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Influence of self-care using complementary and integrative therapies during the COVID-19 pandemic in children and adolescents aged 4 to 13 years with bruxism and temporomandibular disorders

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Abstract

Bruxism is a behavior of the mandibular muscles, characterized by clenching and/or dental grinding, both in wakefulness and in sleep, which can lead to Temporomandibular Disorders (TMD). Highly prevalent in children and possessing a multifactorial etiology, psychosocial aspects stand out, especially stress and anxiety. The need for social distancing during the COVID-19 pandemic has had consequences for children and has given rise to new formats of actions in Dentistry. This study evaluated the influence of self-care on the manifestations of Bruxism/TMD in children who were undergoing treatment, before the pandemic, Care Center for children with Bruxism and TMD, whose acronyms in Portuguese is SABDI, located in Ribeirão Preto School of Dentistry (FORP-USP), through assisted interventions, implemented remotely, of Complementary and Integrative Therapies (CIT). Prior to the interventions (T0), the parents answered the questionnaire (Q1) about the child (in Google Forms, sent by WhatsApp and e-mail). The proposed practices were explained in virtual meetings (Google Meet) and performed for 21 days and recorded in a "Control Diary". A new questionnaire (Q2) was completed for comparative analysis after the interventions (T1). Of the 37 children who were undergoing treatment, the final sample of 18 who completed all the proposed steps showed a quantitative difference in the items: "pain in the mouth/face when chewing"; "pain or difficulty opening and closing the mouth"; "waking up with pain in the face or headache" and "headache during the day or night"; "grinding teeth while awake"; "frequency grinding teeth while awake"; "grinding teeth while sleeping"; "frequency grinding teeth while sleeping"; "restless sleep"; "nightmare"; and "insomnia". Evidence of statistical difference was observed with a P value <0.05, in the item "clenches teeth while awake" (p=0.0057). It is concluded that the proposed interventions influenced the manifestations of Bruxism, favoring its control.

Keywords: Bruxism. COVID-19. Children. Temporomandibular dysfunction.

INTRODUCTION

Bruxism is a repetitive activity of the mandibular musculature characterized by clenching and/or grinding of the teeth, as well as by the thrust of the mandible, which can be manifested in both waking and sleeping states[1], the latter being more prevalent in children and adolescents[2], and may be a precursor of Temporomandibular Disorders (TMD)[3].

Psychological factors have been associated with Bruxism and TMD[4] and still act as a risk factor for changes in sleep patterns[5]. Additionally, the COVID-19 pandemic has resulted in a series of psycho-emotional implications[6,7]. Fear and insecurity, one of the psycho-emo-

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tional aspects most exacerbated by the pandemic situation, can increase levels of anxiety and stress in healthy people and intensify the symptoms of those with pre-existing psychiatric disorders[8].

Changes in daily routine after the advent of the COVID-19 pandemic and its direct and indirect psychological effects on mental health are considered an emerging public health problem and, therefore, it is recommended that programs offering preventive support and early intervention be implemented during potential pandemics[9]. Among these treatment alternatives, the Complementary and Integrative Therapies (CIT) have been highlighted, which involve approaches that treat the human being in a holistic way and seek their physical, energetic, and emotional balance, aiming at the improvement of health conditions[10].

Since 2014, Care Center for Children with Bruxism and TMD, whose acronyms in Portuguese is SABDI, located in Ribeirão Preto School of Dentistry (FORP-USP) has been carrying out training, research, and community assistance actions in order to supply the demand for knowledge and care for children and adolescents with bruxism and TMD. However, during the pandemic period, clinical care at FORP-USP was initially suspended, since aerosols and saliva/blood droplets are forms of transmission of COVID-19, representing a current challenge for dentistry[11].

Considering the feasibility of continuing the therapies to which children were submitted to in person at SABDI before the pandemic, this study proposed the remotely assisted application of Integrative and Complementary Therapies, such as flower therapy, Aromatherapy, Acupressure, and Mindfulness-based Strategies, in order to assess the influence of self-care on the manifestations of Bruxism and TMD.

MATERIAL AND METHODS

This study was approved by the Ethics Committee of the School of Dentistry of Ribeirão Preto (CAAE: 39684520.8.0000.5419) of the University of São Paulo. The parents and/or legal guardians of the children signed a "Informed Consent Form" and the children were informed through the "Informed Assent Form".

