



## THE IMPACT OF STRESS DURING THE COVID-19 PANDEMIC ON THE DENTAL HEALTH OF MU-VARNA EMPLOYEES

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### ABSTRACT:

**Introduction:** One of the negative manifestations of stress and anxiety related to dental health is the unconscious clenching or grinding of teeth, which gradually leads to tooth wear.

**Aim:** The aim of this article is to determine the impact of the COVID-19 pandemic on the dental health of MU-Varna employees, to follow up on the therapeutic effect of wearing a bruxism mouthguard, and for the results to be applied in preparing a model for health promotion based on a multidisciplinary approach.

**Materials and Methods:** From July 2022 to now, 995 patients have been examined, and 40 of them, university lecturers and administrative staff at MU-Varna, Bulgaria, have been prescribed a bruxism mouthguard. The following instruments were used: a unified form for defining the dental status and a survey about the therapeutic effect of the bruxism mouthguard.

**Results and Discussion:** A voluntary, anonymous survey was conducted among MU-Varna employees in October 2023. The SPSS (version 22) software was used to process the data from the survey. The assessment of the therapeutic effect of the mouth guard was based on the results from the secondary exam at the clinician's office and those from the conducted *individual survey* among the people wearing mouth guards for a specified period of time.

**Conclusion:** The analysis indicates that the employees have a positive attitude toward wearing the mouthguard in the future. Its use helped decrease the frequency of conditions such as affect, anxiety, and quick tiredness.

**Keywords:** COVID-19, dental health, bruxism, university employees,

### INTRODUCTION

The COVID-19 pandemic and the subsequent closing of education institutions, the transfer of all processes to an exclusively digital environment, the social contact reduction, and the decrease in physical activity have led to a number of problems for those working in the field of education [1, 2]. Many studies have been conducted, both nationally and internationally, examining the stress levels among instructors, with the aim of developing models to overcome the consequences of this condition [3, 4]. One of the negative manifestations of stress and anxiety related to dental health is the unconscious clenching or grinding of teeth, which gradually leads to tooth wear. Bruxism affects not only the patient's health status but also their esthetic outlook, which results in deteriorated quality of life and has serious ramifications for the human organism. This condition is defined as an unconscious oral habit of rhythmic, non-functional clenching, grinding, and production of sounds with the teeth while performing movements which are not part of the masticatory function and lead to occlusal trauma [5, 6, 7].

Among the most frequent factors which may cause teeth grinding during the night are:

- **anxiety** - people who are under stress and frequently feel anxious are at a higher risk of developing this problem;
- **drug intake** - occasionally, teeth grinding is a side effect of drugs, such as antidepressants;
- **addictions** - smoking, alcohol abuse, caffeine;
- **certain conditions** - hypoglycemia, hypofunction of the adrenal glands, sleep disturbance, gastroenterological diseases, etc.

Symptoms of the condition are:

- > tooth enamel wearing off;
- > tight jaw muscles;
- > earache;
- > frequent headache;
- > facial muscle pain.

The mild bruxism cases do not require treatment. However, if it results in functional impairment and trauma of the teeth and jaw, a complex approach is needed for the patient to realize there is a problem [8, 9, 10]. There are various types of treatments based on behavior modification (realizing the habit; techniques for relaxation, and overcoming the anxiety and stress in everyday life), which

could eliminate bruxism when the person is awake. This would lead to the start of a process of control over the habit and a decrease in the frequency and/or intensity of the daily tooth contact and muscle tension [11, 12]. Pos-

sible solutions to managing bruxism, depending on the cause and the severity of the condition, are: psychotherapy, drug therapy, prosthetic therapy, and bruxism mouth guard [13, 14] (Fig. 1).

**Fig. 1.** Possible solutions to managing bruxism, depending on the cause and the severity of the condition.



The most frequently used conservative treatment is by wearing a bruxism mouth guard. The guard is a sort of dental “pillow” made from thermoplastic silicone, which is capable of creating a protective barrier between the two tooth rows. Its primary purpose is eliminating tooth load [15]. It can be used in patients with intact dentition, patients with fixed dental constructions and variations of them. The decision on whether the dentition present allows using the mouthguard belongs to the dentist. An important

condition is the decrease of stress by regular rest, short breaks at work, combined with respiratory exercises or sport. There are several technologies for manufacturing bruxism mouthguards (Fig. 2):

- cuvette technique with flexible plastic (1);
- thermoforming technology (2) ;
- 3D print (3);
- universal thermoplastic mouth guards with individual adaptation by the patient (4).

