloid process and styloid ligaments as the origin of its symptoms, since there is chronic local irritation caused by osteitis, periostitis or tendinitis or by surgical trauma to the region. In addition, it is

hypothesized that the persistence of mesenchymal elements, known as Reichert's cartilage remnants, could undergo bone metaplasia in the event of an appropriate traumatic or stressful event (Galletta et al., 2019).

As for the epidemiology of ES, it has been observed that the symptomatic picture is more common in female patients between the fourth and fifth decades of life (Garcia Luna et al., 2016), manifesting bilaterally. Symptoms include sore throat, dysphagia, odynophagia, otalgia, facial pain and painful neck movements or a foreign body sensation in the throat (Romero et al., 2015). In addition, neurological complaints can be identified if there is compression of adjacent vessels and nerves (Bokhari et al., 2023; Péus et al., 2019; Romero et al., 2015). Thus, the Quality of Life (QoL) of patients with ES is affected by chronic pain and the associated symptomatology. This condition is diagnosed based on the patient's clinical assessment, combined with imaging tests such as panoramic radiographs and computed tomography - the gold standard (Moon, et al., 2014). In turn, treatment can be carried out conservatively, with postural guidance for the cervical region, non-steroidal anti-inflammatory drugs, steroids or local anesthetic injections, or surgically, using transoral or extraoral techniques (Elimairi et al., 2015).

Against this backdrop, photobiomodulation therapy has emerged as an innovative method for treating patients with chronic pain caused by ES. This technology has been applied clinically to a broad spectrum of disorders and has proven to be effective, less invasive and free of side effects, with “photobiostimulation” and “photobiomodulation” being the molecular effects of low-intensity laser irradiation on cells (Rola et al., 2014). When used at the appropriate wavelength and power density, photobiostimulation dissociates with nitric oxide (NO), allowing intracellular oxygen access, restoring ATP synthesis and thus reducing oxidative stress. Thus, once mitochondrial function has been re-established by LASER/LED lights, cellular metabolism is accelerated and patients recover more quickly. The success of phototherapy depends on a sequence of factors, such as: individual characteristics, i.e. the number of chromophores, which varies from individual to individual, pain threshold, application to the correct anatomical area, nature of the injury and the choice of an appropriate protocol. As a result, some conditions respond well to the first session, allowing for a progressive reduction in the number of applications and dosimetry (Pereira et al., 2019). Irradiation with Diode Emitted Light (LED) is an effective strategy in oxidative stress, and LED light at a wavelength of 625 nm promotes a sweep in Reactive Oxygen Species and consequent anti-inflammatory and analgesic effects (Sun, Kin. Cho et al., 2018).

Despite diagnostic advances, Eagle's Syndrome remains underdiagnosed, and is little known among health professionals and the general population. This results in diagnostic confusion with other conditions, such as orofacial pain and dysphagia, leading to inadequate and often ineffective treatments. In addition, the scarcity of studies on health-related quality of life in this population highlights the need for more in-depth research to better understand the impact of the disease and develop effective interventions aimed at optimizing clinical management and patient experience.

Therefore, this study aimed to report the case of a 53-year-old Brazilian woman diagnosed with ES who underwent LED therapy in 10 sessions, to discuss the patient's sociodemographic, clinical and imaging aspects and assess the impact of ES on the patient's quality of life before and after the use of LED therapy. In addition, the study analyzed the therapeutic response derived from the effect of photobiomodulation in reducing pain, discomfort and symptoms in a patient with ES, with the aim of expanding knowledge about the syndrome, its clinical implications and the effects of potential treatments.

## 2. Methodology

The present research is descriptive, qualitative and quantitative study or case report (Pereira et al., 2018) using simple descriptive statistics like in data class, mean values and standard deviation data of VAS and LED therapy (Shitsuka et al., 2014; Akamine & Yamamoto, 2009). Data collection was carried out at the Pain Control Service (SECDOR) of the Hospital

