

ASSOCIATION BETWEEN EXPERIENCE OF STRESSFUL LIFE EVENTS AND MUSCLE-RELATED TEMPOROMANDIBULAR DISORDERS IN PATIENTS SEEKING FREE TREATMENT IN A DENTAL HOSPITAL

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Abstract

Objectives: Psychological factors are known to play an important role in the etiology and maintenance of temporomandibular disorders. Since there have been very few studies on this issue in Asian countries, the study was aimed to investigate the relationship between various stressful life events and temporomandibular disorders in patients seeking free treatment in a Dental Hospital, Bangladesh.

Materials and Methods: Five hundred and twenty Bangladeshi adults (370 males and 150 females; mean age, 30.9 ± 8.2 years) participated in this study. The subjects were given a questionnaire to evaluate their stress status in the last 12 months. The Research Diagnostic Criteria for TMD (RDC/TMD) was used as TMD diagnostic system by three standardized examiners. Two hundred and thirty-six patients were RDC/TMD-defined TMD-positive and were subsequently classified into 7 groups: group I, myofascial pain only; group II, disk displacement only; group III, joint pain only; group IV, myofascial pain and disc displacement; group V, myofascial pain and joint pain; group VI, disc displacement and joint pain; and group VII, myofascial pain, disk displacement and joint pain. Two hundred and eighty-four subjects were RDC/TMD-defined TMD-negative subjects (controls). Adjusted odds ratios were calculated by multiple logistic regression analysis.

Results: Logistic regression analysis revealed that patients diagnosed with myofascial pain (group I) and a combination of myofascial and joint pain (group V) had significantly higher levels of financial and job stress than did the controls. Self-health-related stress and stress related to a spouse or deaths of a relative were also identified as predisposing factors for myofascial pain (group I).

Conclusion: This study suggests that myofascial pain is more common in individuals with various types of psychological stress. When treating patients with facial pain, dentists should consider the possible presence of psychological factors.

Key words: Myofascial pain, job stress, financial stress, self-health related-stress

INTRODUCTION

Temporomandibular disorders (TMDs) are musculoskeletal pain conditions characterized by pain in the temporomandibular joint (TMJ) and/or the masticatory muscles (Kuttila et al. 1998; Gameiro et al. 2006). Several studies have shown relationships between major life stressors and temporomandibular disorders (Moody et al. 1982; Lundeen et al. 1987; DeLeeuw et al. 2005). A high incidence of exposure to stressful life-events and elevated levels of stress-related somatic symptoms in TMD patients have been reported (Speculand et al. 1984; Auerbach et al. 2001). It has been reported that patients with temporomandibular disorders experienced twice as many undesirable stressful life events in a 6-month period than did controls and that life events contributed to the onset of TMDs in almost 50% of the patients (Speculand et al. 1984).

There are various kinds of stress in life, including financial stress, job stress, self-health stress, family health-related stress, and stress related to parenting stress related to a spouse or death of a relatives. Such factors need to be taken into account individually for accurate diagnosis and appropriate management strategies. However, the association between each stress factor and TMD was not investigated in any previous studies. Therefore, the relative importance of each factor cannot be assessed.

Most studies on TMDs had been carried out in developed countries, and little is known about TMDs in developing countries such as Bangladesh. In Bangladesh, per-capita income is US\$ 470 and literacy rate is 43.1%. According to the UNDP (United Nations Development Programme) Bangladesh Progress Report 2005, 49.8% of the total population were below the poverty line and 36% of those below the poverty line were living below \$1 a day at 1985 international prices (equivalent to \$1.08 at 1993 international prices). The dentist : population ratio is about 1:1 million. Dhaka Dental College Hospital provides free dental treatment for poor people due to the lack of dentists and treatment facilities. These patients generally have various kinds of stress in their daily life, including financial stress, job stress, and self-health stress.

The aim of the present study was to determine the association between experience of various stressful life-events and muscle-related temporomandibular disorders in a group of Bangladeshi adults seeking free dental treatment.