**Fig. 2.** Technologies for manufacturing bruxism mouth guards.



*The advantages* of the first three technologies are: precise customization of the mouthguards based on the patient's prosthetic field by a dental technician and the exercise of medical control.

*The disadvantages* are limited to the investment in buying specialized equipment and training people to work with it [6, 13, 16].

Universal thermoplastic foils for mouthguard manufacture are freely available. They are distributed in the pharmaceutical network and dental depots and do not require specialized equipment and a visit to the dental office. However, the aforementioned advantages are also disadvantages because patients rarely manage to accurately adapt the thermoplastic foil to their tooth rows themselves, which results in increased discomfort. The lack of medical control negates the possibility of determining both the proper fit of the mouthguard and the therapeutic effect of wearing it.

The research team is working under Science Fund project 1 21009 of MU-Varna, which aims to apply a complex of multidisciplinary interventions targeting health prevention, assess their efficiency, and offer a universal model for health promotion. The practice work of the members of the team from TS Dental Technician is related to the dental health prevention of MU-Varna employees during the COVID-19 pandemic, which consists of an initial examination by a clinician and if needed—manufacturing bruxism mouthguards. The study on the therapeutic effect of wearing a bruxism mouthguard is assessed by the treating doctor after a specific period of time. The data from the voluntary, anonymous survey conducted among those wearing the mouthguard indicate their personal opinion on its effectiveness.

**AIM**

The aim of the article is to establish the impact of the COVID-19 pandemic on the dental health of MU-Varna employees and to follow up on the herapeutic effect of

wearing bruxism mouthguards with the results being applied in developing a health promotion model based on a multidisciplinary approach.

**MATERIALS AND METHODS**

From July 2022 until now, 995 patients have been examined, 40 of whom, university lecturers and administrative staff at MU-Varna, Bulgaria, were prescribed a bruxism mouthguard. The following instruments were used:

**A unified form for determining the dental status.**

It is part of an outpatient card for an exam by the general practitioner or a physician specialist and contains:

- patient data;
- physician data;
- date and time of the exam;
- type of exam;
- medical information;
- main diagnosis;
- dental procedures.

**A survey form about the therapeutic effect of the bruxism mouthguard.** It consists of 10 questions, the first concerning demographic indicators, such as age and gender. The remaining questions aim to establish certain aspects of the quality of life of the respondents after wearing the bruxism mouth guard, as well as their attitude toward continuing to wear the protector after concluding the therapy. The voluntary, anonymous survey was conducted among MU-Varna employees in October 2023. The SPSS (version 22) software was used to process the data from the study.

The assessment of the therapeutic effect of wearing a mouth guard is based on the results from the secondary exam at the clinician's office with the help of the *unified form for determining the dental status* and those from the voluntary *individual survey* conducted among the people wearing mouth guards for the specified period of time (Fig. 3).

**Fig. 3.** Unified form for determining the dental status.

DENTAL STATUS OF THE PATIENT																	
(when determining the status, the temporary teeth present are marked with a circle)																	
Legend	C: caries																
	P: pulpitis																
	G: periodontitis																
	R: root	18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
	O: obturation																
	E: missing tooth																
	K: crown																
	X: artificial tooth	48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38
	Pa: parodontitis																
	I, II, III: degree of mobility				85	84	83	82	81	71	72	73	74	75			
	F: fracture																

The mouth guard manufacturing consists of two clinical stages and one laboratory stage. It is intended for the upper jaw due to better retention [17, 18]. The borders depend on the length of the clinical crowns and are determined by the dentist.

**The clinical stages** include the following steps:

- determining the dental status;
- taking an imprint of the prosthetic field of the patient, the upper and lower tooth rows;
- placing the mouthguard;
- assessing the effect of the mouthguard after a 3-month period of use.