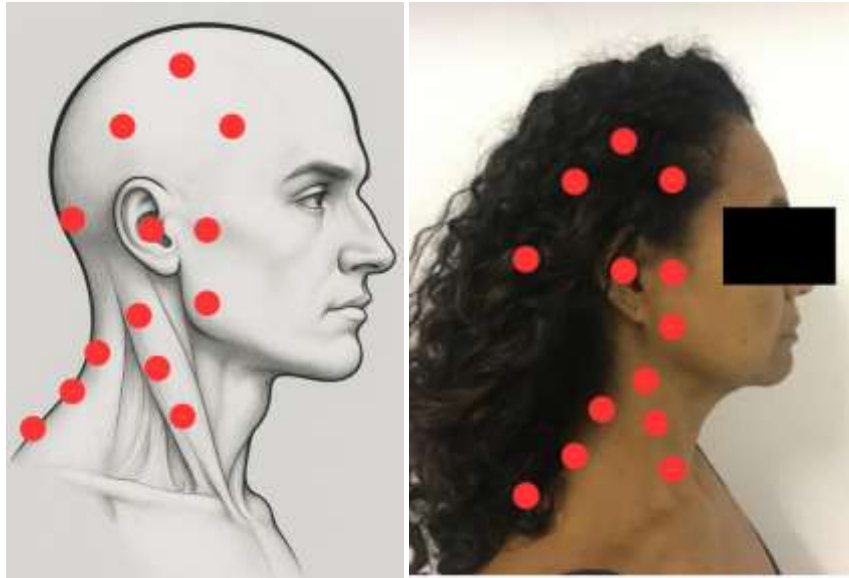
Universitário Lauro Wanderley (HULW) in the city of João Pessoa - PB. The patient was selected according to the following inclusion criteria: individuals with a diagnosis of ES, being monitored at the HULW Orofacial Pain Control Service, over 18 years of age, by agreeing to take part in the study and signing the Free and Informed Consent Form (FICF). Exclusion criteria were: patients who had already undergone photobiomodulatory therapies or whose tests did not include styloid process (SP) measurements.

This study is based on compliance with Resolution 466/2012 of the National Health Council, which deals with the rules regulating research involving human beings, as well as obeying the guidelines of the Research Ethics Committee and the National Research Ethics Committee (CONEP), especially regarding Letter CONEP/2018. The study was previously approved by the UFPB Research Ethics Committee under protocol number CAAE: 84415724.9.0000.5188. In addition, an informed consent form was prepared, indicating the adherence of the research participant, to guarantee the transparency of the information presented.

The information collected included demographic analyses, such as age, gender and profession, as well as medical history, previous surgeries, classification of ES and description of symptoms, which were recorded using a data collection instrument specifically designed for the study. Next, the WHOQOL-bref questionnaire on individual perception of QoL and health conditions was used, covering physical factors (pain, discomfort, energy, fatigue, sleep, dependence on treatment and ability to carry out daily activities), psychological factors (cognition, appearance, self-esteem, ability to concentrate, self-perception, negative feelings) and factors related to the environment (safety, home environment, financial resources, availability of information, leisure opportunities and transportation). All the questions are presented in the form of a Likert scale, so participants indicate their level of satisfaction for each item, ranging from 1 to 5. Higher scores indicate a better perceived quality of life. At the end of the questionnaires, an extensive literature review was carried out to discuss the importance of epidemiology, evolution, pathophysiological mechanism and social factors associated with the clinical condition.

After collecting the clinical data, the patient was scheduled for LED therapy sessions, which lasted between 40 and 45 minutes each week, according to the established protocol. The equipment used was an LED (BIOS Therapy II ®) with a wavelength of 630 nm, 300 mW of power and a fiber optic beam diameter of 0.7 cm, with a dosimetry of 9 J/cm<sup>2</sup>. Before starting the photobiomodulation, the patient underwent antisepsis with 0.2% alcoholic chlorhexidine and protective goggles were provided during the light emission. The applications involved the anatomical regions as shown in Figures 1 and 2, lasting 90 seconds in each one, bilaterally, involving the masseter muscle (2 points), the sternocleidomastoid muscle (3 points), the temporal muscle (3 points), the temporo-mandibular joint (1 point), the trapezius muscle (2 points) and the region of the minor occipital nerve (1 point), starting in the head region and ending in the neck region. For evaluation and comparative criteria, before and after each session, the patient was assessed using the VAS, a tool widely used in clinical practice to measure pain intensity subjectively. It consists of a 10-centimeter horizontal line with defined ends, with the left end indicating no pain (zero) and the right end representing the most intense pain imaginable (ten). The patient is asked to mark a point along this line that represents their perception of pain at the time of assessment (Delgado et al., 2018).