A process of selection of subjects was carried out, based upon a convenience sample composed of 37 children of both sexes (53% girls and 47% boys) who were attended in the face-to-face format, from August to December 2019, at SABDI-FORP/USP. The mean age of participants was 10.59 years (Standard Deviation of 2.98 years), with a variation between participants from 4 to 13 years of age. As a methodological criterion, all children whose parents and/or caregivers had a smartphone and Internet access and who agreed to participate in all phases of the research were included.

Preceding the application of the proposed practices (T0), the parents and/or guardians answered a questionnaire (Q1) about the child (in Google Forms format and sent by WhatsApp and e-mail). This questionnaire was divided into four sections:

- Section A: questions about orofacial pain, manifestations of bruxism and associated factors;
- Section B: questions about children's habits and routine during the pandemic;
- Section C: questions about families' knowledge of the COVID-19 disease;
- Section D: questions about psycho-emotional and behavioral aspects of the child during the pandemic.

In a second phase, parents and/or guar-

dians participated in a virtual meeting through the Google Meet platform. Information on childhood bruxism and TMD was provided, covering concepts, risk factors with an emphasis on psychosocial aspects, and educational guidelines. Instructions for implementing the practices were detailed as follows:

- Flower Therapy – indication for oral use of a Bach Flower Therapy (Rescue Remedy), 4 drops 4 times a day;

- Aromatherapy - use of a roll-on bottle containing 5 drops of dõTERRA® Lavender essential oil (Young Living®, Utah, United States) and 10 mL of carrier oil (dõTERRA® Fractionated Coconut Oil) for application once a day, before the child sleeps, on the cheeks and soles of the feet.

- Acupressure: massage in acupuncture points, performed after the application of Aromatherapy. These stimuli were performed by means of continuous pressure for one minute on four acupoints (F3, CS6, C7, and IG4) and massage, counterclockwise, for one minute, on two acupoints (YINTANG and E6).

- Mindfulness-based strategies: practices for the development of mindfulness with a focus on breathing were carried out and explained through an audio and an educational booklet in digital format (sent via WhatsApp and by email), developed by an expert and instructor in Mindfulness, which directed the activities to the age group of the children in this study. It should be noted that mindfulness exercises were practiced by children, in person, before the pandemic. Thus, the realization of strategies based on Mindfulness were well accepted by the children in the sample and their guardians.

All activities were carried out for 21 days, with materials provided free of charge and taken from the pharmacy that handled the florals, and activites were recorded in a "Control Diary". After the end of this period, the parents and/or guardians sent (through WhatsApp) the notes filled in the "Control Diary" (scanned or photographed) for data tabulation and answered the Q2 questionnaire (in Google Forms format sent by WhatsApp and e-mail) after the interventions (T1). This questionnaire (Q2) was structured in the same way as Q1, in order to reassess the child after the proposed interventions and were completed by the same person.

Figure 1 illustrates the flowchart of the participants' evolution during all stages of implementation of the proposed interventions.

RESULTS

Initially, the data obtained in the Q1 and Q2 questionnaires and the information collected in the "Control Diaries" were tabulated in electronic spreadsheets, checked, and verified.

Fisher's hypothesis test was used to verify the statistical association of categorical variables with characteristics of time T0 (time of application of Q1, before the interventions) and T1 (time of application of Q2, after the interventions).

Table 1 describes the data referring to symptoms related to bruxism and TMD in childhood, considering T0 and T1. There was no evidence of statistical difference. However, it was possible to observe a quantitative difference between the items: "pain in the mouth or face when chewing"; "pain or difficulty opening and closing the mouth"; "wake up with pain in the face or headache"; and "headache during the day or night".

Table 2 shows evidence of statistical difference in the item "clenches teeth while awa-

ke", and in the other factors evaluated, only quantitative differences were observed.

The characteristics related to teeth grinding are described in Table 3. For the items evaluated: "grinding teeth while awake", "frequency grinding teeth while awake", "grinding teeth while sleeping", and "frequency grinding teeth while sleeping" there was no evidence of statistical differences, only quantitative differences.

Table 4 lists data referring to the sleep characteristics of the children and adolescents in this study, such as: "restless sleep", "nightmare", and "insomnia", in which no statistical differences were observed, but quantitative differences were.

