BOTULINUM TOXIN IN THE MANAGEMENT OF HYPERHIDROSIS: ADVANCES AND CLINICAL IMPLICATIONS

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Abstract- Botulinum toxin (BT) is widely used in the treatment of neuromuscular and aesthetic conditions, including hyperhidrosis, which is characterized by excessive sweating. This study aims to review the application of BT in the treatment of hyperhidrosis, exploring its mechanisms of action and clinical efficacy. A review was conducted through the analysis of scientific articles that address the use of BT in hyperhidrosis, with a focus on clinical studies and systematic reviews. Hyperhidrosis can be classified as primary or secondary, significantly affecting patients' quality of life. BT, by blocking the release of acetylcholine at neuromuscular junctions, offers an effective therapeutic option for this condition. The application of BT has proven to be effective in reducing sweating in various regions of the body, such as the axillae, palms, soles, and face. Studies have shown that BT can significantly reduce sweat production, improving patients' quality of life. However, the effects of BT are temporary, lasting from 4 to 12 months, which necessitates periodic reapplications. BT is an effective and safe therapeutic alternative for the treatment of hyperhidrosis, providing temporary relief of symptoms and improving patients' quality of life. Further studies are needed to optimize dosage and intervals between applications, as well as to assess the long-term effects of this intervention.

Keywords - Botulinum toxin, hyperhidrosis, treatment.

Resumo: A toxina botulínica (TB) é amplamente utilizada no tratamento de condições neuromusculares e estéticas, incluindo a hiperidrose, que se caracteriza por sudorese excessiva. Este estudo tem como objetivo revisar a aplicação da TB no tratamento da hiperidrose, explorando seus mecanismos de ação e eficácia clínica. Uma revisão foi realizada através da análise de artigos científicos que abordam o uso da TB na hiperidrose, com foco em estudos clínicos e revisões sistemáticas. A hiperidrose pode ser classificada como primária ou secundária, afetando significativamente a qualidade de vida dos pacientes. A TB, ao bloquear a liberação de acetilcolina nas junções neuromusculares, oferece uma opção terapêutica eficaz para essa condição. A aplicação da TB mostrou-se eficaz na redução da sudorese em várias regiões do corpo, como axilas, palmas das mãos, plantas dos pés e face. Estudos demonstraram que a TB pode reduzir significativamente a produção de suor, melhorando a qualidade de vida dos pacientes. Entretanto, os efeitos da TB são temporários, com duração de 4 a 12 meses, o que requer reaplicações periódicas. A TB é uma alternativa terapêutica eficaz e segura para o tratamento da hiperidrose, proporcionando alívio temporário dos sintomas e melhorando a qualidade de vida dos pacientes. Mais estudos são necessários para otimizar a dosagem e o intervalo entre as aplicações, além de avaliar os efeitos a longo prazo dessa intervenção.

Palavras-chave: Toxina botulínica, hiperidrose, tratamento.

I. INTRODUCTION

Botulinum toxin (BT) generates considerable interest in the medical field, ranging from the treatment of neuromuscular disorders to aesthetic interventions. Its history dates back to the 19th century when it was initially identified as the cause of botulism, a severe illness associated with the ingestion of contaminated food [1]. Produced by the bacterium *Clostridium botulinum*, BT works by blocking the release of acetylcholine at neuromuscular junctions, resulting in temporary muscle paralysis [2]. This ability to interfere with neuromuscular function has made BT a valuable tool in the treatment of various medical conditions, including spasticity, dystonias, muscle spasms, and even chronic migraines [3].

With advances in research, different types of BT have been identified, with BT type A being the most commonly used in clinical practice, and type B, less common, each with specific characteristics in terms of potency, duration of action, and safety profile [4]. This variety of formulations allows for a personalized approach to the treatment of various conditions, maximizing therapeutic benefits while minimizing adverse effects [5]. Moreover, BT has stood out as an effective option in the treatment of hyperhidrosis due to its less invasive nature, applied locally through injections. By blocking the presynaptic release of acetylcholine, botulinum toxin reduces the frequency of

postsynaptic potentials, temporarily decreasing sweat gland production and interrupting excessive sweating, leading to an improved quality of life [6].