**The laboratory stage** includes the following steps:

- casting work models (upper and lower) from hard plaster;
- inclusion of the models in an articulator after taking a bite registration of the mandibular position in centric condylar relation by Dimova-Gabrovska M. [10];
- shaping the mouthguard with the help of thermoforming technology;
- removing the mouthguard from the model, cutting, shaping, printing the masticatory surfaces of the antagonists, smoothing the edges and delivering it to the clinic (Fig. 4) [19, 20].

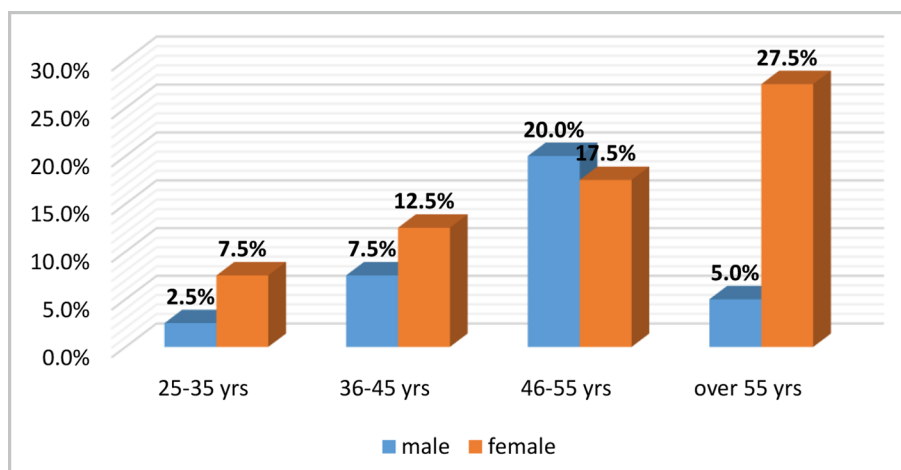
**Fig. 4.** Laboratory stages of manufacturing the mouthguard: 1) positioning of the model. 2) a thermopress machine. 3) molded plate. 4) cutting and shaping along the borders. 5) printing the antagonists. 6) the finished mouthguard.



## RESULTS AND DISCUSSION

The current study includes 40 MU - Varna employees. Of them, 14 (35%) are men and 26 (65%) are women. The distribution by gender and age shows that the majority of them are in the 46–55 age group, consisting of 15 individuals (37.5%). Second place is for the group of those over 55, with 13 individuals (32.5%). The 36–45 age group includes 8 people (20.0%), and the least numerous is the 25–35 age group with 4 individuals (10.0%).

**Fig. 5.** Age and gender distribution of the employees (%).

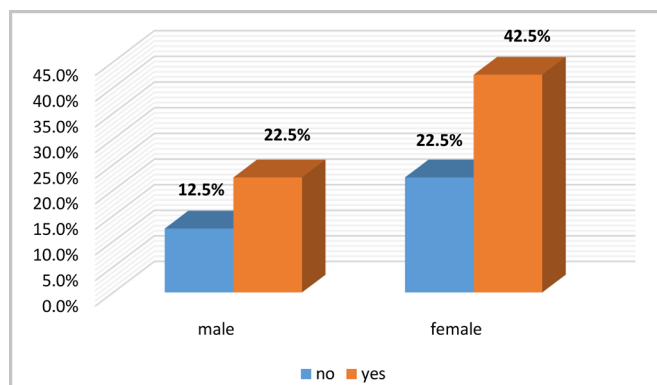


Out of a total of 40 employees, 26 (65.0%) have fixed dental constructions, and 14 (35%) do not have such. Of them, 17 (42.5%) are women and 9 (22.5%) are men (Fig. 5).

Applying the Chi-Square analysis, the hypothesis that **gender does not influence fixed dental constructions** is tested.

The results show that 26 employees (65.0%) have fixed dental constructions. Of them, 9 (22.5%) are men and 17 (42.5%) are women (Fig. 6).

