

Assessing the prevalence of Temporomandibular Disorders in Brazilian para-athletes

Avaliação da prevalência da Disfunção Temporomandibular em para-atletas brasileiros

Evaluación de la prevalencia del Trastorno Temporomandibular en paratletas brasileños

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Palavras-chave:

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Palabras clave:

Paratletas;
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ABSTRACT

This study aimed to investigate the prevalence of Temporomandibular Disorder (TMD) in Brazilian para-athletes. We performed clinical examinations on para-athletes during a selective competition. For TMD diagnosis, the Research Diagnostic Criteria for Temporomandibular Disorders protocol was used, and the individuals were categorized into three groups: muscle disorders, disc displacements, and arthralgia. 138 para-athletes performed clinical examinations: 40 (28.9%) were swimmers, 27 (19.6%) were powerlifters, and 71 (51.5%) were from athletics. 35 (25.3%) para-athletes presented TMD and the most prevalent symptom was muscle disorders in females ($P = 0.003$). It is concluded that the TMD prevalence in para-athletes is higher in females than males. Nevertheless, it is still lower than in the general population.

RESUMO

Este estudo teve como objetivo investigar a prevalência da Disfunção Temporomandibular (DTM) em para-atletas brasileiros. Realizamos exames clínicos em para-atletas durante uma competição seletiva. Para o diagnóstico da DTM foi utilizado o Critério Para Diagnóstico de DTM e os indivíduos foram divididos em três grupos: distúrbios musculares, deslocamento de disco e artralgia. Realizaram exame clínico 138 para-atletas: 40 (28,9%) eram nadadores, 27 (19,6%) eram halterofilistas e 71 (51,5%) eram do atletismo. 35 (25,3%) para-atletas apresentaram DTM e o sintoma mais prevalente foi distúrbios musculares em mulheres ($p=0,003$). Conclui-se que a prevalência de DTM em para-atletas é maior em mulheres do que em homens, entretanto ainda é menor do que na população em geral.

RESUMEN

Este estudio tuvo como objetivo investigar la prevalencia del Trastorno Temporomandibular (TMD) en paratletas brasileños. Realizamos exámenes clínicos a paratletas durante una competición selectiva. Para el diagnóstico de TMD, se utilizó el protocolo de Criterios de Diagnóstico de Investigación para trastornos temporomandibulares y los individuos se clasificaron en tres grupos: trastornos musculares, desplazamientos de disco y artralgias. 138 paratletas realizaron exámenes clínicos: 40 (28,9%) eran nadadores, 27 (19,6%) eran levantadores de pesas y 71 (51,5%) eran paratletas de atletismo. 35 (25,3%) paratletas presentaron DTM, y el síntoma más prevalente fueron los trastornos musculares en el sexo femenino ($p=0,003$). Se concluye que la prevalencia de TMD en los paraatletas es mayor en mujeres que en hombres, con todo, sigue siendo menor que en la población general.

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INTRODUCTION

Para-athletes refer to a specific group of people who practice physical activity with some regularity and who have some physical or intellectual disability (Tweedy and Vanlandewijck, 2011). For these people, sports practice, in addition to improving health, increased self-esteem, self-efficacy, and better quality of life, plays essential side effect: mental health benefits and positive social change (Blauwet and Willick, 2012; Tuakli-Wosornu and Derman, 2018). On the other hand, sports practice, especially when overtraining, can induce chronic pain and injuries that often take time to regress due to the individual's physical limitations (Swartz et al., 2019).

Interesting that there is evidence in the literature about the high prevalence of sports-related joint, muscle, or bone injuries and illness in para-athletes, and the most frequent locations of these injuries are in the shoulder, upper or lower limbs (Fagher et al., 2020; Harrington et al., 2021; Pinheiro et al., 2021) however little is known about injuries to the temporomandibular joints (TMJ). The TMJ are one of the body's most important joints. They connect the mandible to the skull through bones, cartilage, articular discs, muscles, and ligaments which normally keep the movement smooth. Conditions that affect these joints and associated structures causes are called Temporomandibular Disorders (TMD) and included a set of joint and muscular dysfunctions of the craniofacial area characterized by joint and/or muscular pain, joint disarrangement, noise, and limited or irregular mandibular function (Ferneck, 2021).

Like any other muscle or joint pain, it is plausible that TMD can negatively affect the athletic performance of para-athletes. In this sense, although general injuries and illness have been studied in para-athletes, there is a paucity of research investigating TMD in this population, so the primary goal of this study was to investigate the prevalence of TMD in its different subgroups (muscle disorders, disc displacements, and arthralgia) in a group of Brazilian para-athletes and, based on literature, compare this prevalence with TMD prevalence in the general population.