**Figures 1 and 2** - Application points for LED therapy.



Source: Own-authored protocol (2024), AI-generated image.

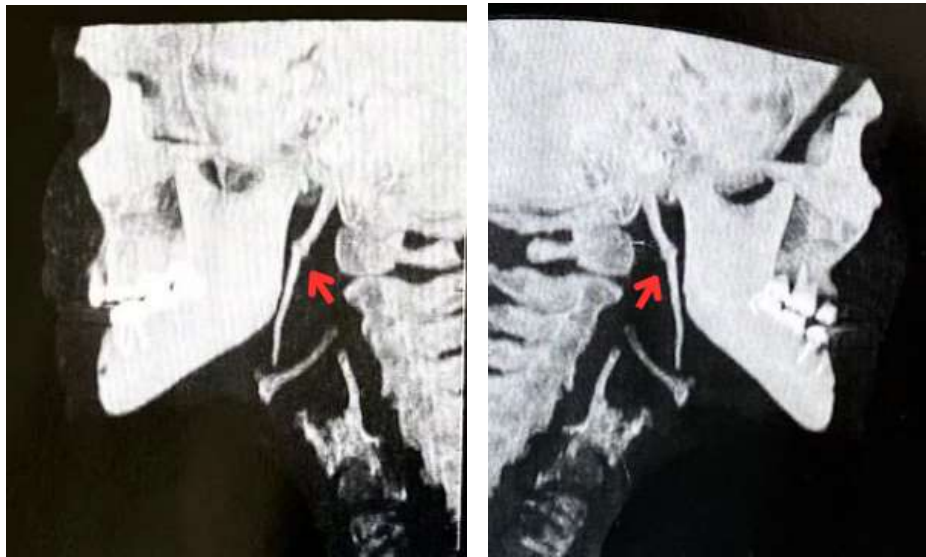
Figures 1 and 2 illustrate the precise anatomical landmarks selected for the application of LED therapy, based on the standardized protocol developed for this study. These points were chosen to target regions of greatest reported pain and muscular tension, ensuring consistent placement across sessions and participants. The images aim to guide reproducibility and clarify the therapeutic focus areas.

### 3. Case Report

A 53-year-old brown-skinned female patient, with a level of education equivalent to complete high school, retired, from João Pessoa, Paraíba, reported persistent chronic pain refractory to previous treatments, compatible with ES. She had styloid process measurements of 3.31 cm on the left and 4.46 cm on the right, evidenced by Computed Tomography (CT), as illustrated in Figures 3-8. The patient had undergone previous surgery to correct the ES, which, however, did not result in significant symptom improvement, with a marked increase in the SP length.

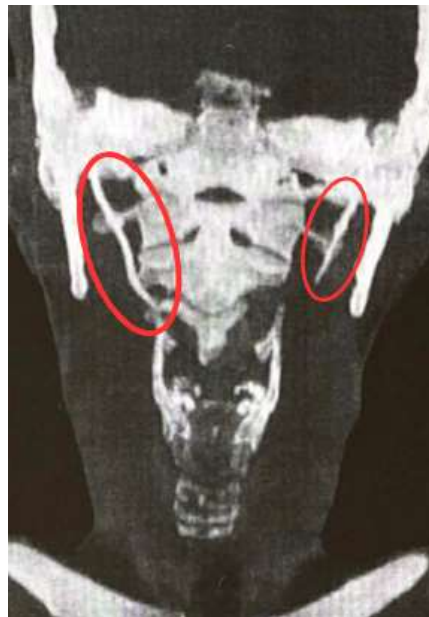
In terms of symptoms, the patient reported severe orofacial pain (graded 9 on the VAS), odynophagia, trismus, otalgia, headache, tinnitus and a burning sensation in the frontal, temporal and mandibular regions. She also reported neck pain, exacerbated by neck rotation (graded 7). She had been taking analgesics and anti-inflammatory drugs, without achieving therapeutic success.

**Figures 3 and 4** - Sagittal reconstruction tomographic images showing bilateral elongation of the styloid processes, a finding consistent with SE.



