

# THE RELATIONSHIP BETWEEN TEMPOROMANDIBULAR DISORDER AND WORK STRESS IN TYPE C PRIVATE HOSPITAL NURSES

Fadhilah Nur Amalina<sup>1</sup>, Ira Tanti<sup>2</sup>, David Maxwell<sup>2</sup>

<sup>1</sup>Undergraduate Program, Faculty of Dentistry, Universitas Indonesia, Jakarta, Indonesia

<sup>2</sup>Prosthodontic Department, Faculty of Dentistry, Universitas Indonesia, Jakarta, Indonesia

## ABSTRACT

**INTRODUCTION:** Temporomandibular disorder (TMD) includes functional problems in the masticatory system affecting the temporomandibular joint, and anything related to orofacial structures, or masticatory muscles. The etiology of TMD is multifactorial and very complex, and many considerations must be made, such as parafunctional activities, occlusal condition, deep pain input, emotional stress, and trauma.

**OBJECTIVES:** Studies analyzing the relationship between TMD and work stress among nurses in type C private hospitals using the Index Diagnostic Temporomandibular Disorder (ID-TMD) and Expanded Nursing Stress Scale (ENSS). Indonesian version questionnaires have never been conducted in Indonesia.

**MATERIAL AND METHODS:** This study analyzed the relationship of TMD with work stress and sociodemographic factors (sex and age) among nurses in a type C private hospital. This cross-sectional study assessed the data of 92 nurses in the Hasanah Graha Afiah Hospital; two questionnaires were given to each nurse. The ID-TMD was used to evaluate TMD and the ENSS Indonesian version questionnaire was used to evaluate work stress.

**RESULTS:** The Mann-Whitney test and independent *t*-test revealed no significant differences ( $p > 0.05$ ) between TMD and work stress among nurses in this type C private hospital. The  $\chi^2$  test showed no significant differences ( $p > 0.05$ ) between TMD and the aforementioned sociodemographic factors in these nurses.

**CONCLUSIONS:** TMD was not associated with work stress among nurses in a type C Indonesian private hospital.

**KEY WORDS:** ENSS, ID-TMD, temporomandibular disorders, work stress.

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## INTRODUCTION

Temporomandibular disorder (TMD) encompasses functional problems within the masticatory system. The etiology of TMD is both complex and multifactorial, and includes such characteristics as parafunctional activities, occlusal condition, deep pain input, emotional stress, and trauma. Signs of TMD include pain in the mastication

muscle, or temporomandibular joint (TMJ), ear pain, headache, limitation of motion, deviation of the mandible, and a clicking sound. Frequency of TMD in the general population is in the range 40-60%, with most of the symptoms being reported by people in the 20-40 year old age group, and women having a higher prevalence of the disorder than men [1, 2].

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**ADDRESS FOR CORRESPONDENCE:** Ira Tanti, Department of Prosthodontics, Faculty of Dentistry, Universitas Indonesia, Jalan Salemba Raya No.4, Jakarta Pusat, Jakarta 10430, Indonesia, e-mail: [iratanti@gmail.com](mailto:iratanti@gmail.com)

Nursing is a profession that requires empathy and high skillfulness [3]. General nurses serve patients 24 hours a day, so rotating shift work is typical practice for general hospital nurses. For these nurses, rotating shift work can have a negative impact on health and quality of sleep by disturbing the circadian rhythm [4]. Working during nighttime can also have negative effects on mental and physical health, and those who work at night have a high risk of insomnia [4, 5]. General nurses have potentially higher levels of work-related stress than any workers in the hospital [6]. Factors such as patient deaths, having conflicts with doctors and other medical staff, high workload, issues with patients and their families, and discrimination are some of the sources of stress for nurses [3, 7].

Oliviera *et al.* reported that 74.5% of nurses display TMD. The higher incidence of TMD is associated with nurses' high workload, which can cause psycho-emotional work stress [8]. The stress-affected body reacts by activation of the hypothalamic pituitary adrenal (HPA) axis and subsequently responds via the autonomous nervous system. The HPA axis is activated through the complex gamma efferent nerve system, which can cause intrafusal fibers within muscle spindles to contract, and increase the tonicity of muscle [1]. Work-related stress has been shown to result in this disorder [9, 10].

## OBJECTIVES

This research aims to determine the relationship between TMD and work-related stress among nurses in a type C private hospital, and such work has never been conducted in Indonesia. The Index Diagnostic Temporomandibular Disorder (ID-TMD) questionnaire was used to evaluate TMD and the Expanded Nursing Stress Scale (ENSS) – Indonesian version was used to evaluate work stress. Both questionnaires have been validated to be highly reliable [11-13].

## MATERIAL AND METHODS

This research is analytic with a cross-sectional design; the study encompassed a month, utilizing a consecutive (nonprobability sampling) method. Calculation of sample size was performed using analytical categorical independent formulation, with type I error 5%, type II error 20%; the proportion of TMD from the prior research is 74.5%, and the proportion of TMD based on the judgment of the researcher is 50%. From this calculation the minimum sample size is 60 subjects [14]. This research took 92 nurses as subjects, who fulfilled the inclusion criteria. These criteria included: working in the hospital for a minimum of 6 months, having a rotating shift within the last month with shift periods (night shift versus day shift) every seven days, having an overall condition of good health, and never having received any treatment for TMD [8, 15, 16].