METHODOLOGY

STUDY DESIGN AND ETHICAL ASPECTS

This is a transversal study that was approved by the local Ethics and Research Committee (#3.261.377) following resolution 466/12 of the National Health Commission and was prepared according to the Strengthening the Reporting of Observational Studies in Epidemiology guidelines (STROBE) (Vandenbroucke et al., 2007). Appropriate written informed consent was obtained from all participants and legal guardians when the para-athlete is underage. It used a non-probabilistic convenience sampling composed of para-athletes taking part in a Brazilian selective competition organized by

the Brazilian Paralympic Committee, in Curitiba, Paraná, Brazil. The criteria for grouping para-athletes in each sport were determined by the Brazilian Paralympic Committee according to International Standard for Eligible Impairments guidelines and in this study, we used a sample of para-athletes who participated in athletics, powerlifting, and swimming competitions. Para-athletes who were using analgesics or anti-inflammatory drugs in the weeks preceding the competition were excluded.

CLINICAL TMD DIAGNOSIS

The clinical examinations were carried out in the days in which the competition took place. The para-athletes remained seated in chairs in a space delimited by drywall plates for higher privacy e comfort and with the maximum natural lighting. For TMD characterization, the Portuguese version of the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD), Axis I, protocol was used. According to the literature, the Axis I instrument can be applied to both adults and adolescents (Franco-Micheloni et al., 2014). Based on the RDC/TMD the individuals were categorized in three RDC/TMD groups. Group I: included muscle disorders (myofascial pain and myofascial pain with limited opening) which were considered positive when the para-athlete reported pain on palpation in three points in the mastication muscles; Group II: included disc displacements (with and without reduction, presence of joint noises, bone cracking and crackling, and mouth opening pattern); and Group III included arthralgia, osteoarthritis, and osteoarthritis, pain during lateral and posterior TMJ palpation, presence of bone crepitation in the protrusion and lateral excursion of the mandible (Dworkin and LeResche, 1992).

STATISTICAL ANALYSIS

The results obtained were submitted to descriptive and inferential analysis. Statistical analysis was performed by sports modalities. Furthermore, the variables of myofascial pain, joint disc displacement, and joint pain were associated with gender, using the Poisson Regression test. Statistical analysis was performed using the Statistical Package for Social Science program (SPSS; version 21.0; SPSS inc. Chicago, IL – USA). All analyzes were performed with a significance level of 5%.

RESULTS

It was estimated that approximately 260 para-athletes participated in the three days of competition and, of those, 138 para-athletes agreed to perform the RDC/TMD examination (a response rate of 53.1%). Of the participants, 40 (28.9%) were swimmers, 27 (19.6%) were powerlifters, and 71 (51.5%) were from athletics (Table 1). A TMD diagnosis was positive if the para-athlete reported the presence of at least one of the criteria for temporomandibular disorders, and when the para-athlete

presented more than one symptom, he was included in more than one group. In this sense, after clinical examination, 35 (25.3%) para-athletes were diagnosed positively for TMD, and between them, 20 (35.7%) of the females presented positive diagnoses for TMD. The prevalence of muscle disorders (TMD Group I) was 17.5% (7 individuals) in swimmers, 18.5% (5 individuals) in powerlifting para-athletes, and 12.6% (9 individuals) in para-athletes of athletics. Disc displacement (TMD group II) was observed in 9 swimmers (22.5%), 7 para-athletes of powerlifting (25.9%), and; 19 athletics (26.7%).

Arthralgia (TMD group III) was mentioned by 7 para-athletes, so, the overall prevalence of arthralgia was 5.0%.

Table 2 showed the signs and symptoms of TMD categorized according to RDC TMD classification: muscle disorders (i.e. myofascial pain), disc displacements (left and/or right joint), and arthralgia (left and/or right) between swimmers, powerlifting, and athletics, compared between genders. Between the swimmers, myofascial pain and disc displacement were prevalent in both, males and females however without a difference ($P > 0.05$). Only 1 female and 1 male reported arthralgia.

Table 1. Characterization of the para-athletes who take part in this study.