MATERIALS AND METHODS

SUBJECTS

This study was carried out in Dhaka Dental College Hospital located in the suburbs of Dhaka, Bangladesh. The ethics committee of the college approved the study protocol. A total of 520 patients who visited the hospital for dental treatment participated in the study. Among them, 236 patients (164 males and 72 females with a mean age of 33.1 years) were diagnosed as having TMDs according to the Research Diagnostic Criteria for TMD (RDC/TMD) (Dworkin and LeResche 1992). The remaining 284 patients were TMD-negative patients according to the following criteria: present signs or symptoms not cataloged under the RDC/TMD diagnostic criteria; duration of symptoms of less than 6 months; pain originating from other structures, such as the teeth, sinuses, ears or vasculature, having previously received occlusal, physical or pharmacological treatment (self-medication not considered) (Yap et al. 2002; Yap et al. 2003). All patients signed an informed consent form before commencing the study. Patients younger than 18 years were excluded from the study because of the possibility of some questions being difficult to understand and because the RDC/TMD have been calibrated to date only for patients over 18 years of age (Yap et al. 2002; Yap et al. 2003). All participants filled out questionnaires before being clinically examined.

QUESTIONNAIRE-BASED MEASURES

The questionnaire covered demographic items (age, sex and education), sleeping time and stress. To estimate stress, a questionnaire based on the life events scale was used (Akhter et al. 2005; Solis et al. 2004). At first, participants were asked to indicate the extent (never, rarely, sometimes, frequently) to which they agree with a statement that had occurred in the last 12 months. Levels of 9 types of stress in the life-events, i.e., financial stress, job stress, self-health stress, family health-related stress, stress related to parenting, stress related to family care, stress related to neighborhood, stress related to a spouse or death of a close relative, and a category called others, were measured. Patients responses were coded as 0 = 'never or rarely' (stress negative) or 1 = 'sometimes or frequently' (stress positive). Subjects were asked to respond only to items that applied to them; i.e., those subjects who were unemployed at the time of the survey were requested to skip questions related to job stress, and subjects who were unmarried were asked to skip questions related to parenting.

MEASUREMENT OF SYMPTOMS AND SIGNS OF TMD

The RDC/TMD history questionnaire/examination forms and specifications for examination used in this

study have been described in detail by Dworkin and LeResche (1992). Before commencing the study, the researchers (RA, NMH, KZ) discussed about Research Diagnostic criteria for TMD (RDC/TMD). Research diagnostic criteria (RDC) for TMD were used regarding Axis I in order to make a diagnosis by a method that is objective, easily reproduced and widely accepted by other researchers (Dworkin and LeResche 1992; Ferrando et al. 2004). Neither resonance imaging nor arthrography was carried out to complement the diagnosis.

Each participant underwent a standardized clinical examination and was given a RDC/TMD Axis I assessment. Two researchers (RA and NMH) and a calibrated operator (KZ) performed the clinical examination to confirm the RDC/TMD diagnosis. The examination consisted of two parts: a detailed interview with a subjective description of symptoms and a clinical examination.

The first part provided information about symptoms of TMD, i.e., self-reported myofascial pain or fatigue and TMJ pain or noise, and their interference with daily activities. The clinical examination consisted of a series of diagnostic techniques to assess vertical range of motion with and without passive stretch, the presence of joint sounds during mandibular movements, the severity of extra oral myofascial pain, joint pain and intraoral myofascial pain on palpation. The patients were subsequently divided into the following 7 groups based on their RDC/TMD axis I diagnostic groups: group I, myofascial pain only; group II, disk displacement only; group III, joint pain only, i.e., arthralgia, osteoarthritis, and osteoarthrosis only; group IV, myofascial pain and disk displacement; group V, myofascial pain and joint pain; group VI, disk displacement and joint pain; and group VII, myofascial pain, disk displacement and joint pain.