In this context, hyperhidrosis can arise due to various factors, including dysfunction of the sympathetic nervous system, hormonal changes, and genetic predisposition, affecting quality of life and causing social discomfort [7]. Hyperhidrosis, or excessive sweating, can be classified as primary or secondary. Primary hyperhidrosis is characterized by excessive sweating without an identifiable underlying cause, usually affecting specific body areas such as the palms, soles, axillae, and face. Secondary hyperhidrosis occurs as a result of an underlying medical condition, such as menopause, hyperthyroidism, diabetes, obesity, and anxiety, requiring specific treatment for the underlying cause [8]. The origin of hyperhidrosis is related to the hyperactivity of the sympathetic nervous system, which activates sweat glands, resulting in excessive sweating [9,10]. Therefore, this literature review aims to provide a comprehensive analysis of the role of botulinum toxin (BT) in the treatment of hyperhidrosis, as well as its clinical implications, contributing to a deeper understanding of the therapeutic aspects and underlying mechanisms of this approach.

II. METHODOLOGY

This study adopts a literature review approach with the aim of comprehensively analyzing the role of botulinum toxin (BT) in the treatment of hyperhidrosis. The inclusion criteria for the selection of reviewed articles consisted of studies published in the last 20 years that discuss the use of botulinum toxin in the treatment of hyperhidrosis. Exclusion criteria included articles that did not provide sufficient data on the mechanism of action of BT or those that addressed other clinical conditions not directly related to hyperhidrosis. The search for scientific articles was conducted in major academic databases, including PubMed, Scopus, Web of Science, and Google Scholar. Keywords used in the search were "botulinum toxin," "hyperhidrosis," "treatment," "neurotoxin," "excessive sweating," and "clostridium botulinum." The terms were combined with "AND" and "OR" to optimize the search. The collected data were analyzed descriptively and comparatively.

III. THEORETICAL FRAMEWORK

A. Anatomy of Hyperhidrosis

The anatomy of hyperhidrosis is complex and involves a series of dysfunctions in the autonomic nervous system, leading to excessive sweat production by the sweat glands. This condition not only causes physical discomfort but can also significantly impact quality of life, causing emotional and social problems [11]. There are two main types of hyperhidrosis: primary, which is more common and usually hereditary, affecting areas such as the armpits, hands, and feet [4]; and secondary, which arises as a result of side effects from medications or underlying medical conditions such as respiratory diseases, cardiovascular issues, obesity, among others [12].

Hyperhidrosis occurs due to hyperactivity of the sweat glands, which are excessively stimulated by the autonomic nervous system. This dysfunction can be influenced by various factors, including genetic, hormonal, and emotional [13]. The sweat glands, located in the dermis, play a crucial role in regulating body temperature. Approximately 3% of the population is affected by this condition [14]. There are two main types of sweat glands: eccrine glands, which are more numerous and distributed in areas such as the face, palms, soles, and armpits, releasing sweat directly onto the skin surface; and apocrine glands, which are responsible for body odor, are stimulated by emotions, and remain inactive until puberty, when they begin to release secretions containing lipid substances [13]. During situations of emotional stress, the walls of the glandular ducts contract, releasing sebum onto the skin surface [15]. These anatomical and physiological complexities are key to understanding the manifestation of hyperhidrosis.

B. Etiology of Hyperhidrosis

The origin of hyperhidrosis is not yet fully understood; however, several theories have been proposed to explain its causes. Genetic factors, dysfunction of the sympathetic nervous system, and hormonal imbalances are among the key theories [6]. Studies indicate that genetic predisposition plays a significant role in hyperhidrosis, with familial cases of the condition being common. Hyperhidrosis can result from overactivation or dysregulation of the sympathetic nervous system, leading to excessive sweat production. Additionally, hormonal imbalances, such as thyroid or sex hormones, can contribute to the development of hyperhidrosis in some cases. In individuals with hyperhidrosis, sweat glands may be more sensitive to stimuli that trigger sweat production, resulting in an exaggerated response [16].

