Prevalence of Bruxism Awareness in a Sardinian Population

Marcello Melis, D.M.D., R.Pharm.; Youssef S. Abou-Atme, D.D.S., M.S.

ABSTRACT: 1014 subjects on the island of Sardinia (Italy) were interviewed regarding the habit of clenching and grinding their teeth. They had to specify if this activity occurred during the day, during the night, or both. Other information recorded was their age, gender, marital status, and occupation. Overall prevalence of bruxism was 27.2% (276 subjects). No association was found between bruxism and age, gender and job. Even differentiating diurnal, nocturnal, diurnal and nocturnal bruxism, associations were non-significant. Marital status seems to make some difference: divorced people reported higher parafunctional activity compared to widows and widowers who reported the least. Although awareness of bruxism is not a precise measure of parafunction, based on the results we cannot support the role of stress on bruxism etiology.

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Address for reprint requests:
Dr. Marcello Melis
Via Grosseto, 1
09125 - Cagliari,
Italy
E-mail: marcellomelis01@tin.it

Dr. Marcello Melis *received his degree in pharmacy from the University of Cagliari (Italy) in 1990, and a D.M.D. degree from the dental school of the same university in 1998. From 1998 to 2000, he was a resident at the Gelb Orofacial Pain Center at Tufts University, Boston, Massachusetts, U.S.A. Currently, Dr. Melis practices in Cagliari in the field of temporomandibular disorders and orofacial pain and has been involved in several international research activities focusing on temporomandibular disorders and orofacial pain, occlusion, and muscle function.*

Dr. Youssef S. Abou-Atme *received his D.D.S. degree from the Université Saint Joseph (Lebanon) in 1994. After finishing a residency in craniomandibular disorders from the Université de Nantes (France) in 1996, he joined the Gelb Pain Center at Tufts University (Boston, MA) were he completed a Fellowship in temporomandibular disorders (TMD) and orofacial pain (1998) and received a Masters Degree in oral biology. He worked as a clinical and research associate at the Gelb Center during the academic year 1998-99. Dr. Abou-Atme's practice in Lebanon is limited to TMD and orofacial pain. He is also an active pain researcher at the Université Saint Joseph.*

Bruxism is defined by the American Academy of Orofacial Pain as a diurnal or nocturnal parafunctional activity including clenching, bracing, gnashing, and grinding of the teeth.[1] It is difficult to report the prevalence of this habit in the general population, because there are no gold standard methods to measure it. As shown in a review study performed by Seligman, et al.,[2] the prevalence depends on the way it is measured. Awareness of bruxism is low, about 15%, even though it varies from one study to another;[2-7] however, prevalence increases to 50% if we clinically evaluate the subjects interpreting dental attrition. If we interpret attrition evaluating study casts, it goes up to 91.5%, and finally using nocturnal electromyographic (EMG) recordings we find bruxism in 100% of the population[2]! This illustrates how difficult is to detect parafunctional activity in the population. In fact, awareness is unquestionably a measure with low reliability, yet dental attrition (evaluated either clinically or using dental casts) is not a sign of current bruxism, but a cumulative record of tooth wear from both functional and parafunctional activity. In addition to that, the amount of dental attrition is also related to age and occlusal features of the subjects[8,9] and is a sign of grinding rather than clenching of the teeth. Also, EMG recordings are not completely reliable, because they detect not only bruxism but also other nocturnal oral muscle activities such as myoclonus, somniloquy, and tics.[8,10]

The etiology of bruxism is also uncertain, but the hypotheses fall into three major categories[11]:

1. Local/mechanical factors
2. Systemic/neurological factors
3. Psychological factors

These categories are not mutually exclusive, and one or the other can be true in different situations, even in the same subject.

Within the first category great importance has been given to occlusal factors with an attempt at interpreting bruxism as an automatic reaction of the body to occlusal interferences with the purpose of eliminating them by grinding. Even though there are some data suggesting that occlusion affects muscle activity leading to parafunctions,[12-15] most of the studies seem to deny this correlation.[16] In fact, occlusal adjustment failed to reduce masseter EMG nocturnal recordings in patients seeking treatment for bruxism,[17,18] and the placement of experimental occlusal discrepancies did not cause an increase in nocturnal parafunctional activity.[19]