Source: Patient's personal archive.

**Figure 5** - Coronal reconstruction tomographic image showing bilateral elongation of the styloid processes.



Source: Patient's personal archive.



**Figures 6 and 7** - CT scan of the neck with 3D reconstruction (left oblique and right oblique views) showing elongation of the PE. Measurements: left side: 3.3 cm; right side: 4.46 cm.



Source: Patient's personal archive

**Figure 8** - Three-dimensional CT reconstruction of the skull base showing bilateral bone prominence of the styloid processes.



Source: Patient's personal archive

Figures 3 to 8 collectively illustrate the anatomical alterations characteristic of ES, through multiple imaging planes and reconstruction techniques. The combination of sagittal, coronal, and three-dimensional views allows for a comprehensive understanding of the extent and spatial orientation of the styloid structures, highlighting their potential to impinge on adjacent tissues. These findings corroborate the patient's reported symptoms and provide a robust radiological foundation for the diagnosis and therapeutic planning.

WHOQOL-bref questionnaires were administered at two points: before and at the end of all the sessions. The intervention, shown in Figures 9 and 10, consisted of ten sessions of LED therapy as part of the symptomatic management of ES. During the sessions, pain intensity was assessed using the VAS and peripheral oxygen saturation (%SpO<sub>2</sub>), as detailed in Table 1.

**Figures 9 and 10** - Patient receiving LED therapy application in the sternocleidomastoid and temporal muscle regions.



Source: Researchers' personal collection (2024).

Figures 9 and 10 document the real-time application of LED therapy in the patient, targeting the sternocleidomastoid and temporal muscle regions. These sites were chosen according to the patient's symptom distribution and clinical assessment. Beyond illustrating the protocol in practice, these images provide insight into the individualized therapeutic approach adopted in this case.

**Table 1** - Details of LED therapy sessions, pain perception and peripheral oxygen saturation.

Session	Initial VAS Face	Initial VAS Cervical	Initial %SpO <sub>2</sub>	Final VAS Face	Final VAS Cervical	Final %SpO <sub>2</sub>	Observations
1°	0	7	97%	0	5	99%	-
2°	4	4	97%	0	0	99%	-
3°	4	0	98%	2	0	99%	-
4°	3	0	99%	3	0	99%	Increased sensitivity in jaw and ear
5°	7	5	99%	4	0	99%	-
6°	3	4	98%	2	2	99%	Significant improvement on the right side, slight discomfort on the left
7°	4	4	99%	2	0	99%	Pain only on the left side
8°	3	0	99%	0	0	99%	-
9°	3	2	98%	4	0	98%	-
10°	5	0	99%	3	0	99%	Discomfort in the right ear to the touch, extending to the tongue

Source: Own authorship (2024).

The treatment with LED therapy showed a progressive reduction in pain in both regions evaluated, as well as stable oxygen saturation levels throughout the sessions. The response to treatment varied between episodes of complete remission and fluctuations in pain intensity, especially in the facial region.



#### 4. Discussion

Regarding sociodemographic aspects, the patient's age, 53, is in the common age range for the diagnosis of ES, which usually occurs in the fourth or fifth decade of life, as shown in a systematic review analyzing 497 patients with the condition (Hassani et al., 2024). In addition, the patient is female, which corroborates the view in the literature of a higher prevalence of the condition in women (Zammit et al., 2018).

In the present case, the patient identified herself as brown-skinned. Although studies on ES do not provide specific evidence on the influence of race on the epidemiology of the condition, it is known that sociocultural factors can impact access to pain treatment. Given this, it should be noted that much of the research available on ES is conducted in predominantly caucasian populations, especially in Western countries, which may limit the generalizability of the results to other ethnicities and indicate a gap in current research. In addition, the patient is single and retired, which may be a reflection of the limitations imposed by the chronic pain derived from the syndrome in both interpersonal and work relationships.