Hyperhidrosis can be categorized into two main forms: primary (idiopathic) and secondary. Primary hyperhidrosis occurs without an identifiable cause, while secondary hyperhidrosis is associated with underlying medical conditions. In summary, hyperhidrosis is a complex and multifaceted condition, with various theories about its origin [17]. Understanding these underlying mechanisms is crucial for developing effective treatment strategies and improving the quality of life for affected patients.

C. Pathophysiology of Hyperhidrosis

Sweating, an essential function of the human body, is coordinated by the autonomic nervous system, which oversees involuntary processes. This system has two main divisions: the sympathetic nervous system and the

parasympathetic nervous system. In the regulation of sweating, the sympathetic nervous system plays a fundamental role [18]. Typically, sweating is triggered in response to environmental stimuli, such as heat, or emotional stimuli, such as stress. When the body detects an increase in temperature or a stress signal, the sympathetic nervous system sends signals to the sweat glands in the skin, stimulating them to produce sweat to help cool the body or cope with the stressful situation [19].

However, in hyperhidrosis, there is dysfunction in this regulatory system. Instead of responding appropriately to external or internal stimuli, the sympathetic nervous system becomes hyperactive, sending constant signals to the sweat glands. This results in disproportionate and excessive sweat production beyond what is necessary to regulate body temperature or respond to emotional stimuli. This overactivation of the sympathetic nervous system can be localized, affecting specific areas of the body such as the armpits, hands, feet, or face, or generalized, affecting the entire body.

D. Botulinum Toxin

Botulinum neurotoxin, derived from the bacterium *Clostridium botulinum*, is renowned for its ability to induce temporary muscle paralysis. Its mechanism of action involves blocking the release of acetylcholine at neuromuscular junctions, resulting in the interruption of muscle contraction. Initially associated with botulism, a severe illness linked to the consumption of contaminated food, botulinum toxin gained prominence in the 20th century due to its broad therapeutic properties, ranging from the treatment of neuromuscular disorders to aesthetic procedures [20].

Botulinum toxin is divided into different types, with types A and B being the most relevant for clinical use. Type A is widely employed in medicine and aesthetics due to its potency and proven efficacy in various conditions, including spasticity, dystonias, muscle spasms, and superficial wrinkles. Type B, although less common, also has relevant therapeutic applications, particularly in cases of resistance or intolerance to botulinum toxin type A.

The diversity of botulinum toxin formulations, both within each type and between types A and B, provides medical professionals with the ability to tailor treatment according to the individual needs of each patient. Factors such as potency, duration of action, and safety profile are considered when selecting the most appropriate formulation for each clinical indication. This personalized approach aims to maximize therapeutic benefits, minimize adverse effects, and ensure satisfactory outcomes for patients [3].

E. Mechanism of Action of Botulinum Toxin in Hyperhidrosis

The mechanism of action of botulinum toxin in hyperhidrosis involves a complex sequence of events at the cellular and neuromuscular levels. When administered through intradermal injections into the area affected by hyperhidrosis, botulinum toxin is internalized by nerve cells that innervate the sweat glands. Inside these nerve cells, botulinum toxin interferes with the release of the neurotransmitter acetylcholine, which is responsible for transmitting nerve signals to the sweat glands [21].

Botulinum toxin works by preventing the fusion of vesicles containing acetylcholine with the nerve cell membrane, a process essential for the proper release of the neurotransmitter. This occurs through the cleavage of proteins involved in vesicular fusion, including SNAP-25 (synaptosomal-associated protein 25). As a result, the release of acetylcholine is blocked, preventing nerve impulse transmission to the sweat glands. By inhibiting acetylcholine release, botulinum toxin effectively reduces stimulation of the sweat glands, thereby decreasing sweat production in the treated area. This selective action of botulinum toxin on nerve fibers that control sweating helps normalize the function of the sweat glands, providing relief from hyperhidrosis symptoms [8].

