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CORRELATION BETWEEN STRESS AND TEMPOROMANDIBULAR DISORDER IN ORPHANED ADOLESCENT IN BANJARMASIN

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ABSTRACT
Background: *Temporomandibular disorder is a temporomandibular joint disturbance characterized with the pain in masticatory muscle and TMJ; clicking in TMJ; and deflection, deviation pattern with limitation in opening of the mouth. TMD can be found in adolescents with prevalence and severity increased along with the age. TMD in adolescent was caused by the increased of the masticatory muscle activity. In adolescent, it was caused by the increase of the emotional state especially stress. Stress is a condition that often experienced by every people including orphaned adolescent, who has more problems than the other adolescent.* ***Purpose****: The aim of this study was to analyze the correlation between stress and temporomandibular disorder in orphaned adolescent in Banjarmasin.* ***Method****: This study is an analytical observational research with cross sectional design. The study was involving 13-18 years old orphaned adolescents in Banjarmasin with purposive sampling. This study is using PSS for stress examination and RDC/TMD for TMD examination. The correlation between stress and TMD were analyzed with Spearman analysis test.* ***Results****: This research showed that 61% of the subject had moderate stress level and TMD was found in 68.3% of the subject, which consists of 58.5% had myofascial pain and 9.8% had disc displacement. Spearman analysis test showed that there is statistical correlation between stress and temporomandibular disorder in orphaned adolescent in Banjarmasin ($p<0.05$).* ***Conclusion****: There is a correlation between stress and temporomandibular disorder in orphaned adolescent in Banjarmasin.*

Keywords: *Myofascial Pain, Stress, Temporomandibular disorder (TMD).*

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INTRODUCTION

Temporomandibular Joint (TMJ) is an important joint in the body. TMJ plays an important role in body including communication, facial expression and mastication. Dysfunction in TMJ will cause a disturbance known as temporomandibular disorder (TMD).[1] TMD was described as a disturbance characterized by orofacial pain including disturbances in the TMJ area, fatigue in the masticatory muscles, abnormal mandibular movements and the sound of the mandibular bone while articulation movement.[2] Signs and clinical symptoms of TMD can be seen from three things, including: pain in the masticatory muscles and the TMJ; 'click' sound on TMJ; and the presence of deflection, deviations in opening pattern and mouth opening limitation. Other symptom include: tinnitus, headache, neuralgia and toothache.[3]

The etiology of TMD are multifactorial, including: trauma; autoimmune disease; neoplasm tissues; emotional stress; occlusal interference; malposition and tooth loss; masticatory muscle dysfunction; structure changes in TMJ; parafunctional activity such as clenching and combination of etiological factors. Other factors that can lead to the occurrence of TMD including: prosthodontic rehabilitation treatment, orthodontic treatment, orthognathic surgery and mandible fracture.[3,4]

TMD is the second most common musculoskeletal disorder after low back pain. TMD was became a significant health problem because it can be found in 5% to 12% of the world population. TMD can be found in adolescents and their prevalence increased along with the age.[5.6] The prevalence of TMD in adolescents was 9% to 48.7%. Research by Junior, 33,2% of 1342 adolescent between 10-17 years old in Brazil had TMD.[7] Other study by Marpaung with 7-12 and 13-18 years old respondents in Jakarta showed that 23.4% of 7-12 respondent and 36.9% of 13-18 respondent had TMD. The most common symptom in this study was myofascial pain (21.6%). Myofascial pain is a localized pain in the masticatory muscle characterized by pain during palpation examination. This pain increased due masticatory muscle tonicity in the area known as the trigger point. Myofascial pain is caused by many factors, including trauma, vitamin deficiency and stress.[6.8]

Stress was a problem that has become part of human life. Stress can be found in children, adolescents, adults and elderly.[9] Stress in adolescent is caused by some problems in school, exams and when communication with adults. Stress can also found in orphaned adolescents who has more problems than the other adolescents. The problems include problems with friends, in schools, with caregivers and the orphanage's society.[10] Stress in orphaned adolescents can cause increased in masticatory muscles tension and TMD.[11]

Therefore author was interested to analyze the correlation between stress and TMD in the orphaned adolescent in Banjarmasin.