The research was conducted at the Hasanah Graha Afiah Depok hospital. According to the Indonesian Health Government there are five types (A, B, C, D, E) of hospital in Indonesia. Hasanah Graha Afiah Depok is a private hospital which is categorized as a type C hospital, a hospital that has facilities and medical services for at least four basic specialists and four medical support specialists [17]. This study was approved by the ethics committee for dentistry, University of Indonesia (protocol 011010817).

The data were collected via completion of three questionnaires, that have been validated to be highly reliable. First, the subjects' biographical data were taken (full name, date of birth, age, and sex). The age was categorized based on the Health Research by the Ministry of Health, Republic of Indonesia. There are two age groups: age 20-24 and age 25-44 [18]. The status of subjects having TMD was collected from an ID-TMD questionnaire, and the status of subjects having stress was collected from ENSS questionnaire. Both questionnaires' data were collected by an interview with the researcher with the assistance of one collaborator, both of whom were similarly trained.

The ID-TMD questionnaire consists of eight questions inquiring about pain experienced around the jaw, the head, the neck and surrounding areas, when opening and closing the mouth, or the presence of buzzing noises in the ears for no apparent reason. Calculation of the ID-TMD score is accomplished using a scale from 0 to 3, with 0 being 'never', 1 'rare', 2 'often', and 3 'always', with the lowest total questionnaire score being 0 and the highest being 24. Subjects with scores < 3 do not have TMD and scores > 3 represent subjects with TMD [11, 16].

Work stress level was evaluated by completion of the ENSS questionnaire, which consists of 57 questions and 9 components, death and dying, conflicts with physicians, inadequate preparation, problems with peers or supervisors, workload, uncertainty concerning treatment, issues with patients and their families, and discrimination. Calculation of the ENSS score is accomplished using a Likert scale from 0 to 4, with 0 being doesn't apply, 1 – never stressful, 2 – occasionally stressful, 3 – frequently stressful, and 4 – extremely stressful. The questionnaire was filled in by the subject who had previously received an explanation on how to complete the survey. There are no specific cut scores or published mean norms for the ENSS that determine whether an individual is stressed or not. However, subjects showing higher levels of stress exhibited higher score on the ENSS [12, 13].

The data collected were processed, analyzed, and presented using the SPSS software version 16. By first using the univariate analysis each variable studied was defined as the frequency distribution and percentage. Using a bivariate analysis of numerical variables, the association of TMJ disorder with work stress was determined using the independent t-test if the data distribution was normal, or the Mann-Whitney test if the distribution

was not normal. Bivariate analysis using the chi-square test was conducted to determine the association between TMJ disorder and sociodemographic factors (e.g., sex and age) [14].

## RESULTS

The distribution of frequency of subjects with TMD and sociodemographic data (sex and age) are shown in Table 1.

Ninety-two total subject respondents with 55 subjects suffering from TMD (59.8%).

The total ENSS score (average  $1.24 \pm 0.64$ ), with the lowest average score ( $0.46 \pm 0.78$ ) being in the component “discrimination” and the highest average score ( $1.423 \pm 0.70$ ) being in the component ‘workload’.

The Mann-Whitney test and independent *t*-test showed no statistically significant association ( $p > 0.05$ ) between TMD and work-related stress.

The  $\chi^2$  test showed no statistically significant association ( $p > 0.05$ ) between TMD and the sociodemographic factors (of sex and age).

## DISCUSSION

In this research, 59.8% of subjects displayed TMD. This value is similar to the study of Martins *et al.*, where more than 50% of subjects had TMD [19]. Most subjects rarely complained about any significant symptoms of TMD. Okeson reported an average of 40-60% of the population as having at least one detectable sign associated with TMD, yet less than 10% of the population studied felt that their problem was severe enough to call for treatment [1].

The average total score from the ENSS questionnaire in this study was  $1.24 \pm 0.64$ , with the most stressful situations being workload ( $1.423 \pm 0.70$ ) and problems with patients and their families ( $1.420 \pm 0.85$ ). This result is similar to those of Aburuz *et al.* and Shivaprasad *et al.* [7, 20]. However, Aburuz *et al.* reported a higher average score in comparison with our results ( $2.8 \pm 1.4$ ), with the average score for the component of workload being  $3.75 \pm 1.8$  and for the component of problems with patients and their families being  $3.56 \pm 1.2$  [7].

No statistically significant association was found regarding TMD with work-related stress. This is contradictory to the studies of Oliveira *et al.* and Martins *et al.* [8, 19].