It is important to note that the effect of botulinum toxin is not permanent and typically lasts between 4 to 12 months, depending on the formulation used and the individual patient response. After this period, repeat applications may be required to maintain results. However, the efficacy and safety of botulinum toxin as a treatment for hyperhidrosis have been well-documented in clinical studies and practice, making it an effective therapeutic option for patients suffering from this condition [16].

F. Palmar, Plantar, and Axillary Hyperhidrosis

Excessive sweating, known as hyperhidrosis, goes far beyond simple perspiration. For many, it is a daily struggle that transcends physical discomfort. Hyperhidrosis can manifest in various ways, from sweating in specific areas of the body to generalized sweating, indicating potential underlying causes. The impact on quality of life is significant, especially for children and adolescents who face emotional and social implications. Diagnosis is based on clinical observation, and treatment varies depending on the severity and location of symptoms. Therapies such as the use of topical aluminum chloride, botulinum toxin, and anticholinergic medications are frequently recommended to help alleviate symptoms and improve patients' quality of life [22].

Axillary hyperhidrosis is characterized by excessive sweating in the armpit area, which can result in social embarrassment and negatively impact the quality of life of affected individuals. In addition to physical discomfort, axillary hyperhidrosis can cause stains on clothing and unpleasant body odor, contributing to anxiety and low self-esteem [23]. Similarly, palmar and plantar hyperhidrosis also present significant challenges. Excessive sweating of the hands and feet can hinder everyday tasks, such as holding objects securely or walking safely. Additionally, constant moisture in these areas can predispose individuals to fungal and bacterial

infections, increasing discomfort and the risk of complications [15].

Despite the challenges faced by those with hyperhidrosis, there are several treatment options available. From described antiperspirants to more invasive procedures such as endoscopic thoracic sympathectomy, patients have various options to manage their condition. Alternative therapies, such as iontophoresis and botulinum toxin, are also recommended for many individuals [24].

It is essential for patients with hyperhidrosis to seek medical guidance to determine the best course of treatment, considering the severity of their condition, impact on quality of life, and personal preferences. Psychological support can also play an important role in managing anxiety and promoting self-confidence [25]. Therefore, hyperhidrosis is a challenging condition that can significantly affect the daily lives of those affected. However, with appropriate treatment and support, it is possible to minimize symptoms and improve the quality of life of these patients [4].

G. Efficacy of Botulinum Toxin Type A Injections

Botulinum toxin, has been widely used in the treatment of various areas affected by hyperhidrosis. Recognized as a safe, potent, and effective procedure, it has become essential in the treatment of this condition. Administered via intradermal injections, it provides superior results for patients with a low risk of complications [6]. The effect of Botulinum Toxin Type A (BTA) is directly related to the application site and dosage used, reaching its maximum efficacy between the 7th and 14th day post-application, with results lasting between 3 to 6 months. This non-surgical procedure works by preventing and blocking the action of neurotransmitters, resulting in the reduction of muscle contraction. This occurs through the inhibition of acetylcholine release at motor nerve endings, causing temporary muscle paralysis and relaxation, as well as reducing the release of inflammatory mediators, providing an analgesic effect [16].

H. BTA in Axillary Hyperhidrosis

Botulinum toxin has been employed in the treatment of axillary hyperhidrosis, effectively reducing sweat production and consequently improving the quality of life for patients affected by excessive sweating [2]. Hyperhidrosis is characterized by excessive sweating, where sweat glands release sweat on the axillary surface in response to nerve stimuli. The application of botulinum toxin can reduce this production by temporarily blocking nerve action and, consequently, sweating [7]. The BTA procedure begins with a starch test on the area affected by sweating, followed by the application of iodine to map the points of hyperhidrosis. BTA is administered superficially, with multiple injections spaced 1 to 2 cm apart, blocking the function of sweat glands in the dermis. Typically, 50 to 100 units of botulinum toxin are used per axilla, providing temporary relief for up to six months [2].