STATISTICAL ANALYSIS

The data were analyzed using the SPSS software package (SPSS Inc., version 11.5, Chicago, IL, USA). Chi-square tests were used to analyze separately the differences between RDC/TMD diagnoses groups and demographic variables and exposure of various types of stress. When several planned comparisons are made, the probability of obtaining significance by chance is increased. Therefore, yes (%) answers of respondents having TMD signs and symptoms (defined by RDC/TMD) were compared with stress factors using Bonferroni's correction to adjust probability. For instance, when group I, myofascial pain was associated with one of the 9 categories of various stress factors, the number of comparisons was 9 and p-values below $0.05/9 = 0.006$ were considered significant (Akhter et al. 2004).

Additionally, a logistic regression model was constructed to identify stress factors and other independent variables related to RDC/TMD diagnostic subgroups. Probability levels at $P < 0.05$ were considered statistically significant. The odds ratios with 95% confidence intervals were computed from regression results.

RESULTS

According to RDC/TMD, the prevalence of TMD was 45.4% (n = 236). Table 1 shows the distribution of frequencies of TMD subgroup: group I, 12.9%; group II, 3.1%; group III, 7.9%; group IV, 6.9%; group V, 8.1%; group VI, 1.3% and group VII, 5.2%.

Cross tabulations between the different groups of TMD and demographic variables and sleeping pattern are shown in Table 2. Older patients (>25 yrs) showed a higher prevalence with TMD groups I, IV, VI and VII than did controls. The prevalences of TMD group I and TMD group VII were higher in females than in males. There were no significant differences among TMD groups with respect to education. Subjects who had the habit of sleeping less than 6 hours/day showed greater prevalence of TMD than did subjects who had the habit of sleeping 7-8 hours/day.

The associations between RDC/TMD subgroups and various stress-related factors are shown in Table 3. Subjects with job stress showed significant relations with TMD groups I and V (P<0.0001) than subjects without job stress. Subjects who had financial stress showed a strong relation with TMD groups I, V and

VII than did subjects who had no financial stress (P<0.0001). Subjects who had stress due to self-health showed higher prevalence of TMD in groups I, IV, VI and VII than did subjects who had no such stress (P<0.0001). We observed a positive relationship between subjects who felt stress due to problems with a spouse or death of a relative (P<0.0001) and TMD groups I, IV and VII. RDC/TMD diagnosed TMD groups II and III did not showed any relation with stress factors.

Table 4 summarizes the results of multivariate analysis revealed by logistic regression analysis. Job stress showed significant positive associations with myofacial pain (OR = 5.32, P<0.01), joint pain (OR = 5.84, P<0.05) and a combination of myofacial and joint pain (OR = 4.20, P<0.01). Prevalences of myofacial pain (OR = 6.48, P<0.001) and a combination of myofacial and joint pain (OR = 2.83, P<0.05) were higher in subjects who felt stress due to financial problems than in the controls. Subjects who felt stress due to self-health and due to a spouse or death of a relative were about 9.5- and 37.7-times more predisposed to experience myofacial pain than were control subjects (P<0.001 and P<0.001, respec-

Table 1. Grouping of patients based on RDC/TMD axis I diagnostic groups.

TMD symptoms	Category	Frequency	Percent (%)
TMD-negative	Control Group	284	54.6
Myofacial pain	Group I	67	12.9
Disc displacements	Group II	16	3.1
Joint pain	Group III	41	7.9
Myofacial pain +Disc displacements	Group IV	36	6.9
Myofacial pain +Joint pain	Group V	42	8.1
Disc displacements+ Joint pain	Group VI	7	1.3
Myofacial pain +Disc displacements+ Joint pain	Group VII	27	5.2
Total		520	100.0

Table 2. Percent distributions of age, gender, education and sleeping pattern according to RDC/TMD diagnostic groups.