In terms of clinical aspects, the analysis of the data shows that the patient has intense orofacial pain, associated with cervicopharyngeal manifestations such as otalgia, headache and odynophagia, which are common in cases of ES (Fini et al., 2000) and in Temporomandibular Disorders. In this context, the patient presents a mixed pain component (Thomaz, 2010), characterized by burning, heaviness, and pulsatility. The pain occurs daily and is exacerbated by specific movements—such as cervical rotation—highlighting the need for a personalized and multidisciplinary treatment approach. This approach should consider factors such as age group, pain intensity, and frequency, aiming to enhance both the effectiveness of management strategies and the overall support provided to the patient, moving beyond conventional pharmacological treatment (Deardorff et al., 1991).

The patient's surgical history, including a procedure for ES itself, suggests a relationship between previous interventions and the persistence of symptoms, which may indicate an additional therapeutic challenge. The pharmacological approach, predominantly with analgesics and anti-inflammatories, although necessary, appears insufficient to control the chronic pain and provide complete relief to the patient - which can be attributed to the multifactorial nature of the condition that may involve neuropathic, psychological and musculoskeletal components (Lyras et al., 2021).

Imaging analysis showed lengths of 3.31 cm and 4.46 cm of the styloid processes, which exceeds the normal range of 2 to 3 cm and is compatible with the diagnosis of ES (Kawai et al., 1990). These elongations of the styloid process may be directly related to the severity of the symptoms reported, given the process's ability to press on or irritate important nerves, such as the glossopharyngeal and vagus, thereby exacerbating pain and discomfort (Jadav et al., 2022).

The results obtained by applying the WHOQOL-Bref before LED therapy indicated a compromised overall quality of life, as shown in Graph 1, evidenced by the total score of 45.19. According to Pedrosa et al. (2010), values above 60 (on a scale ranging from 0 to 100) are considered indicative of a satisfactory quality of life, while scores below 50 reflect significant difficulties in different aspects of well-being.

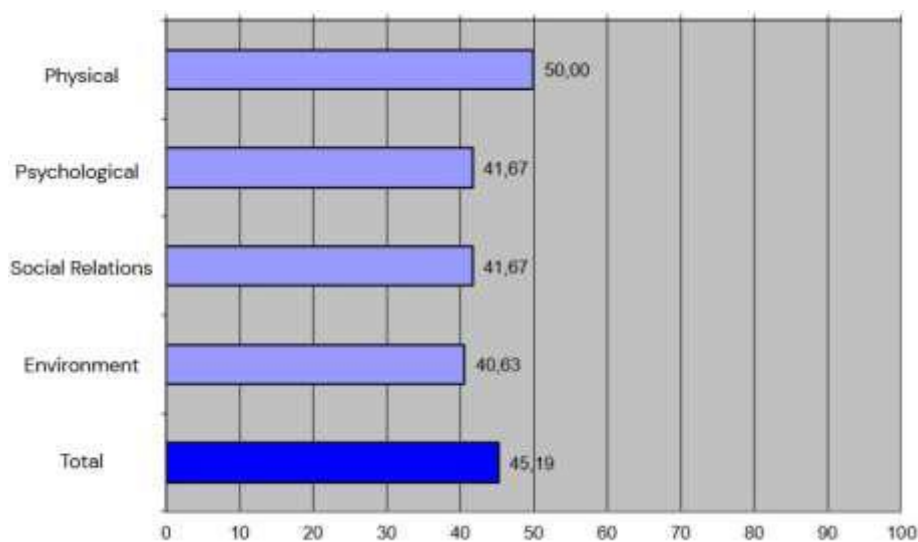
At baseline, the physical domain had the highest score (50.00), which suggests an intermediate perception of physical functionality, being one of the most affected in populations with chronic diseases or debilitating conditions (Pedrosa et al., 2010). Although higher than the other categories assessed, a score of 50 stills suggests important limitations, directly impacting the autonomy and quality of life of the individuals assessed.

The psychological and social relations domains had scores of 41.67, indicating emotional and interpersonal difficulties. A score below 50 suggests a prevalence of negative feelings, often associated with anxiety or depression. Similarly, a low score in social relationships indicates difficulties in social support and satisfaction with interpersonal

interactions, possibly reflecting social isolation or a lack of emotional support. Low scores in this criterion are frequently linked to reduced psychological resilience and increased risk of emotional disorders (Pedroso et al., 2010).