I. BTA in Palmar Hyperhidrosis

As previously mentioned, although not considered a severe condition, hyperhidrosis can significantly impact patients' quality of life. The various disorders associated with it can cause discomfort in social interactions, especially when manifested in the hands and other body regions. In palmar hyperhidrosis, symptoms often begin in childhood or adolescence, marked by constantly wet hands, which can cause embarrassment when greeting people, difficulties during activities such as writing and reading, and issues related to odor, bacterial infections, and vascular conditions due to excessive sweat production [16].

The treatment of hyperhidrosis using BTA has proven effective, albeit temporarily, in alleviating symptoms without significant risks to patients, thus contributing to their well-being. BTA works by blocking the transmission of nerve impulses to the eccrine sweat glands, temporarily halting hyperhidrosis symptoms for several months. It is crucial that the professional responsible for the procedure has a complete understanding of palmar anatomy and adheres to precise anatomical references to ensure the success of anesthetic blocks [4].

Following a similar protocol to that used for the treatment of axillary hyperhidrosis, the procedure for palmar hyperhidrosis involves applying iodine and starch to identify the areas affected by excessive sweating. The treatment involves locally administering anesthesia and then marking the points where multiple injections will be made, typically around 25 points on the fingers, with a distance of 1 to 2 cm between them [26].

J. BTA in Plantar Hyperhidrosis

In cases of plantar hyperhidrosis, wearing shoes can lead to the accumulation of sweat, causing discomfort and making it difficult to use certain types of footwear [27]. The condition is often managed through the treatment with Botulinum Toxin Type A (BTA), as proposed in other sources, where BTA inhibits sympathetic nervous system stimuli, being a non-invasive procedure with lasting effects [28]. The procedure for treating plantar hyperhidrosis begins with cleaning the affected area, followed by the application of the iodine-starch test using a 3.5% iodine solution and covering it with starch. This allows for the identification of regions affected by excessive sweating. After applying local anesthesia, multiple BTA injections are then administered at the affected site, achieving impressive results in reducing this dysfunction [27].

K. BTA in Craniofacial Hyperhidrosis

Craniofacial hyperhidrosis is a condition with an unclear cause, which can vary and be influenced by hereditary or hormonal factors, such as excessive stress, diabetes, among others. This condition manifests through

excessive sweating in the facial region, especially on the forehead, affecting approximately 9.40% of the population [29]. Research has shown that botulinum toxin is one of the procedures used to treat craniofacial hyperhidrosis. This treatment involves the application of various doses, ranging from 37.5 to 150 units. The effects and efficacy of the procedure can be observed after 3 days, with up to a 50% reduction in symptoms during the first week. By the second week, the reduction reaches 94%, demonstrating the treatment's efficacy. Additionally, this procedure is considered minimally invasive and safe, with temporary effects lasting up to 6 months [30].

L. Compensatory and Residual Hyperhidrosis

Residual hyperhidrosis is a state in which excessive sweating persists despite initial treatment for the condition. While initial approaches may involve topical medications, special antiperspirants, or even surgical procedures such as sympathectomy, in some cases, these measures may not achieve full effectiveness, resulting in persistent symptoms. In such situations, it may be necessary to explore other treatment alternatives, such as oral medications, botulinum toxin injections, or alternative therapies to control sweating. Regular follow-up with a specialized physician is crucial to assess the efficacy of the treatment and adjust the approach as needed [31].

On the other hand, compensatory hyperhidrosis occurs when there is an increase in sweat production in areas where there was no abnormal sweating before the surgical intervention, manifesting in varying degrees of intensity: mild, moderate, or severe. This can be considered a symmetrical side effect that causes an increase in sweating levels in the postoperative period of procedures such as thoracic sympathectomy, which is performed to treat localized hyperhidrosis [32].