Among the systemic and neurological factors, we can report several medications that have been shown to elicit bruxism, such as amphetamines,[3] L-dopa,[3,20] fenfluramine,[3,2l] phenothiazine,[3] other neuroleptics,[22] selective serotonin reuptake inhibitors (SSRls),[23-27] and all antipsychotic agents which frequently cause dyskinesias: fluphenazine, haloperidol, loxapine, molindone, perphenazine, pimozide, thiothixene, trifluoperazine.[28] Also recreational drugs (heroin, cocaine, ecstasy, marijuana, "crack", LSD, methadone) have been reported to increase bruxism as well as other parafunctional oral activities.[29]

Some neurological pathologies may be associated with parafunctional oral activity. These are all disorders that are characterized by involuntary movements such as dyskinesias,[30] Parkinson's disease,[30] and other extrapyramidal disorders.[31,32]

A lot has been written on psychological factors that are supposed to trigger bruxism. Stress seems to be the most significant and the most frequently mentioned in the literature. In some studies by Rugh, et al.,[12,33] EMG nocturnal monitoring showed a strong association between stressful events (exams, family, and job problems) and muscle activity, and other studies had similar results.[34] On the other hand, other studies obtained different results.[6,35,36]

Type-A behavior has been related to bruxism evaluated by occlusal wear, especially if associated with higher stress levels,[38] other personality traits,[39] and anxiety.[37,40,41] But again, another study by Harness, et al.[42] denied any association between bruxism and psychological disturbance as measured by the Minnesota multiphasic personality inventory (MMPI), agreeing with other studies.[43]

The effects of bruxism are indeed directed towards all the structures of the stomatognathic system, including teeth,[44,46] periodontium,[45] temporomandibular joints,[47,48] and masticatory muscles,[47-51] even though not all the structures are affected in the same patient, but usually one gives up protecting the others.[52]

Treatment is based on protecting the masticatory system using occlusal appliances[53-58] which avoid the damage to the teeth, periodontium, temporomandibular joints, and the masticatory muscles, and trying to reduce bruxism using stress management,[59] biofeedback modalities,[57,59,60] and, when needed, medications.[59,61,62] Lately, injections of botulinum toxin have been tried with some success.[63]

The purpose of this study was to detect the prevalence of bruxism awareness in a specimen group drawn from the population of the island of Sardinia (Italy), differentiating diurnal bruxism from nocturnal bruxism, and analyzing correlations between bruxism and other factors: age, gender, marital status, and occupation.

The choice was made because these factors, especially marital status and occupation may influence the psychology of the individual, affecting in turn parafunctional behavior.[12,33,34]

Additionally, diurnal and nocturnal bruxism which could be two separate issues and the result of different factors, and might respond to different treatments.[3,4,64,65] This is why the authors chose to evaluate these two manifestations of bruxism separately.

Materials and Methods

One thousand fourteen (1014) Sardinian (citizens of the island of Sardinia, Italy, population 1,423,808 [regional electoral lists 11/1999]) adult subjects were interviewed on their habit of clenching or grinding their teeth during the day and/or during the night, on their age, gender, marital status, and occupation.

The following questions were in the questionnaire:

1. Do you have the habit of clenching, grinding your teeth, sliding them between each other or keeping them tight together?
   And in case of a positive answer:
2. During the day, during the night, or both?

These questions were followed by information on age, gender, marital status, and occupation. No effort was made to verify the data or to distinguish symptomatic from asymptomatic people. Several inves-tigators in different social and occupational areas, but without standardized randomization, recruited the subjects.

Statistical Analysis

In this study, we looked at different groups with different characteristics. RxC table (contingency table) was

used to calculate the chi-square statistics to investigate the null hypothesis of no association between the row and column variables.[66] Statistical significance was accepted for $p<0.05$. For significant associations, Index of difference (I dif.) was calculated in order to judge and classify association factors.

Results

Gender: 1014 subjects answered the questionnaire, 542 being females, and 472 males (53.5% F, 46.5% M; mean age 37.23 years, SD 14.38, range 18-84). 276 subjects (27.2%) reported bruxism. The data showed no significant difference between males and females regarding parafunctional activity (chi-square = 0.4, $p>0.05$).

Diurnal/Nocturnal Bruxism: Even differentiating between diurnal and nocturnal parafunction data analysis did not show significant gender difference between parafunction (either diurnal or nocturnal or diurnal/nocturnal) and nonparafunction groups (chi-square = 0.75, $P>0.05$). **Table 1** and **Figure 1** show gender distribution of parafunction.