The data in Table 5 demonstrate psycho-emotional characteristics of children and adolescents, such as: "insecurity", "fear", "sadness", and "stress", and after the proposed interventions, it was not possible to observe evidence of statistical differences, only quantitative differences.

Table 1 – Comparative description of symptoms related to Bruxism and TMD in childhood, pre- and post-implementation of CIT.

Characteristics	Time		p-value*
	T0	T1	
	n (%)	n (%)	
Pain in the mouth or face when chewing			
Yes	11(22.45%)	2(4.08%)	0.0947
No	20(40.82%)	16(32.65)	
Pain or difficulty opening and closing the mouth			
Yes	4(8.16)	2(4.08%)	0.99
No	26(53.06%)	16(32.65)	
I don't know	1(2.04%)	0(0%)	
Wakes up with a pain in the face or a headache			
Yes	16(32.65%)	9(18.37%)	0.99
No	14(28.57%)	9(18.37%)	
I don't know	1(2.04%)	0(0%)	
Headache during the day or at night			
Yes	18(36.73%)	8(16.33%)	0.6044
No	12(24.49%)	10(20.41)	
I don't know	1(2.04%)	0(0%)	

Legend: n = absolute number. % = percentage. * Fisher's test

Table 2 – Comparative description of frequency and periods in relation to teeth clenching.

Characteristics	Time		p-value*
	T0	T1	
	n (%)	n (%)	
Clenches teeth in wakefulness			
Yes	18(36.73%)	3(6.12%)	0.0057*
No	12(24.49%)	11(22.45)	
I don't know	1(2.04%)	4(8.16%)	
Frequency of teeth clenching while awake			
Daily	13(54.17%)	2(8.33%)	0.2885
2 to 3 X week	2(8.33%)	1(4.17%)	
1 X week	4(16.67%)	0(0%)	
1 X every 15 days	1(4.17%)	1(4.17%)	
Clenches teeth while sleeping			
Yes	21(42.86%)	11(22.45)	0.9033
No	6(12.24%)	5(10.20%)	
I don't know	4(8.16%)	2(4.08%)	
Frequency of clenching teeth while sleeping			
Daily	17(53.13%)	6(18.75%)	0.2742
2 to 3 X week	3(9.38%)	3(9.38%)	
1 X week	1(3.13%)	1(3.13%)	
1 X every 15 days	0(0%)	1(3.13%)	

Legend: n = absolute number. % = percentage. * Fisher's test

Table 3 – Comparative description of frequency and periods in relation to teeth grinding

Characteristics	Time T0	Time T1	p-value*
Grinds teeth in wakefulness	n (%)	n (%)	
Yes	7(14.29%)	4(8.16%)	0.8987
No	20(40.82%)	13(26.53)	
I don't know	4(8.16%)	1(2.04%)	
Frequency of grinding teeth while awake			
Daily	4(30.77%)	3(23.08%)	0.6410
2 to 3 X week	2(15.38%)	0(0%)	
1 X week	1(7.69%)	0(0%)	
1 X every 15 days	1(7.69%)	2(15.38%)	
Grinds teeth while sleeping			
Yes	22(45.83%)	13(27.08)	0.99
No	6(12.5%)	4(8.33%)	
I don't know	2(4.17%)	1(2.08%)	
Frequency of grinding teeth while sleeping			
Daily	15(41.67%)	6(16.67%)	0.5094
4 to 6 X week	1(2.78%)	1(2.78%)	
2 to 3 X week	4(11.11%)	4(11.11%)	
1 X week	3(8.33%)	1(2.78%)	
1 X every 15 days	0(0%)	1(2.78%)	

Legend: n = absolute number. % = percentage. *Fisher's test

Table 4 – Sleep characteristics of children and adolescents.

Characteristics	Time T0 n (%)	Time T1 n (%)	p-value*
Restless sleep			
Yes	11(22.45%)	7(14.29%)	0.8888
No	19(38.78%)	10(20.41%)	
I don't know	1(2.04%)	1(2.04%)	
Bad dream			
Yes	7(14.29%)	3(6.12%)	0.8740
No	22(44.90%)	14(28.57%)	
I don't know	2(4.08%)	1(2.04%)	
Insomnia			
Yes	9(18.37%)	2(4.08%)	0.1781
No	22(44.90%)	16(32.65%)	

Legend: n = absolute number. % = percentage. * fisher test

Table 5 – Comparative description of the psycho-emotional characteristics of children and adolescents.