**Fig. 6.** Distribution according to gender and the presence of fixed dental construction (%).

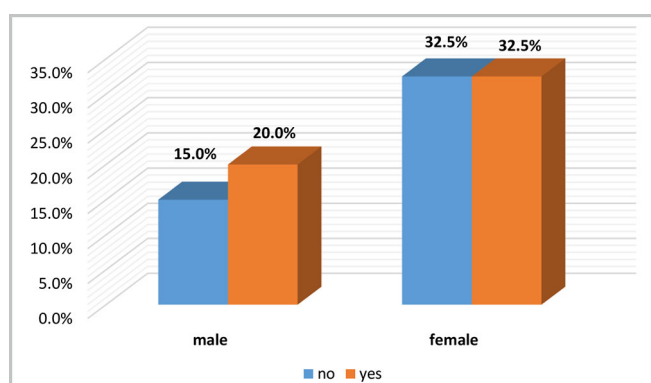


The Chi-Square analysis indicates that the tested hypothesis is valid because Pearson Chi-Square = 0.005 and has a significance level of Asymp. Sig. (2-sided) = 0.945 >  $\alpha = 0.05$ . Therefore, **gender does not influence the presence of fixed dental constructions**.

The hypothesis that **there are no gender differences in regard to the awareness of the employees about the presence of bruxism** is tested. To the question: „Did you know that you suffered from bruxism before volunteering for the study, which is part of the project for dental health prevention?“ a positive reply was given by 21 (52.5%), while the remaining 19 individuals (47.5%) replied in the negative. The gender distribution shows that in the group of employees unaware of their suffering from bruxism, 6

(15.0%) are men, and 13 (32.5%) are women. In the group of those aware of their condition, 8 (20.0%) are men and 13 (32.5%) are women (Fig. 7).

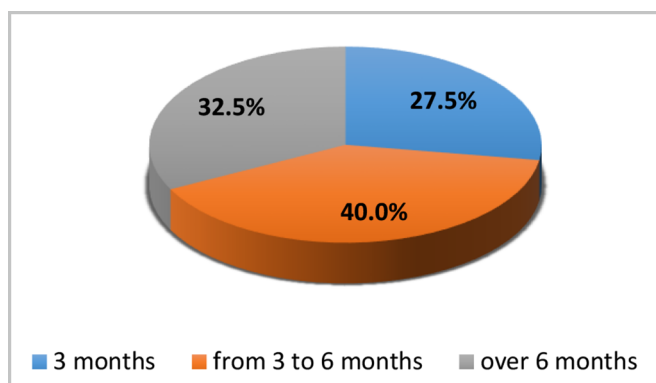
**Fig. 7.** Distribution according to the awareness of the presence of bruxism (%).



The Chi-Square analysis indicates that **the null hypothesis is accepted** because Pearson Chi-Square = 0.186 and has a significance level of Asymp. Sig. (2-sided) = 0.666 >  $\alpha = 0.05$ . Therefore, there are no gender differences regarding the employees' prior awareness of bruxism.

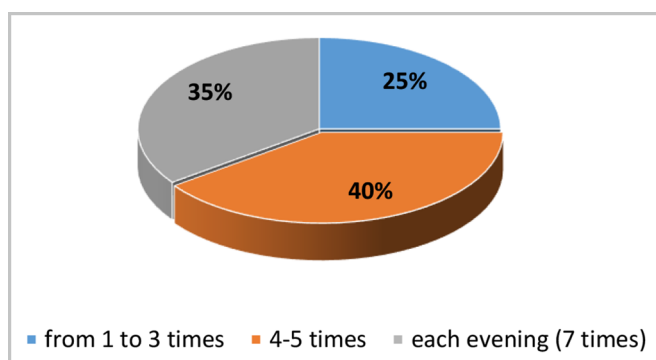
Studying the length of time, employees wore the bruxism mouth guard; it has been established that most wore it for 3 to 6 months. These are 16 individuals, constituting 40% of all participants. Another 13 (32.5%) employees wore it for over 6 months. The least numerous group of 11 (27.5%) individuals wore the bruxism mouth guard for only 3 months (Fig. 8).