		Male	Female
Total Sample (N = 138)	Distribution (N,%)	82 (59.4)	56 (40.6)
	Mean age (years, SD)	29.1(9.9)	27.0 (9.5)
	Diagnosed TMD (N,%)	15 (18.3)	20 (35.7)
	Swimmers (N,%)	18 (45.0)	22 (55.0)
	Powerlifters (N,%)	15 (55.5)	12 (44.4)
	Athletics (N,%)	45 (63.3)	26 (36.6)

Note: SD = standard deviation.

Source: the authors.

Table 2. Frequency and distribution of para-athletes in each sport and TMD subgroups.

Overall TMD Prevalence (N,%)				35 (25.3)
Diagnosed TMD by subgroups				
Swimmers (N = 40)	Swimmers mean age (years, SD)			28.3 (10.1)
			Male	Female
	Muscle disorders	No (33)	18 (81.8)	15 (83.3)
		Yes (7)	4 (18.2)	3 (16.7)
	Disc displacement	No (36)	19 (86.4)	17 (94.4)
		Yes (4)	3 (13.6)	1 (5.6)
	Arthralgia	No (38)	21 (95.5)	17 (94.4)
		Yes (2)	1 (4.5)	1 (5.6)
Powerlifters (N = 27)	Powerlifters mean age (years, SD)			30.4 (9.9)
			Male	Female
	Muscle disorders	No (22)	13 (86.7)	9 (75.0)
		Yes (5)	2 (13.3)	3 (25.0)
	Disc displacement	No (23)	13 (86.7)	10 (83.3)
		Yes (4)	2 (13.3)	2 (16.7)
	Arthralgia	No (26)	14 (93.3)	12 (100.0)
		No (1)	1 (6.7)	0 (0.0)
Athletics (N = 71)	Athletics mean age (years, SD)			32.1 (11.7)
			Male	Female
	Muscle disorders	No (62)	43 (95.6)	19 (76.0)
		Yes (9)	2 (4.4)	7 (24.0)
	Disc displacement	No (59)	36 (80.0)	23 (88.5)
		Yes (12)	9 (20.0)	3 (11.5)
	Arthralgia	No (67)	41 (91.1)	26 (100.0)
		Yes (4)	4 (8.9)	0 (0.0)

Note: SD = standard deviation.

Source: the authors.

Concerning para-athletes of the powerlifting modality, again muscle disorders and disc displacement were the most cited symptom but there is no difference between males and females. Arthralgia was related by 1 male, on the left side of the TMJ. The last analyzed group was the para-athletes from athletics. In this group females presented significantly more muscle disorders than males. Muscle disorders represented by myofascial pain with limited opening were not observed in any cases.

DISCUSSION

This transversal study aimed to investigate the prevalence of TMD in a group of Brazilian para-athletes. In this study, we used the Research Diagnostic Criteria for Temporomandibular Disorder to dichotomize TMD signs and symptoms into three groups that included muscle disorders, disc displacements, and arthralgia. The main results showed that 25.3% of the para-athletes reported having TMD. This prevalence was higher in females (35.7%) than in males (18.3%) para-athletes. Despite no significant differences in the prevalence of TMD between different analyzed para-sports, females that competed in athletics showed significantly more myofascial pain, than males. These findings allowed the same insight regarding TMD in this population.

Before discussing the results, themselves, it is essential to note that currently, the Diagnostic Criteria for Temporomandibular Disorders (DC-TMD) is the tool used for TMD diagnosis in research. However, the DC-TMD protocol was only validated for the Portuguese language after the start of data collection for this research, so in our study, we used the RDC-TMD tool.

Myofascial pain represents the principal muscle disorder. This condition stems from localized, taut regions of skeletal muscle and fascia, termed trigger points (Galasso et al., 2020). These areas of persistent muscle contraction are responsible for decreased blood flow to the site, and when they are palpated, they hurt (Weller et al., 2018). In our study, the palpated areas included the preauricular area, mastication muscles in its origin, body, and insertion, and submandibular area according to the RDC/TMD protocol. The overall prevalence of this muscle disorder was 15.2%, lower than the related prevalence in the general population (Desai et al., 2013), but, female para-athletes who competed in athletics reported having significantly more myofascial pain than men.

In this sense, several studies have shown that TMD is more common in women, being 1.5 to 2 times more prevalent than in the male population (Wang et al., 2008; Lövgren et al., 2016; Bueno et al., 2018) and associate TMD with stress and hormonal changes (Küchler et al., 2020). Studies suggest that the presence of TMD is associated with estrogen levels in women and that hormonal signaling during the reproductive age and menopause may predispose to myofascial pain and potentiate TMD degeneration (Bäck et al., 2017; Robinson et al., 2020).