Characteristics	Time T0 n (%)	Time T1 n (%)	p-value*
Insecurity			
Yes	16(32.65%)	7(14.29%)	0.3519
No	15(30.61%)	10(20.41%)	
I don't know	0(0%)	1(2.04%)	
Fear			
Yes	14(28.57%)	7(14.29%)	0.8899
No	16(32.65%)	10(20.41%)	
I don't know	1(2.04%)	1(2.04%)	
Sadness			
Yes	13(26.53%)	5(10.20%)	0.3721
No	18(36.73%)	13(26.53%)	
Stress			
Yes	14(28.57%)	9(18.37%)	0.7746
No	17(34.69%)	9(18.37%)	

Caption: n = absolute number. % = percentage. *Fisher's test

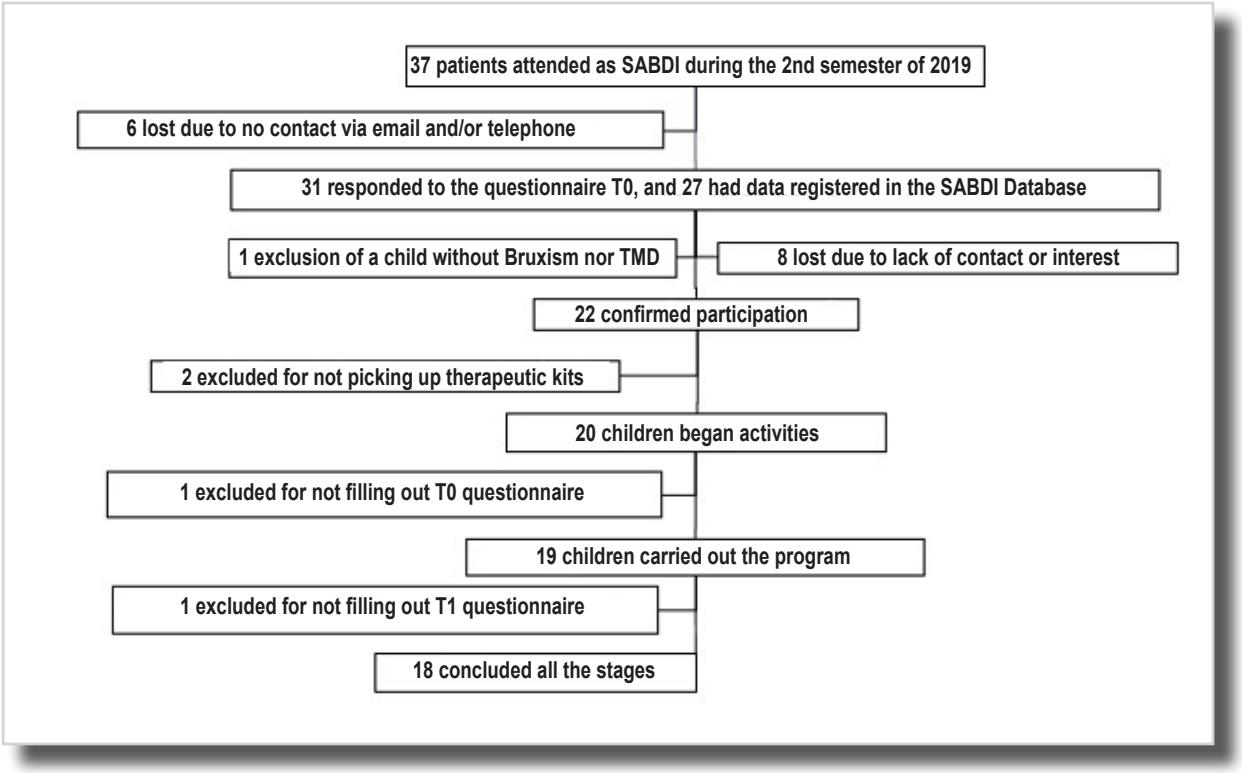

Figure 1 – Flowchart evolution of participants during all stages of implementation of the proposed interventions

DISCUSSION

On March 11, 2020, the World Health Organization (WHO) officially designated the spread of SARS-CoV-2 as a global pandemic[12]. COVID-19 has caused a series of psycho-emotional implications and has affected people from different social classes[6,7]. Despite the advance of vaccinations, the total number of cases in October 2021 exceeded 230 million, with more than four million and 700 thousand deaths[6]; and Brazil recording the tragic mark of more than 600 thousand deaths from COVID-19.