**Fig. 8.** Period of time wearing the bruxism mouth guard.



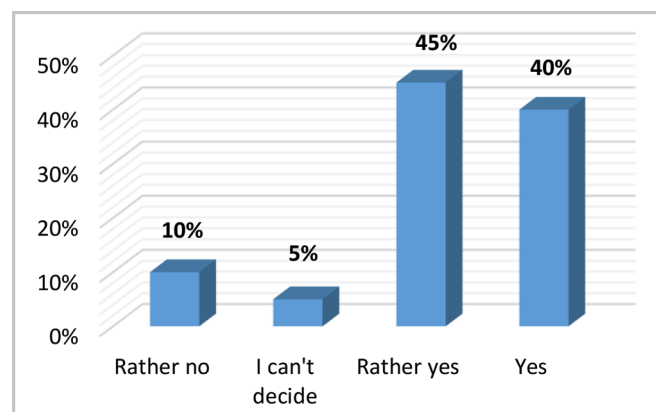
The distribution according to the weekly frequency of wearing the bruxism mouth guard shows that the majority of the employees wore it 4–5 times. They are 16, with a relative share of 40%. It was worn from 1 to 3 times by 10 (25.0%) individuals, and each night, or 7 times, by 14 (35.0%) people (Fig. 9).

**Fig. 9.** Weekly frequency of wearing the bruxism mouth guard.



The analysis shows that most of the employees are satisfied with the effect of the use of the bruxism mouthguard. Of them, 18 (45.0%) gave a “Rather yes” reply, and another 16 (40.0%) confidently indicated “Yes” as an answer. Only 4 (10.0%) replied “Rather no,” and 2 (5.0%) indicated that they could not assess their satisfaction with the mouthguard (Fig. 10).

**Fig. 10.** Degree of satisfaction from wearing a bruxism mouthguard.



The predominant part of the employees give a positive assessment of the changes observed after wearing the bruxism mouthguard. The “Rather yes” reply is given by 22 (55.0%), and another 13 (32.5%) people answer with “Yes”. “Rather no” is indicated by only 5 (12.5%) individuals.

Better sleep is reported by a total of 36 employees. Of them, 23 (57.5%) replied with „Rather yes” and another 13 (32.5%)—with a firm „Yes“. Disagreement is expressed by only 3, and 1 cannot decide.

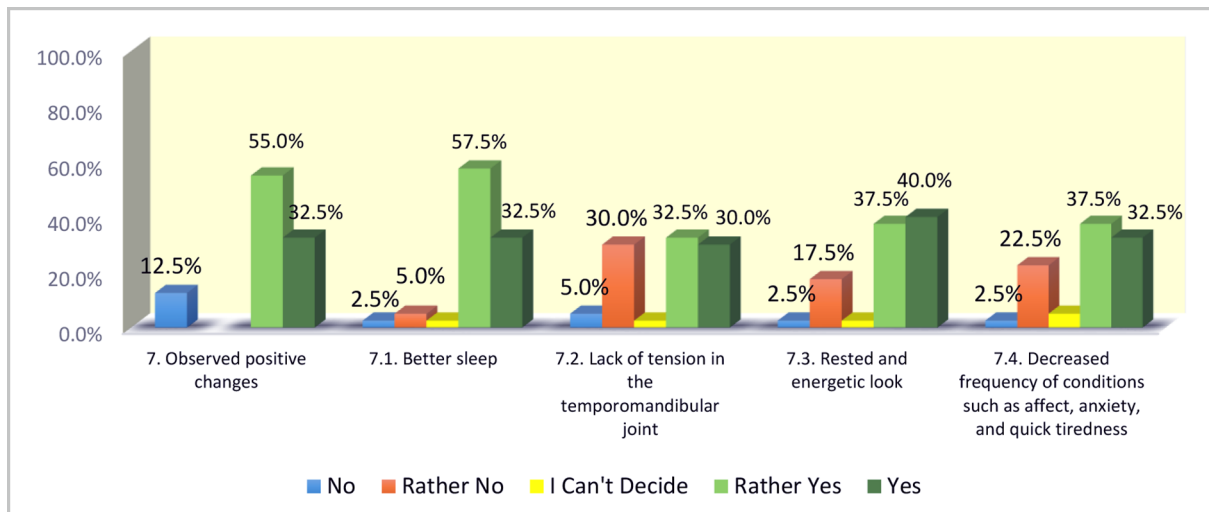
Lack of tension in the temporomandibular joint is observed by 25 individuals. Of them, 13 (32.5%) reply with „Rather yes“, and another 12 (30.0%) affirm with „Yes“. It must be noted that there are 12 (30.0%) employees who choose the “Rather no” option for this indicator. In addition, there are 2 (5.0%) negative replies.