Marital Status: Out of 1014 subjects, 577 were single, 396 married, 22 divorced, and 19 widows/widowers (**Table 2**, **Figure 2**). Overall parafunctional activity between these four marital status groups showed significant difference (chi-square = 12.38, $P<0.01$). Based on the Index of difference (I dif.=(|E-O|)/O) and following a decreasing order, associations between parafunction and marital status were as follows: Divorced (0.40), Widow(er) (0.29), Married (0.24) and Single (0.10). Even though very close to being statistically significant, marital status failed to show any significant association (chi-square = 16.8, $P>0.05$) related to nocturnal, diurnal, diurnal/nocturnal and nonparafunction groups.

Occupation: Subjects were grouped in eleven job categories: educator, hard physical worker, health care professional, inactive, law enforcement, light physical worker, manager, office worker, professional, salesperson, and student. Statistical analysis did not show significant association between overall parafunction and job categories (chi-square =10.39, $P>0.05$). When analyzed regarding daily activity of parafunction: nocturnal, diurnal, nocturnal/diurnal or nonparafunction, there was no significant association with any job (chi-square = 37.37, $P>0.05$), as shown in **Table 3**, **Figure 3**.

Age: As mentioned earlier, the mean age was 37.23 years (SD 14.38, range 18-84). Subjects were grouped in five age categories. Statistical analysis showed no significant association between overall parafunction and different age categories (chi-square = 6.65, $P>0.05$). When analyzed regarding daily activity of parafunction: nocturnal, diurnal, diurnal/nocturnal or nonparafunction and age categories (**Table 4** and **Figure 4**), no significant associations were found (chi-square = 15.59, $P>0.05$).

Discussion

Based on our results, 276 subjects reported some parafunctional habit, which is 27.2% of the population we examined. Even though the data found in the literature are not consistent and vary significantly probably due to the different populations surveyed and to different ways of evaluating bruxism, awareness seems to range from six to 23%.[2,8] Since the range is so wide, we can consider the percentage we obtained not so different, but we cannot exclude some peculiarity due to differences in the examined population and probably to the way the questions on the questionnaire were formulated. We also did not take into account the effect on bruxism of medications or neurological diseases, because this information was not included in the questionnaire. In addition to that, subjects in this study were selected and interviewed casually, without any standardized randomization, leading to some

Table 1
Gender Distribution of Diurnal and Nocturnal Parafunctional Activity

Gender	Nocturnal	Diurnal	Diurnal/nocturnal	Nonparafunction	Total
Female	66 (12.2%)	50 (9.2%)	36 (6.6%)	390 (72.0%)	542 (53.5%)
Male	51 (10.8%)	45 (9.5%)	28 (6.0%)	348 (73.7%)	472 (46.5%)
Total	117 (11.5%)	95 (9.4%)	64 (6.3%)	738 (72.8%)	1014 (100%)

Parafunction and gender showed no significant association (chi-square = 0.75, $P>0.05$, df=3)

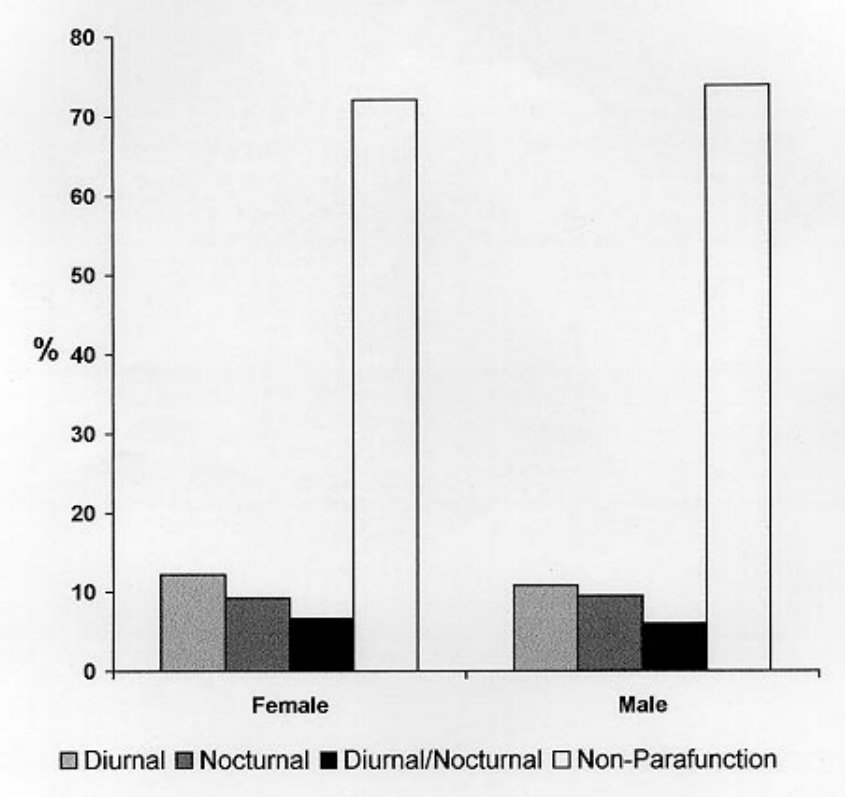

Figure 1
Gender distribution of diurnal and nocturnal parafunctional activity (%).