In this scenario, public health and dentistry have been affected, which implies the need for joint measures and remote assistance combined with clinical practice. This was favored by the advancement of technology, with the ease of access to the internet and the widespread use of smartphones[13]. Currently, Teledentistry has represented a promising educational tool that is safe and easy to use, as in Telemedicine, with its numerous benefits. Among these, guidelines for patients on the various ways of performing self-care and preventive care by transferring knowledge and images that favor health conditions and habits[14,15]. In this context, one of the communication platforms that can be used is the WhatsApp application, which is the most popular channel with the highest number of monthly users in Brazil, considered in the year 2019[16]. This means of intervention via cell phone enables care approaches through the transmission of educational information and monitoring, strengthening the bridge be-

tween health and technology with its various innovations[13,15].

Bruxism is defined as a repetitive activity of the jaw muscles, characterized by clenching and/or grinding of the teeth that can manifest, based on the circadian cycle, in the waking states (awake bruxism or daytime bruxism) or during sleep (sleep bruxism)[1], with a higher incidence in children than in adults and with a tendency to decrease with age[2]. This condition has been associated with several factors, including pathophysiological ones, such as airway obstruction, sleep apnea, gastroesophageal reflux, and sleeping disorders[17,18], genetic factors[19,20], psychological aspects, especially anxiety, stress and neuroticism[4,21], among others, such as mouth breathing, biting nails, and biting objects[22,23].

It is important to know the symptomatological picture resulting from this condition, which includes pain in the masticatory muscles, wear on the dental structure, tooth sensitivity, headaches and, also, this behavior can be a precursor of TMD, understood as a set of signs and symptoms characterized by orofacial pain, temporomandibular joint (TMJ) noises, and restriction or locking in mandibular movements[3]. It is worth noting that there is no single effective specific intervention, but several options available that can help and that each case must be evaluated individually[2,24,25].

The field of Integrative and Complementary Practices (CIT), called by the WHO Traditional and Complementary/Alternative Medicine (TC/AM), involves approaches that seek to stimulate the natural mechanisms of disease prevention and health recovery, through effective and safe technologies, with an emphasis on welcoming listening, the development of the therapeutic bond and the integration of the human being with the environment and society. These integrative follow-ups based on education and evidence with non-pharmacological therapeutic methods enable an improvement in health conditions in the physical, mental, and social realms[10].

Among the strategies proposed in this study, therapies were selected were easily applicable based on self-care, through practices that contribute to a healthy lifestyle in response to stress[26], and to which the children were submitted to in person at the SABDI, prior to the COVID-19 pandemic. The therapies used were Floral Therapy, Aromatherapy, Acupressure, and Mindfulness-based Strategies.

The period stipulated for this non-face-to-face service was three weeks, based on the power that habits (positive and negative) have over routines and behavioral control[27], affecting health and quality-of-life in the short- and long-terms around the concept of "lifestyle medicine" in the daily routine[28] as well as in the understanding of dependence on the commitment or engagement of the participants. Studies suggest that participant involvement can be a major problem in web-based interventions[29].

The results regarding the symptoms of bruxism and TMD in childhood showed that there was a statistical difference only for the item “clenches teeth during the day”. However, although there was no statistically significant difference in relation to other aspects, such as “pain in the mouth or face when chewing”, “pain or difficulty opening and closing the mouth”, “waking up with pain in the face or headache”, “headache during the day or at night”, “clenches teeth while sleeping”, “grinds teeth during the day”, and “grinds teeth while sleeping” it was possible to observe an expressive numerical difference, with a reduction of values after the interventions. The same pattern of numerical decrease could be observed in relation to children's sleep during the pandemic, in the evaluation of "restless sleep", "nightmare", and "insomnia", as well as in relation to

"psychoemotional aspects", such as "insecurity", “fear”, “sadness”, and “stress”. This fact indicates a potential beneficial effect of these CIT in the control of bruxism and TMD. It should be noted that a study does not necessarily need to present statistically significant results to be valid. The quantitative data of this study contributed to elucidate issues that influenced the evaluated group and such information contributes to improve strategies that enable future applicability in the control of Bruxism and/or TMD.