**Table 1.** Assessment of the positive changes after wearing the bruxism mouthguard.

Indicators	No	Rather No	I Can't Decide	Rather Yes	Yes
7. Observed positive changes		5 (12.5%)		22 (55.0%)	13 (32.5%)
7.1 Better sleep	1 (2.5%)	2 (5.0%)	1 (2.5%)	23 (57.5%)	13 (32.5%)
7.2 Lack of tension in the temporomandibular joint	2 (5.0%)	12 (30.0%)	1 (2.5%)	13 (32.5%)	12 (30.0%)
7.3 Rested and energetic look	1 (2.5%)	7 (17.5%)	1 (2.5%)	15 (37.5%)	16 (40.0%)
7.4 Decreased frequency of conditions such as affect, anxiety, and quick tiredness	1 (2.5%)	9 (22.5%)	2 (5.0%)	15 (37.5%)	13 (32.5%)

A total of 31 of the employees feel rested and with an energetic look. Of them, 15 (37.5%) replied with „Rather yes“, and 16 (40.0%)—with an affirmative “Yes”. There are 7 (17.5%) individuals who answered in the negative, choosing the “Rather no” option (Table 1).

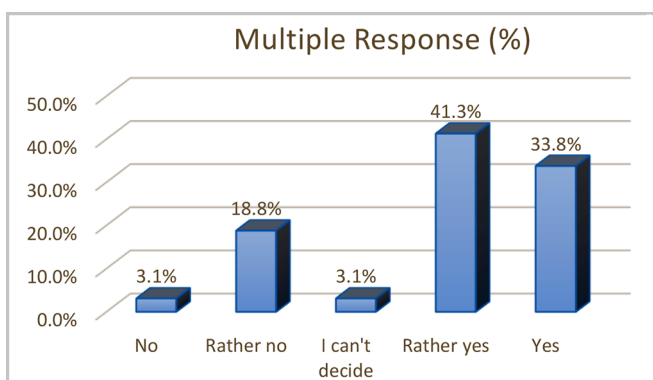
**Fig. 11.** Positive changes after wearing the bruxism mouthguard (%).



Wearing the bruxism mouthguard has helped in decreasing the frequency of states such as affect, anxiety, and quick tiredness in 28 employees. Of them, 15 (37.5%) replied with “Rather yes,” and another 13 (32.5%) provided a positive answer, choosing “Yes.” Only 9 (22.5%) elect “Rather no” and 1 - “No”. Two provide a neutral position, saying they cannot assess this indicator (Fig. 11).

Applying the multiple response analysis with more than one provided reply, it has been established that the largest relative share is that of the “Rather yes” replies—41.3%, given 66 times. The second place is for the affirmative “Yes” with 33.8%, or 54 total replies. The “Rather no” option is chosen 30 times, constituting 18%. The negative answer “No” and “I can’t decide” are elected only 5 times, or 3.1% each, respectively (Fig. 12).

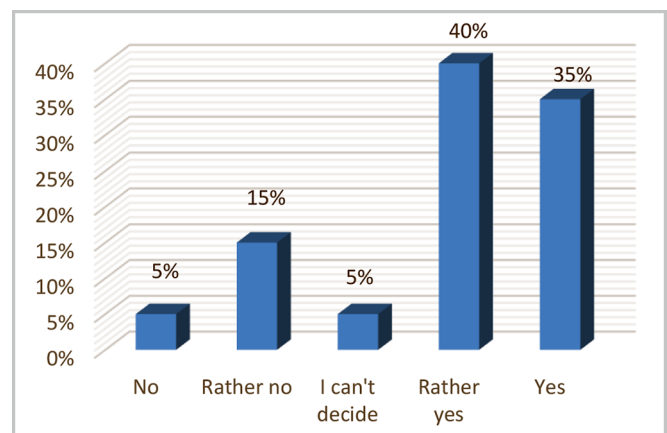
**Fig. 12.** Degree of satisfaction after the use of the bruxism mouthguard (multiple response).