M. Essential Use of Injection Points and BTA Dilution in Hyperhidrosis Therapy

In the treatment of hyperhidrosis with botulinum toxin, the appropriate choice of injection tips is a crucial factor for the success of the procedure. These tips vary in size, shape, and number of openings, being selected according to the anatomical area to be treated and the preferred application technique. In larger areas, such as the axillae, it is common to use injection tips with multiple openings, ensuring a broad and uniform distribution of botulinum toxin throughout the region. On the other hand, smaller or more delicate areas, such as the palms of the hands or soles of the feet, require finer and more precise injection tips to ensure careful application and minimize discomfort for the patient during the procedure [33].

In addition to selecting the appropriate injection tips, the correct dilution of botulinum toxin plays a crucial role in the treatment of hyperhidrosis. This toxin is supplied in lyophilized powder form and must be reconstituted with a sterile diluent, such as sodium chloride, before administration. The dilution ratio may vary depending on the specific formulation of the botulinum toxin and the characteristics of the area to be treated, making it essential to follow the manufacturer's instructions and clinical guidelines. Accurate dilution ensures that the final concentration of botulinum toxin is adequate to produce the desired therapeutic effects while minimizing the risk of adverse side effects [33].

Integrating a detailed approach in the selection of injection tips and the dilution of botulinum toxin is essential to improve hyperhidrosis treatment outcomes. Experienced healthcare professionals should be familiar with a variety of injection tips and dilution techniques, adapting the approach as needed to meet each patient's individual needs. Furthermore, it is important for professionals to stay updated on the latest scientific evidence and clinical guidelines related to the use of botulinum toxin in hyperhidrosis treatment, thus ensuring the safety and efficacy of the procedure. By adopting a multidisciplinary and personalized approach, professionals can provide effective treatment and significantly improve the quality of life of patients affected by hyperhidrosis [34].

IV. RESULTS AND DISCUSSION

This research focused on the use of botulinum toxin as a treatment for hyperhidrosis, evaluating its efficacy and associated clinical implications (Table 1). Based on the articles analyzed [35], the results show that botulinum toxin is highly effective in reducing sweating in patients with hyperhidrosis, with an average reduction of 85%. The effect duration was approximately 6 months, indicating that patients generally require biannual applications to maintain results. The occurrence of side effects was relatively low, affecting 10% of patients, with manifestations such as mild pain at the application site and temporary muscle weakness.

Table 1: Information on Botulinum Toxin in Hyperhidrosis Treatment

Evaluated Parameter	Result
Efficacy in sweating reduction	Average reduction of 90%
Duration of effect	6 months, with biannual reapplications
Occurrence of side effects	10% of patients experienced side effects
Types of side effects	Mild pain at the application site and temporary muscle weakness

Based on various studies (Table 2) by SOUSA et al., 2021 [35]:

1. Study of 322 patients with axillary hyperhidrosis: 81% of patients improved with botulinum toxin, with a reduction of more than 50% in sweating, and an average effect duration of 201 days (about 7 months).

2. Study with 7 patients with plantar hyperhidrosis: Most patients were satisfied with the treatment and repeated it when the effects wore off.

3. Pilot study with 50 patients (29 women and 21 men) with severe palmar hyperhidrosis: After 24 weeks of treatment with injections, there was a reduction in sweating from the 4th week, and despite some discomfort, the treatment was considered satisfactory.

4. 2014 study with 28 patients (17 women and 11 men) with primary palmar hyperhidrosis: Using 500 units of botulinum toxin A in the first injection, efficacy lasted an average of 7 months for the first session and 9 months for the last, with few reported side effects.

5. Study with 24 patients with axillary hyperhidrosis: Using 200 units of botulinum toxin per axilla, all patients experienced cessation of excessive sweating after 6 days, with effects lasting from 7 to 10 months.

6. Study with 11 female patients with postmenopausal craniofacial hyperhidrosis: 64% of patients had a complete response to symptoms without adverse effects.

Thus, botulinum toxin has proven to be effective and safe for various types of hyperhidrosis, with generally mild and transient side effects. However, the treatment is expensive and may require regular reapplications.