RESEARCH METHODS

This research was an analytical observational research with cross sectional design that has been received ethics permission with number 030/KEPKG-FKGULM/EC/I/2020 by the Health Research ethics committee Faculty of Dentistry, University of Lambung Mangkurat. The study was held in orphanage located in Banjarmasin on 30 January 2020-15 February 2020. The population in this study was adolescents in Banjarmasin. Based on the calculation of correlative analytical samples formula, the minimum sample in this study was 39 people. Sampling techniques in this study was performed by the purposive sampling. The inclusion criteria in this study was the adolescent between 13-18 years old in Banjarmasin, in the permanent teeth period with molar relation class I, the second molar had been erupted and the third molar is not erupt. The exclusion criteria in this research was: respondent is not willing to take part in the research; received TMD treatment; has systemic medication; has illness with other symptoms such as TMD, including inflammation that occur in the ear, sinus or nose, throat, salivary gland; rheumatism, trigeminal neuralgia and acute pericoronitis; respondent is experiencing congenital disorders and fractures because of trauma in the face or head; respondents were in orthodontic treatment or using dental bracket; have sleep bruxism; and respondents have chewing in one side habit.

Samples that have fulfilled the criteria subsequent to the stress and TMD examination. Stress examination was done by filling out the perceived stress scale questionnaire. This questionnaire contains 10 questions about the conditions experienced within a month. The results of this questionnaire are mild, moderate and severe stress level. Furthermore, TMD examination used the Research Diagnostic criteria for Temporomandibular Disorder (RDC/TMD). RDC/TMD examination contains questionnaire and physical examination. The physical examination related to RDC/TMD consists of facial pain examination; sound examination; and physical examination in intraoral muscle, extra oral muscle and TMJ. The results of RDC/TMD examination are non-TMD, TMD group I (myofascial pain), TMD group II (discus displacement) and TMD group III (degenerative joint disease). The results of stress examination and TMD were analyzed with statistical analysis in univariate and bivariate. Univariate analysis was performed by looking at the characteristic of the variables. Otherwise bivariate analysis is performed by using the spearman correlative test to determine the correlation between stress and temporomandibular disorder.

RESULTS

41 samples involved in this study, which included 21 female and 20 male orphaned adolescents. The result of stress examination are shown in table 1. It showed that the most frequently stress level experienced by orphaned adolescent in Banjarmasin was moderate stress level (61%). This table also showed that severe stress level experienced by 4 respondent which were female orphaned adolescent.

Table 1. Characteristics of Respondent's stress

	Stress levels			Total
	Mild	Moderate	Severe	
Male	6 (28,5)	15 (71,5)	0 (0)	21 (100)
Female	6 (30)	10 (50)	4 (20)	20 (100)
Total	12	25	4	41

The prevalence of TMD diagnosis based of RDC/TMD is presented in table 2. It showed that TMD was experienced by 68,3% respondents. Myofascial pain (group I) was the most prevalent diagnosis (58,5%) and followed by disc displacement or group II (9,8%).

Table 2. Characteristics of Respondent's TMD.

TMD	Number (n)	Percentage
Non-TMD	13	31.7%
Group I	24	58.5%
Group II	4	9.8%
Group III	0	0
Total	**41**	**100%**

Table 3 shows the result of TMD diagnosis based of RDC/TMD according to the gender characteristic in this study. It was found that TMD is more experienced by female (57,1%) than male orphaned adolescent (43,9%).

Table 3. Characteristics of Respondent's TMD According to Gender.

	TMD				Total
	Non TMD	TMD Group I	TMD Group II	TMD Group III	
Male	9 (42,9)	11 (52,3)	1 (4,8)	0 (0)	21 (100)
Female	4 (20)	13 (65)	3 (15)	0 (0)	20 (100)
Total	13	24	4	0	41

The result of TMD diagnosis according to stress in orphaned adolescents are shown in table 4. It showed that TMD is more experienced by the respondents with moderate stress level (51,2%). Myofascial pain was the most prevalent diagnosis in this stress level (95,2%).

Spearman correlative test result are shown in table 5. It was found that there is correlation between stress and temporomandibular disorder in orphaned adolescent in Banjarmasin (p=0,000).

Table 4. Characteristics of Respondent's TMD According to Stress Level.