The analysis indicates that the employees have a positive attitude toward wearing a bruxism mouthguard in the future. This conclusion is confirmed by the positive replies provided by 30 individuals, with 16 (40.0%) choos-

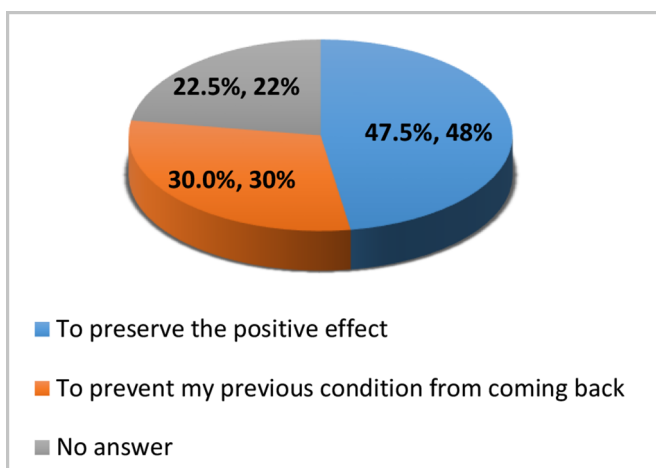
ing „Rather yes” and 14 (35.0%) affirming with “Yes”. Only 6 (15.0%) answered with “Rather no”, “No” and “I can’t decide” is chosen by 2 individuals each (Fig. 13).

**Fig. 13.** Desire to wear the mouthguard after the recommended by the doctor period of time.



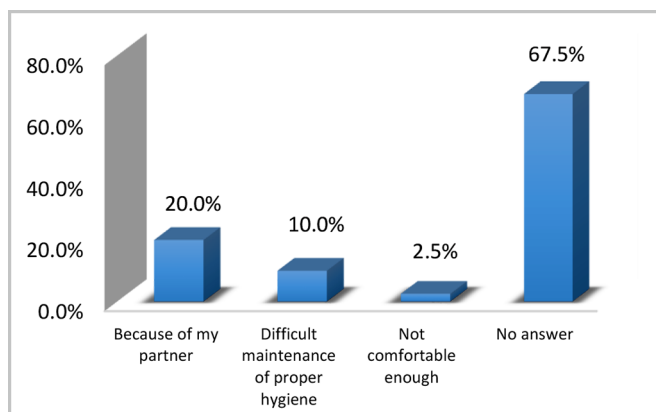
The main reasons why the employees want to continue wearing the bruxism mouthguard are two—to preserve the therapeutic effect and to prevent the previous condition from coming back. Of them, 19 (47.5%) indicate that they would like to preserve the therapeutic effect from the application of the mouthguard, and another 12 (30.0%) point out that they would like to prevent their previous condition from coming back. Nine (22.5%) individuals provide no reply (Fig. 14).

**Fig. 14.** Reasons for the expressed desire to continue wearing the mouthguard after the period indicated by the dentist.



Only 13 participants replied that they would not wear a bruxism mouthguard, constituting 32.5% of all surveyed employees.

**Fig. 15.** Reasons for not wanting to wear a bruxism mouthguard.



As the main reason, 8 (20.0%) indicate that they do not want it because of their partner. Another 4 (10.0%) mention the problematic maintenance of proper hygiene. Only 1 says that the mouthguard is not comfortable enough (Fig. 15).

### CONCLUSION

Applying the Chi-Square analysis, the hypothesis that gender does not influence fixed dental constructions is tested. It has been proven that there are no gender differences in regard to the employees' prior awareness about the presence of bruxism. The majority of them express a positive attitude toward the use of a bruxism mouthguard. Its use helps decrease the frequency of conditions such as affect, anxiety, and quick tiredness. The analysis indicates that the employees have a positive attitude toward wearing the protector in the future.

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