The environment domain obtained the lowest score (40.63), reflecting dissatisfaction with external factors such as access to health services, transportation, leisure and safety. This finding is consistent with studies that indicate that populations exposed to socioeconomic or structural barriers tend to report a worse perception of this domain (Fleck et al., 2000). The low score may be indicative of difficulties in accessing essential resources, directly impacting the participant's quality of life.

**Graph 1** - Results obtained by applying the WHOQOL-Bref questionnaire before LED therapy.



Source: Own authorship using the spreadsheet from Pedroso, et al 2010 (2024).

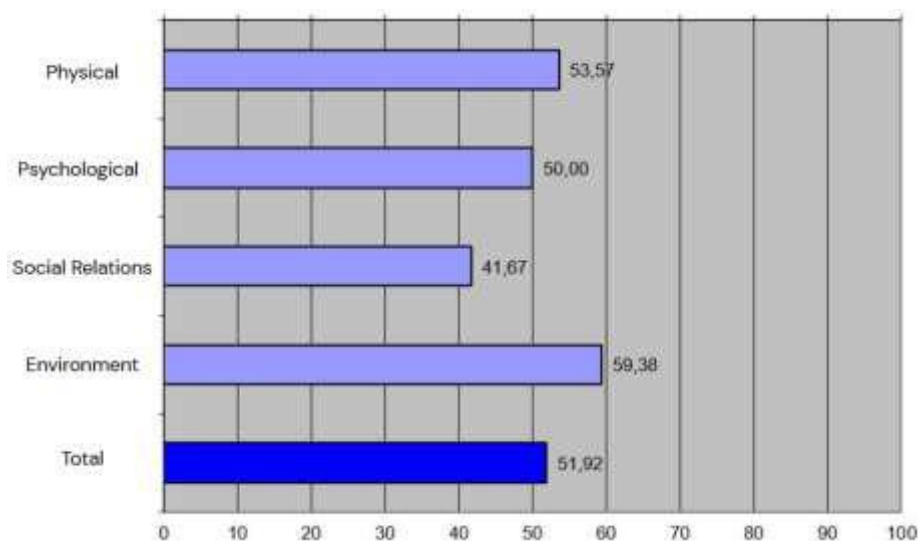
After treatment with LED therapy, the QoL questionnaire was applied again and showed the following results, as seen in Graph 2: the physical domain showed an improvement, with a score of 53.57, indicating a reasonable perception of the patient's state of physical health, including aspects such as pain, fatigue and mobility, which suggests that, despite possible functional limitations, the patient is able to carry out her daily activities without major difficulties (WHOQOL Group, 1998).

In the post-treatment assessment, the psychological domain, with a score of 50.00, indicates a better balance between emotional well-being and possible stressors such as anxiety and depression - suggesting that the participant now has an average perception of her mental health, which may be associated with factors such as relief from physical symptoms, emotional support and the ability to cope with challenges. This is relevant because studies indicate that improved mental health is often associated with pain control and a greater sense of autonomy, which may justify this result (Fleck et al., 2000).

The social relationships domain, with a score of 41.67, was the one with the lowest score among those assessed, which suggests persistent difficulties in her interpersonal interactions or that she does not have robust social support. This highlights the social support network as an ongoing limiting factor in the participant's perception of quality of life (Pedroso et al., 2010).

On the other hand, the environmental domain had the highest score, 59.38, suggesting that the patient perceived improvements in access to health, safety, transportation and leisure services. This result may indicate that, despite individual challenges, the external context in which the patient is inserted offers resources that favor her quality of life, a very important fact, since a good perception of the environment can compensate for difficulties in other categories, providing an overall positive impact on quality of life (WHOQOL Group, 1998).

**Graph 2** - Results obtained by applying the WHOQOL-Bref questionnaire after LED therapy.



Source: Own authorship using the spreadsheet from Pedrosa, et al 2010 (2024).

The post-treatment results indicate an improvement in the participant's QoL compared to the values obtained previously. The total score rose from 45.19 to 51.92, approaching the limit considered adequate by Pedrosa et al. (2010). Although the overall result is still below this level, there has been a significant improvement in almost all the criteria assessed. The comparison between the pre- and post-treatment scores indicates that the treatment had a positive impact on the participant's quality of life, with emphasis on improvements in the physical, psychological and environmental domains. However, there was a stagnation in social interactions, which points to the need for additional therapeutic strategies aimed at strengthening psychosocial support and promoting the active inclusion of individuals in support networks. The positive evolution in the scores reinforces the effectiveness of the approach used in treatment, especially in terms of pain relief and the impact on general well-being. However, the total score has not yet reached optimal levels, suggesting that continued follow-up may be essential to consolidate these gains and promote further improvements in the participant's QoL.