involuntary selection bias, possibly altering the results of the survey. However, the number of the subjects (1014) should be high enough to help reduce this bias.

Comparing male to female subjects we could not detect any significant difference in parafunctional habits. This result agrees with Glaros, et al.'s[4] study were overall parafunctions where equal in men and women, but they found gender differences between diurnal and nocturnal clenching and grinding behavior, with more men reporting diurnal bruxism and more women reporting nocturnal bruxism. Even though our results show a slightly higher number of females reporting nocturnal parafunction, this trend did not reach statistical significance, and no differences were found regarding diurnal and diurnal/nocturnal

Table 2
Marital Status Distribution Between Parafunction and Nonparafunction

Marital status*	Parafunction	Nonparafunction	Total
Divorced	10 (45.4%)	12 (54.6%)	22 (2.2%)
Married	87 (22.0%)	309 (78.0%)	396 (39.1%)
Single	175 (30.3%)	402 (69.7%)	577 (56.9%)
Widow(er)	4 (21.1%)	15 (78.9%)	19 (1.9%)
Total	276	738	1014

*Parafunction and marital status showed significant association (chi-square=12.38, P<0.01, df=3)

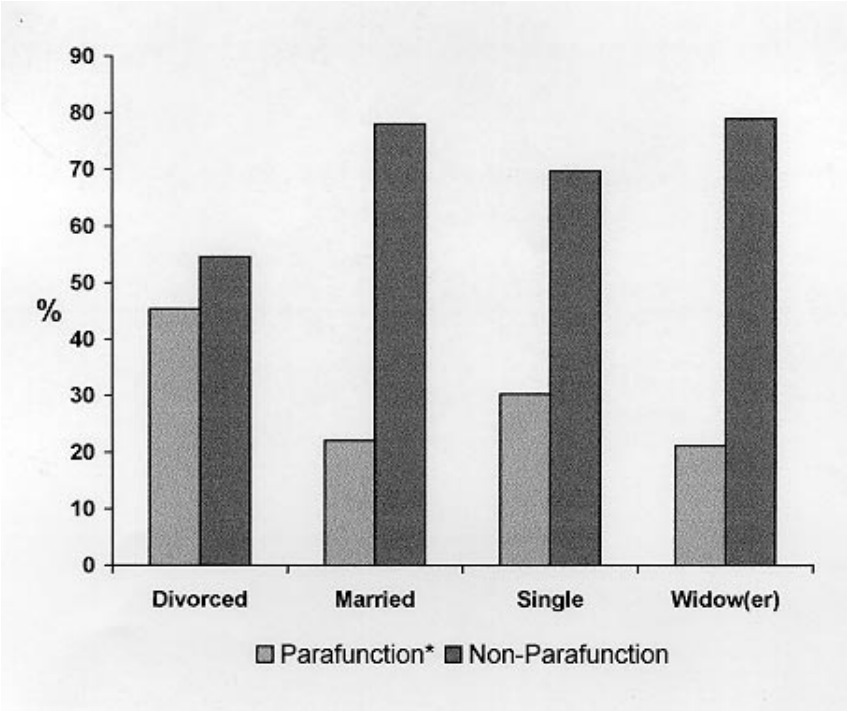

Figure 2
Marital distribution between parafunction and nonparafunction (%).

bruxism. Another study[2] reports higher bruxism scores in males than in females, but the method they used to measure it was based on study cast evaluation and cannot be a measure of awareness. That is why we cannot compare the results.