On the other hand, the practice of intense exercises has been associated with hormonal disorders, which is proven in the study by Coelho et al. (2015), who observed that there was a difference in the hormone level of athletes before the competition, suggesting an imbalance with the decrease in hormones responsible for regulating the menstrual cycle and testosterone. Unfortunately, in our study, we did not measure the hormone levels of the participating athletes, which is a limitation of the study, but, in general, the prevalence of TMD in these athletes was lower than in the population, both male and female.

Disc displacement is defined as an abnormal positional relationship between the disc and the condyle, articular eminence, and joint fossa (Murakami et al., 1993), being the crepitation corresponding to 26.2% of clinical signs (Jussila et al., 2017). Its considerate one of the most common intra-articular disorder of the temporomandibular joint (Poluha et al., 2019) and some factors are related with increase the risk, such as trauma, anatomical alterations, occlusal abnormalities, joint hypermobility, and ligament weakness (Okeson, 2007; Manfredini et al., 2011).

It is expected that, especially in powerlifting athletes, due to the contraction of masticatory muscles and force production, the prevalence of this condition is higher (Churei, 2003). Overall, the prevalence of disc displacement is higher in females (Bueno et al., 2018), however, in our study, this was not observed, with a prevalence of 15.7% in females and 21.2% in males. Furthermore, in the present study, the overall prevalence of disk displacement was 25.3%, lower than in the general population (Talaat et al., 2018).

Arthralgia was defined as pain in the joint, which could be during palpation, maximum opening, or excursion (Schnabl et al., 2018). Regarding joint pain perceived by arthralgia, few para athletes reported it during the examination, with a 5.0% prevalence of this disorder. It is important to mention that para-athletes who are using analgesics or anti-inflammatories were not studied to avoid research bias. That way when compared with other studies, two points deserve to be discussed: first, previous studies suggested that pain management using medications in athletes is common, however in our study, all para-athletes said they did not use medications for pain control. This leads us to the second point: more studies must be carried out on para-athletes, since for this population the psychological factor may be crucial in the perception and tolerance of pain when compared to athletes and the population in general, which would explain the low prevalence of TMD.

Another point that should be considered is the level of competitiveness. A study by Bonotto et al. (2016) concluded that the aspect of competition plays an important role in the development of TMD, that is, recreational athletes have lower values than competitive athletes (Bonotto et al., 2016). In our study, a large part of the population were recreational para-athletes who competed through a social inclusion program in Brazilian municipalities and states, explaining the low prevalence of TMD symptoms in this population.

Finally, it is well known that TMD symptoms affect a large portion of the population. Malgorzata et al. (2020) estimated that over 40% of the population has TMD and its prevalence increased in recent years (Malgorzata et al., 2020). They reinforce the need to adopt specific protocols to diagnose the disorder in earlier stages. In recent years our research group had already observed a high prevalence of TMD in adolescents, higher than 35% (Bertoli et al., 2018). In the evaluated group of para-athletes that took part in this study, this prevalence was lower than the population in general. In this sense, it is important to mention that the practice of physical activity provides physical and mental well being, which is characterized by a decrease in the somatization of painful processes in general. Scientific evidence indicates that physical activity and sports are beneficial for individuals with special needs, influencing self-esteem, self-perception, self-efficacy, body image, and motivation (Muraki et al., 2000; Wetterhahn et al., 2002; Yazicioglu et al., 2007; Giacobbi et al., 2008; Groff et al., 2009). As far as we know, this is the first study that evaluated the prevalence of TMD in para-athletes and suggests that, for this population, sport offers benefits related to health and quality of life and, possibly contributed to reducing TMD.

CONCLUSION

Our study demonstrates that the prevalence of TMD in a sample of Brazilian para-athletes is lower than in the general population, and TMD prevalence and symptoms are higher in females than in males. These two primary conclusions allow us to raise two hypotheses: First, once temporomandibular joints are susceptible to individuals' emotional status, the explanation for the lower TMD prevalence in para-athletes is the mental well being provided by sports practice.

Second, despite the lower prevalence of TMD symptoms in the studied population, female para-athletes presented higher symptoms than male para-athletes, reinforcing the idea already described in the literature that in women, TMD is modulated by hormonal signaling. In this sense, one limitation of our study was the need for more information regarding the hormonal cycle of the women enrolled in this research. Further studies must be designed to test this approach.

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CONFLICTS OF INTEREST

The authors have declared that no competing interests exist.

DATA AVAILABILITY

Not applicable.

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