Variable	Control group	RDC/TMD-positive groups						
		I	II	II	IV	V	VI	VII
Age								
18-25 years	80.6	64.2	62.5	97.6**	8.3	92.9	42.9	22.2
>25 years	19.4	35.8**	37.5	2.4	91.7***	7.1	57.1*	77.8***
Gender								
Male	72.5	58.2	81.3	75.6	97.2**	81.0	57.1	29.6
Female	27.5	41.8*	18.8	24.4	2.8	19.0	42.9	70.4***
Education								
<10 years	64.8	73.1	81.3	58.5	69.4	52.4	71.4	88.9
≥10 years	35.2	26.9	18.8	41.5	30.6	47.6	28.6	11.1
Sleeping time								
7-8 hours/day	74.6	31.3	50.0	85.4	22.2	40.5	71.4	18.5
≤6 hours/day	25.4	68.7***	50.0*	14.6	77.8***	59.5***	28.6	81.5***

*, P<0.05, **, P<0.01, ***, P<0.001 (Significantly higher than that in the TMD-negative group by the chi-square test)

Table 3. Prevalence of stress in patients with different RDC/TMD diagnoses.

Variable	TMD-negative	TMD-positive groups						
	group (control)	I	II	III	IV	V	VI	VII
Job stress								
Negative	93.0	65.7	93.8	90.2	94.4	64.3	100.0	88.9
Positive	7.0	34.3**	6.3	9.8	5.6	35.7**	0	11.1
Financial stress								
Negative	78.2	20.9	62.5	92.7	69.4	47.6	57.1	29.6
Positive	21.8	79.1**	37.5	7.3	30.6	52.4**	42.9	70.4**
Self-health-related stress								
Negative	94.0	58.2	75.0	97.6	75.0	92.9	57.1	37.0
Positive	6.0	41.8**	25.0	2.4	25.0**	7.1	42.9**	63.0**
Family health-related stress								
Negative	79.9	43.3	93.8	97.6	75.0	71.4	100.0	59.3
Positive	20.1	56.7**	6.3	2.4	25.0	28.6	0	40.7
Parenting-related stress								
Negative	90.1	47.8	81.3	97.6	83.3	73.8	57.1	37.0
Positive	9.9	52.2**	18.8	2.4	16.7	26.2*	42.9*	63.0**
Family care-related stress								
Negative	88.0	43.3	87.5	97.6	83.3	73.8	57.1	37.0
Positive	12.0	56.7**	12.5	2.4	16.7	26.2	42.9	63.0**
Neighborhood-related stress								
Negative	95.8	80.6	93.8	100.0	100.0	88.1	57.1	77.8
Positive	4.2	19.4**	6.3	0	0	11.9	42.9**	22.2**
Spouse/death of relative-related stress								
Negative	98.6	64.2	100.0	97.6	83.3	92.9	100.0	48.1
Positive	1.4	35.8**	0	2.4	16.7**	7.1	0	51.9**
Stress due to other causes								
Negative	95.8	77.6	100	100.0	83.3	85.7	100.0	100.0
Positive	4.2	22.4**	0	0	16.7*	14.3	0	0

Negative: Never/rarely, Positive: Sometimes/frequently

*: P<0.006; **: P<0.0001 (Significantly higher than that in the TMD-negative group by the chi-square test)

Table 4. Results of multiple logistic regression analysis after adjustment for age, gender, education and sleeping time.

Stress variables	Odds ratio (95% CI)		
	Myofacial pain (Group I)	Joint pain (Group III)	Myofacial and joint pain (Group V)
Job stress	5.32 (1.63-17.36)**	5.84 (1.07-31.88)*	4.20 (1.49-11.82)**
Financial stress	6.48 (2.31-18.18)***		2.83 (1.11-7.17)*
Self-health-related stress	9.48 (2.50-36.01)***		
Stress related to a spouse or death of a relative	37.68 (5.13-276.90)***		

*: P<0.05, **: P<0.01, ***: P<0.001

tively). No significant relation was found between RDC/TMD diagnoses subgroups and other types of stress.

DISCUSSION

Stresses related to job, finance, self-health, and a spouse or deaths of a relative were significantly related

to myofacial pain (group I), joint pain (group III), and a combination of myofacial and joint pain (group V) (Table 4). This is in line with findings in previous studies (Lundeen et al. 1987; List et al. 2001; DeLeeuw et al. 2005). Pallegama et al. (2005) reported that psychological stress is more involved in muscle related TMD than Joint related TMD due to pathophysiology. Psy-

chological stress operates via masticatory muscles through endocrinal or neural mechanisms, which may be mediated via interactions of limbic system and motor cortex, that transform emotive and cognitive processes to motor responses, that may in turn increase the muscle tone.