Among the four Marital Status groups, the Divorced group showed the highest parafunctional activity, while Married and Widow(er) showed the least. Considering that the Divorced group included only 22 people, and Widow(er) 19, this small number compared to the other two groups (396 Married, 577 Single) might have given

Table 3
Detailed Parafunctional Distribution Per Job

Job	Nocturnal	Diurnal	Diurnal/ Nocturnal	Nonparafunction	Total
Educator	4 (11.8%)	2 (5.9%)	3 (8.8%)	25 (73.5%)	34 (3.4%)
Hard physical worker	8 (7.2%)	15 (13.5%)	7 (6.3%)	81 (73.0%)	111 (10.9%)
Health care professional	8 (8.2%)	11 (11.2%)	11 (11.2%)	68 (69.4%)	98 (9.7%)
Inactive	10 (8.7%)	9 (7.8%)	8 (6.9%)	88 (76.6%)	115 (11.3%)
Law enforcement	1 (2.9%)	2 (5.9%)	1 (2.9%)	30 (88.3%)	34 (3.4%)
Light physical worker	3 (6.3%)	6 (12.5%)	5 (10.4%)	34 (70.8%)	48 (4.7%)
Manager	0 (0%)	0 (0%)	2 (12.5%)	14 (87.5%)	16 (1.6%)
Office worker	37 (15.9%)	21 (9.0%)	11 (4.7%)	164 (70.4%)	233 (23.0%)
Professional	2 (7.7%)	1 (3.8%)	3 (11.6%)	20 (76.9%)	26 (2.6%)
Salesperson	10 (12.5%)	5 (6.2%)	3 (3.8%)	62 (77.5%)	80 (7.9%)
Student	34 (15.5%)	23 (10.5%)	10 (4.6%)	152 (69.4%)	219 (21.6%)
Total	117	95	64	738	1014

Parafunctional and jobs showed no significant association (chi-square=37.37, P>0.05, df=30)

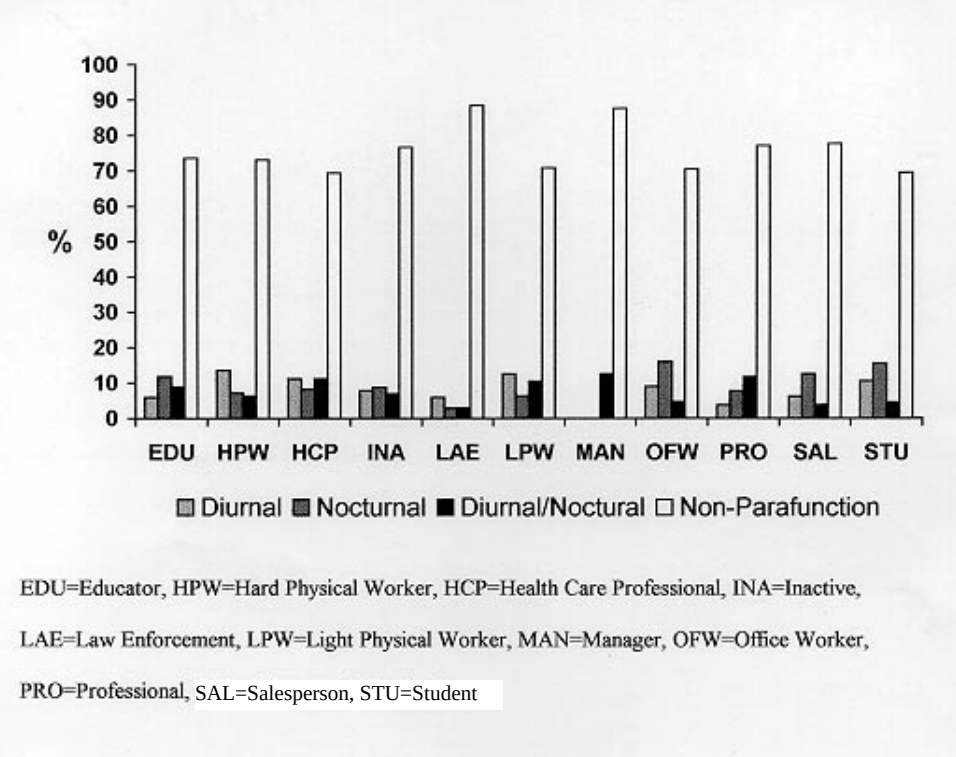

Figure 3
Detailed parafunctional distribution per job (%).

us unreliable results. Conversely, divorced subjects could lead a more stressful life, which may, in turn, elicit parafunction. But here we must say that our overall results did not suggest a strong link between stress and bruxism.

In fact, different job categories did not seem to be associated with different parafunctional activity, neither assessing it as a whole nor separately as diurnal and/or nocturnal parafunctional activity. We could have expected categories including jobs that share high responsibility (health care professional, law enforcement, manager) or high competition (professional, salesperson, student) to show higher bruxism, but we did not detect this difference, even though students and health care professionals seem to report more parafunctional activity.