Table 2: Efficacy of Botulinum Toxin in Hyperhidrosis Treatment

Study	Number of Patients	Type of Hyperhidrosis	Improvement Percentage	Average Effect Duration	Side Effects
Sousa et al., 2021 - Study 1	322	Axillary	81%	7 months	Few and mild
Sousa et al., 2021 - Study 2	7	Plantar	General satisfaction	Not specified	Not specified
Sousa et al., 2021 - Pilot Study	50	Severe Palmar	Reduction by 4th week	24 weeks	Mild discomfort
Sousa et al., 2021 - 2014 Study	28	Primary Palmar	7/9 months	Not specified	Few and mild
Sousa et al., 2021 - Study 3	24	Axillary	After 6 days	7 to 10 months	Few and mild
Sousa et al., 2021 - Study 3	24	Axillary	After 6 days	7 to 10 months	Few and mild
Sousa et al., 2021 - Study 4	11	Postmenopausal Craniofacial	64% complete response	Not specified	None

The study by LIMA et al., 2019 (Table 3), addresses the prevalence and impact of hyperhidrosis (HP), with a particular focus on medical students and general aspects of the condition:

1. Prevalence:

Global: HP affects more than 1% of the world's population.

Brazil: In Blumenau, prevalence was 9%, while in other samples of medical students, it varied between 5.5% and 18%. These numbers may vary due to cultural, climatic, and methodological differences among studies.

2. Profile of Affected Individuals:

Onset Age: HP usually begins in adolescence, but many patients seek treatment only in adulthood, suggesting that the condition is chronic and often poorly managed in its early stages.

Demographic Characteristics: Prevalence is higher among white individuals, with an average age of around 21 years. Many have a family history of HP, indicating a possible genetic component.

3. Affected Areas:

Palmar Region: Among medical students, the hand region is the most affected, contrasting with other studies that found the axillary region to be the most common. This can affect practical activities, such as handshaking, which is relevant to medical training.

4. Severity and Impact:

Severity Levels: Most students have mild to moderate HP. However, severe cases (grades 3 and 4) significantly impact patients' quality of life (QoL).

Quality of Life: HP can cause discomfort and difficulties in daily and social activities. The perception of QoL is inversely proportional to the severity of HP, with more severe cases leading to worse QoL.

5. Social and Professional Impact:

Stigma and Embarrassment: HP can cause embarrassment and stigmatization, leading some patients to avoid seeking treatment to prevent embarrassment.

Professional Performance: Excessive sweating can be misinterpreted as anxiety or lack of confidence, impacting how students are perceived in their professional environment.

6. Need for Greater Awareness:

Lack of Knowledge: Both patients and healthcare professionals may not be sufficiently informed about HP, complicating diagnosis and treatment.

Dissemination and Research: The text highlights the need for more research and greater dissemination about HP to improve knowledge and management of the condition.

Prevalence varies according to location and population studied, and the lack of awareness of the condition suggests that more studies and dissemination efforts are needed to improve diagnosis and treatment.

Table 3: Prevalence and Impact of Hyperhidrosis (LIMA et al., 2019)

Elements	Data
Global Prevalence	Affects more than 1% of the population
Prevalence in Brazil	Blumenau: 9%, Medical Students: 5.5% to 18%
Age of Onset	Usually during adolescence
Demographic Characteristics	Prevalent in white individuals, average age 21
Affected Areas	Hands in medical students, axillae more common
Severity and Impact	Most have mild to moderate HP
Quality of Life	Greater severity = poorer quality of life
Social and Professional Impact	Impacts professional perception
Need for Awareness	Lack of knowledge, need for dissemination

V. CONCLUSION

Botulinum toxin (BT) stands out as an effective and safe therapeutic option for treating hyperhidrosis, providing significant relief in various body areas such as the axillae, palms, soles, and face. Its application considerably reduces excessive sweat production, improving patients' quality of life. Although the effects are temporary and require periodic reapplications, BT remains a first-line approach, especially for cases refractory to conventional treatments. Future studies may enhance understanding of dose optimization and application techniques, aiming to maximize its benefits.

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