It is difficult to compare these results with other studies, since remote assistance is a recent research tool in dentistry, as well as the use of CIT in cases of bruxism and TMD in children. Some studies contemplate the use of certain CIT, with good results; however, the association of the four techniques used in this study has not been previously investigated.

Studies indicate that the use of floral therapy can exert some biological effects, some emotional changes with relief of negative emotions, as well as promote positive thoughts with a reduction of anxiety and even pain relief, which contributes to help in the control of cases of bruxism and TMD in this current pandemic scenario[30-32]. Rescue Remedy® was the flower essence used in this study and is composed of five flower extracts: Star of Bethlehem (Ornithogalum umbellatum), used for situations of emotional shock; Rock Rose (Helianthemum nummularium), for moments of panic; Impatiens (Impatiens glandulifera), to calm down physically and mentally; Cherry Plum (Prunus cerasifera), for situational control, and Clematis (Clematis vitalba), for providing awareness and focus[33]. Similarly, Dixit and Jasani (2020)[32] evaluated anxiety during dental care in children using Bach Flowers and music therapy and demonstrated a significant improvement in behavior and reduced anxiety.

Another technique used was acupressure, which is a valuable facilitator tool due to its anxiolytic effects, minimizing discomforts such as anxiety, stress, insomnia, and fear[34,35]. Manual therapy stimulates parasympathetic activity by involving the relaxation response, has an analgesic effect, can lead to a reduction in the frequency and intensity of bruxism and TMD symptoms, and its association with other therapeutic resources potentiates the effects obtained in controlling the myofascial pain symptoms, demosntarting more significant results[36]. Moreover, Anvisa *et al.* (2018)[37] evaluated the effect of acupressure on specific points for the control of anxiety in children, between 8 and 12 years old, undergoing scaling and/or restoration procedures using the Modified Child Dental Anxiety Scale (MCDAS). Heart rate was the physiological parameter recorded. The acupressure group had a lower level of anxiety, representing a viable alternative to reduce dental anxiety in children.

Regarding aromatherapy, James *et al.* (2021)[38] compared aromatherapy and the technique of musical distraction in the management of anxious children undergoing restorative treatments and showed that both were effective in controlling anxiety during dental care. Furthermore, inhalation and massage with Lavender essential oil, specifically, offers numerous benefits as a non-pharmacological and simple method with a positive effect on mood, in the control of anxiety, depression, and improvement of sleep quality[39-41].

Regarding mindfulness-based interventions, it has been reported, among the resulting benefits, the improvement of mental health[42], with reduced levels of stress and anxiety[43], as well as increased well-being[44]. Mindfulness, referred to in Portuguese as Full Attention, is defined as “the awareness that emerges when paying attention, intentionally, focused on the present moment, without judgments”[43]. The consolidation of Mindfulness as a strategy promotes the

development of emotional regulation in the individual, including the pediatric population.

Moreover, favorable results have been reported resulting from the practice of Mindfulness in children and adolescents. Benefits such as improved executive functions, cognition and emotional regulation, favoring optimism, empathy, interpersonal relationships, and consequently prosocial behaviors, as well as such as the reduction of aggression, stress, and anxiety, have been pointed out[45]. Considering that psycho-emotional factors are associated with bruxism and the signs and symptoms of TMD, it is also possible to attribute to the Mindfulness-based interventions implemented in the present study the quantitative differences related to fear, sadness, and stress, and consequently to the reduction of manifestations of bruxism.

In this study, four techniques were used together, which does not make it possible to designate greater effectiveness to just one of them; however, this was not our objective. Our objective was to prove and encourage self-care in times of a pandemic, in which face-to-face care is impossible, which was identified in this initial study. Thus, despite not having presented evidence of statistical differences in most of the items evaluated, possibly due to the small size of the sample, the numerical reduction of the values after the four proposed interventions, through remote strategies, showed a strong interference of these practices of self-care in the manifestations of bruxism and signs and symptoms of TMD in children. Thus, in view of the above, it is necessary to promote new forms of care and self-care, through educational means and monitoring, in order to mitigate the impacts of the interruption of clinical care and not to neglect patients.

CONCLUSION

The interventions proposed in this study showed statistical evidence in cases of clenching during wakefulness and a significant quantitative reduction in the other aspects evaluated. Therefore, the practices applied remotely in this study, for self-care, can contribute to the control of the manifestations of Bruxism and TMD in children and adolescents.

CRediT author statement

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