Muscles are innervated by the afferent and efferent nerve fibers. Efferent nerves consist of alpha and gamma neurons, each neurons playing a different role. The hypothalamus plays an important role in controlling emotional stress, which influences muscle activity through the gamma efferent pathways. Intrafusal fiber contraction occurs by the increased activity of the gamma efferent fibers. This sensitizes the spindle and as a result any stretching of the muscle will cause a reflex contraction.

**TABLE 1.** Data distribution of the frequency of temporomandibular disorder (TMD) and sociodemographic factors (sex and age)

Variable	n = 92	Percentage (%)
Temporomandibular disorder		
Non-TMD	37	40.2
TMD	55	59.8
Sex		
Men	8	8.7
Women	84	91.3
Age		
20-24	31	33.7
25-44	61	66.3

**TABLE 2.** Average score of component Expanded Nursing Stress Scale (ENSS) Indonesian language version

Component	Average	Standard deviation
Death and dying	1.22	0.76
Conflict with physicians	1.17	0.75
Inadequate preparation	1.28	0.67
Problems with peers	1.03	0.68
Problems with supervisors	1.17	0.76
Workload	1.423	0.70
Uncertainty concerning treatment	1.410	0.71
Problems with patients and their families	1.420	0.85
Discrimination	0.46	0.78
Total ENSS score	1.24	0.64

The process affects the myotatic (stretch) reflex and increases muscle sensitivity to external stimuli, which increases head and neck muscle tonicity. An increase in its tonicity will increase the risk of muscle fatigue and increased intra-articular TMJ pressure [1, 21]. Ryalat *et al.* reported that a high level of stress was associated with TMD; in this study the level of stress was categorized as low [22]. Rehman *et al.* discovered that stress is strongly associated with the severity of TMD. In our research using only the questionnaire for screening, one cannot determine the degree of severity of TMD in our subjects [23].

Significantly more women (89.1%) than men (10.9%) suffered from TMD, similarly to other studies [2, 24-26]. Dasilva *et al.* discovered that the reproductive hormone estrogen in women may contribute to TMD. In the peripheral central nervous system, estrogen acts through its receptors (estrogen receptor  $\alpha$  and  $\beta$ ) to play an important role in the inflammatory process. For example, to regulate the production of cytokines, estrogen acts

**TABLE 3.** Relationship between temporomandibular disorder (TMD) and work stress

Component	Non-TMD n = 37	TMD n = 55	p-value
	Average	Average	
Death and dying	1.06	1.32	0.177*
Conflict with physicians	1.04	1.27	0.155**
Inadequate preparation	1.21	1.33	0.521*
Problems with peers	0.93	1.09	0.377*
Problems with supervisors	1.02	1.27	0.107**
Workload	1.27	1.52	0.091**

\*Mann-Whitney

\*\*Independent t-test

**TABLE 4.** Relationship between temporomandibular disorder (TMD) and sociodemographic factors

Variable	Non-TMD		TMD		p-value
	n	%	n	%	
Sex					
Men	1.04	5.4	6	10.9	0.468*
Women	1.21	94.6	49	89.1	
Age					
20-24	12	32.4	19	34.5	1**

\*Fisher's exact test

\*\*Continuity correction

directly on monocytes and macrophages. There are two cytokines present in the TMJ synovium during inflammation, IL-1b and IL-6. The cytokines IL-1 and TNF- $\alpha$  function to promote cartilage reabsorption, and drive inflammation in the areas of TMJ structures, as well as to inhibit the synthesis of proteoglycans. Therefore, as a sex hormone, estrogen may play an important role in the degree of pain severity and predisposition to TMJ disorder [27]. No statistically significant association was found regarding TMD with sex, similar to the study of Mello *et al.*, and contradicted by the studies by Kim *et al.*, and Gillborg *et al.* [2, 25, 28]. A limitation of this research is that the proportion of male and female subjects is not balanced (1 : 8), whereas Gillborg *et al.* and Kim *et al.* had a sex ratio of subject of 3 : 4. In this research, the subjects are general nurses, and according to the center data of the Indonesian Ministry of Health conducted in April of 2017, 71% of nurses in Indonesia are women [29]. In the Gillborg *et al.* and Kim *et al.* studies, subjects were taken from different professions to represent more accurately the general population [2, 25].

No statistically significant association was found regarding TMD with age, similar to the study of Magalhaes *et al.* and contradicted by the study of Gillborg *et al.* [2, 30]. A limitation of this research is that the propor-

tion of age groups is not balanced and the range discrepancy between age groups is too wide. Epidemiology studies reveal that the most TMJ disorder symptoms are reported by people in the 20-40 year old age group, and this prevalence decreases by age 60, with a lower prevalence in the elderly [1, 31]. In this study 65.5% of subjects displayed TMD in the 25-44 year old age group. Gillborg *et al.* reported that individuals younger than 50 years old had a significantly higher prevalence of TMD. At this time period of life, people are most often preoccupied with education, employment, pursuing a career, starting a family, and taking care of children, all of which can be associated with stress [2].

## CONCLUSIONS

TMD was not associated with either work-related stress or sociodemographic factors (i.e., sex and age) among nurses in a type C private hospital.

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## CONFLICT OF INTEREST

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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