Analysis of the data obtained over the ten LED therapy sessions, using the VAS, shows a significant reduction in the perception of pain, especially in the trapezius muscle region. Despite some fluctuations in the results obtained - with periods of crisis, followed by periods of stability - this is a pain pattern that is typical among patients living with chronic pain. Initially, the intensity of pain in the face averaged 3.6 points on the VAS, while in the cervical region it reached 2.6 points. This trend, detailed in Table 2, highlights an average reduction of 1.6 points in the face and a more significant reduction of 1.9 points in the neck, reaching an average of 0.7 after the tenth session. This difference in pain reduction between the regions may be related to the pathophysiological characteristics of the structures involved, since the cervical muscles, which are highly influenced by tension and inappropriate postures, may respond better to the relaxing and anti-inflammatory effects of LED therapy. On the other hand, facial pain may have a more complex multifactorial origin, involving joint and nerve components that may require more time and an increase in the frequency of sessions using photobiomodulation or complementary practices for complete relief.

The statistics also reveal a tendency for pain to stabilize as treatment progressed. The standard deviation of facial pain went from 1.78 in the first sessions to 1.56 at the end, indicating less variability in pain reports. In the cervical region, this difference was even more marked, with an initial standard deviation of 2.55 which fell to 1.64, reflecting greater consistency in

the response to treatment. This reduction in the variability of scores reinforces the effectiveness of LED therapy in promoting sustained improvement in pain levels as the sessions progress.

Another relevant aspect was the analysis of the correlation between VAS and Peripheral Oxygen Saturation (%SpO<sub>2</sub>). Throughout the study, %SpO<sub>2</sub> values fluctuated between 97% and 99%, with no clear trend of variation associated with pain reduction. This suggests that although LED therapy had a positive effect on pain, its impact on tissue oxygenation was not significant, i.e. the improvement reported by the patient seems to be predominantly attributable to the analgesic, anti-inflammatory and vasodilator effects of the treatment, without directly influencing oxygen saturation. The data presented corroborates the existing literature on LED therapy as an effective resource for controlling musculoskeletal pain, especially in conditions involving muscle tension and inflammation (Shinozaki et al., 2010). However, the less expressive effect in the facial region suggests that, in certain clinical conditions, a combined multidisciplinary approach may be necessary in order to maximize the benefits of the treatment, potentially associated with holding sessions at shorter intervals, avoiding prolonged spacing that could compromise therapeutic efficacy.

**Table 2** - Comparison between VAS at the beginning and end of treatment with LED therapy.

	Average before sessions	Average after sessions	Reduction	Initial Standard Deviation	Final Standard Deviation
Facial Pain (VAS)	3,6	2,0	1,6	1,78	1,56
Neck Pain (VAS)	2,6	0,7	1,9	2,55	1,64
% O <sub>2</sub> Saturation (SpO <sub>2</sub> )	97-99%	97-99%	Not Significant		

Source: Own authorship (2024).

## 5. Conclusion

Therefore, it is concluded that photobiomodulation, applied over 10 sessions, proved to be a promising intervention for pain management and improving the quality of life in ES, as previously demonstrated in studies focusing on other disorders, such as temporomandibular joint dysfunction and muscle pain, reaffirming the analgesic and angiogenic effects of the therapy.

The collected data highlight the multifactorial impact of ES on quality of life, emphasizing the importance of an accurate diagnosis and proper management of associated conditions. Additionally, although the patient showed significant improvements in the physical and psychological domains, the stagnation in social domains indicates the need for complementary approaches to promote full social integration and stronger social support.

The proposal to apply photobiomodulation to a new group of patients—those with ES—underscores the innovative nature of the research and opens the possibility of expanding the therapy to other individuals whose quality of life is impaired by intense, often disabling pain. However, to establish a direct correlation between the findings and the benefits described in the literature, larger-scale studies are necessary.

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