If we consider that job is probably one of the most common sources of stress, we may conclude that, in light of the results of this study, stress has no role in causing bruxism, agreeing with other previous studies.[36,38,43,44]

One limitation of this study is that we measured bruxism prevalence asking the subjects if they "clench or

Table 4
Detailed Parafunctional Age Distribution

Age (yrs.)	Nocturnal	Diurnal	Diurnal/nocturnal	Nonparafunction	Total
<26	20 (9.8%)	24 (11.7%)	14 (6.8%)	147 (71.7%)	205 (20.2%)
26-35	54 (13.0%)	40 (9.7%)	22 (5.3%)	298 (72.0%)	414 (40.8%)
36-45	19 (13.6%)	9 (6.4%)	12 (8.6%)	100 (71.4%)	140 (13.8%)
46-55	16 (15.0%)	12 (11.2%)	6 (5.6%)	73 (68.2%)	107 (10.6%)
>55	8 (5.4%)	10 (6.8%)	10 (6.8%)	120 (81.0%)	148 (14.6%)
Total	117	95	64	738	1014

Parafunction and age categories showed no significant association (chi-square = 15.59, P>0.05, df=12)

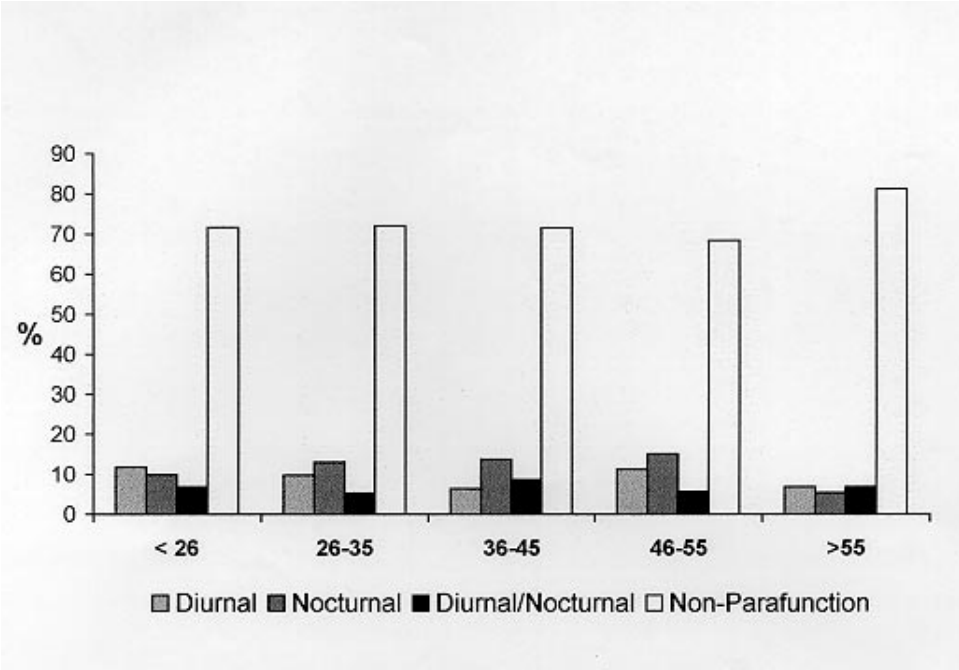

Figure 4
Detailed parafunctional age (years) distribution (%).

grind their teeth" and bruxism awareness does not coincide with actual bruxing activity; we could have subjects who have such a parafunctional habit in spite of them being unaware of it. This limitation probably led to some bias and might have hidden a possible link between the variables we examined. Furthermore, we arbitrarily grouped the jobs into categories within which subcategories might not be uniformly stressful.

Observing the effect of age on parafunctions, our results agree with Seligman, et al.'s[2] study, where no association was found between bruxism and age. The results of our study did not change after we divided the overall bruxism into diurnal, nocturnal, and diurnal/nocturnal, confirming no association with age.

Conclusions

All the data we collected seem to show that bruxism is not associated with gender, age, and work, but it is associated to different marital statuses. The results do not allow us to draw conclusions on the role of stress in eliciting bruxism. In fact, even though some correlation might be assumed based on the differences between different marital statuses, the data from different job categories do not support this hypothesis.

From another point of view, what might be of importance is that stress is a personal experience, felt differently by different individuals, and probably different ways of coping with stress lead to bruxism rather than stress itself.

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