We found that patients with myofacial pain experienced more stressful life events in the 12-month period than did the control patients (Table 4). These were stress related to problems of work (job) and money (financial) and to self-health problems and stress related to problems of interpersonal relationships or loss (death of relatives). The present observations are in agreement with results of a previous study showing a similar tendency for patients with muscle-related TMD to have a higher degree of anxiety and higher stress level than healthy individuals (Aggarwal et al. 2003; Pallegama et al. 2005). However, joint pain was only related to job stress (Table 4). Myofacial pain is thought to be associated with short-term of stress and is diffuse in nature from TMJ pathology (disc displacements and other joint conditions). However, joints are more resistant than muscles and do not become painful after brief episodes of loading of psychological stress (Laskin 1969; Yap et al. 2002). Since stress due to self-health or stress due to problems with a spouse or death of a close relative could be associated with relatively short-term stress, their association with myofacial pain might be reasonable. On the other hand, job stress could be associated with long-term stress giving rise to muscular or joint pain or both. On the other hand, Michelotti et al. (1998) did not observe psychological differences between patients with myofacial pain and patients with joint pain. This may be due to methodological differences, such as sample selection criteria, and pain duration and intensity discrepancies between the different study populations.

In the present study, the older patients in the TMD group reported a significantly higher degree of intensity of myofacial pain and combined myofacial and joint pain than did the controls, while the younger patients reported a significantly higher degree of joint pain only (Table 2). Initially the symptoms of TMD starts in younger patients with joint pain, which could originate from a wide variety of sources such as trauma (either intrinsic or extrinsic), and immunologic or degenerative processes, when the age increases in susceptible patients, secondary myofacial hyperactivity will then arise and joint pain could then resolve and leave the patient with a self-perpetuating stress-induced myofacial pain (Lundeen et al. 1988).

Sleep disturbances are prevalent among myofacial pain populations (McCracken and Iverson 2002). In our study, poor sleep habit was found to be more prevalent in the myofacial pain group than in the control group, which is in accordance with findings in other studies (Lindroth et al. 2002; McCracken et al. 2002; Vazquez-Delgado et al. 2004). Vazquez-Delgado et al. (2004) reported that myofacial pain patients had more daytime dysfunction than did joint pain patients. Mongini et al. (2000) also observed a higher prevalence of sleep disturbances among myofacial pain patients. It is also possible that sleep disturbances are a consequence of myofacial pain (Yatani et al. 2002).

Recommendations for development of standardized clinical measures have been suggested to improve reliability, potentially and validity of clinical examinations. The Research Diagnostic Criteria for TMD (RDC/TMD) was established to allow standardization and replication of the most common forms of research relating muscle and joint (Yap et al. 2002). Since RDC/TMD is an internationally recognized and widely adopted tool for TMD research, its axis I methodology (Dworkin and LeResche. 1992) was used in this study.

Some limitations in the present study need to be pointed out. First, standard questionnaires were used in the present study. However, inaccuracies may always occur when gathering data with questionnaires. The reporting of pain symptoms may depend on several factors, e.g., subjects' motivation; therefore, comparing data of different studies may include bias due to cultural or societal differences. Sometimes individuals with different kinds of stress may be more likely to perceive, over-react and complain about their sensations during reporting of pain symptoms (Suvinen et al. 2004). Second, we did not evaluate other psychosocial and behavioral domains such as anxiety, depression and fatigue.

In conclusion, the results of this study indicated associations of RDC/TMD diagnoses TMD subgroups, especially those with myofacial pain, with psychological issues as stress related to finance, job, self-health and spouse or death of a relative. Clinicians should carefully assess and provide guidance for reducing high levels of such stress in patients experiencing TMD-related myofacial pain.

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