		TMD n (%)				Total
		Non TMD	TMD Group 1	TMD Group 2	TMD Group 3	
Stress Level	Mild	9 (75%)	3 (25%)	0 (0%)	0 (0%)	12 (100%)
	Moderate	4 (16%)	20 (80%)	1 (4%)	0 (0%)	25 (100%)
	Severe	0 (0%)	1 (25%)	3 (75%)	0 (0%)	4 (100%)
Total		13	24	4	0	41

Table 5. The Result of Spearman Test

	Temporomandibular Disorder		
	Correlation strength (r)	Significance value (p)	Direction of correlation (+/-)
Stress	0.679	0.000	+

DISCUSSION

Stress is a condition that can be experienced by everyone, including children, adolescents, adults and elderly. The stress in adolescents can be caused by academic stress and stress in relationships with the others adolescent. Academic stress can be caused by duty demands, exams and the other condition. Otherwise, stress in relation with others can be caused by adolescent's personality including, anti-social personality such as disturbing, lying and aggressive behaviors.[9] Stress also can be experienced by orphaned adolescent who have more problems than the other adolescents. The orphaned adolescent problems are relate to social relation problem, study activities and life necessity problem.[12] Problems experienced by orphaned adolescents was also related to self-adaptation problem. It relates to the school, friend, society and caregivers. Furthermore, they're often bullied by their friend. The problems will cause stress, which is a physical and psychic responses to a problem.[9]

Stress in orphaned adolescents which described in table 1 showed that moderate stress level was the most common stress levels. Moderate stress level was interpreted as a stress that affect the body and characterized by the presence of health disorders and behavioral changes such as excessive anxiety and insomnia.[13] Stress was more experienced by female than male adolescent. This fact demonstrated by more severe stress level in female orphaned adolescent. The difference of stress response based on gender in orphaned adolescent was influenced by hormonal factors. The sex hormone in female will cause HPA (hypothalamus, pituitary, adrenal) response decreased. HPA is a center of stress response in human. The decrease of HPA response will reduce cortisol hormone production.[14] Cortisol hormone is a hormone that produced by adrenal glands and have a function in stress compensation mechanism through the process of gluconeogenesis which will provide energy for the body to face against stress. The decrease of cortisol hormone will cause human to be stress easier.[15] The difference of stress response based on gender is also caused by male who required to be stronger and ready to face the problem. It makes male use their sense rather than female who use feeling to face a problem.[16]

TMD is a disturbance that occurs in the TMJ. TMD can occur in adolescents and their prevalence increased with age.[6] Prevalence of TMD in this study was 68.3%. This study also showed that TMD was more experienced by female orphaned adolescent. The high case of TMD in female orphaned adolescent was caused by two factors, psychological and hormonal factor.[17] Psychological factor was related to stress response based on gender. The stress condition in female will cause masticatory muscle tension increased that trigger the occurrence of TMD.[18] Hormonal factor was related to estrogen hormone. Estrogen hormone will increase TLR-4 stimulation which will lead the increased of IL-6 release. The increase of IL-6 will make female orphaned adolescent more sensitive to pain, including the facial pains.[19,20]

TMD symptoms according to RDC/TMD can be classified into 3 groups, group I (myofascial pain, group II (discus displacement) and group III (degenerative joint disease). The most common symptom of TMD in the orphaned adolescent in Banjarmasin was myofascial pain. The American Academy of Pediatric Dentistry also stated that TMD may occur in adolescence and the most common symptoms was myofascial pain.[21] Myofascial pain in adolescents is a result of emotional conditions that experienced by the adolescent. The increased of emotional condition in adolescents was because of the problems that faced by orphaned adolescent who have more problems than the other adolescent.[10,12,22] Stress that experienced by orphaned adolescent will lead to muscle hyperactivity that cause fatigue and pain in the muscles. Pain was also caused by the accumulation of lactic acid as a result from hypoxia condition of local ischemia that occur when the muscles is experiencing continuous hyperactivity.[23,24]

Non-parametric correlation analysis, Spearman test showed that there was a meaningful correlation between stress and temporomandibular disorder in orphaned adolescent in Banjarmasin. Stress was an important factor and the main etiology of TMD by affecting the activity of masticatory muscles.[6,25] Stress can simply described as excess energy that should be out from the body. The process to taken out the excess energy can be done in two ways, through external and internal mechanisms. External mechanisms can be done by release the energy out of the body through screaming and wreak to the things around. Otherwise, internal mechanisms can occur when the energy is not released from the body and stay in the body. Internal mechanisms will cause some condition in the body, such as hypertension, asthma and increased activity and tonicity of the head and neck muscle. The increased activity and tonicity of the muscle is a part of a condition called general adaptation syndrome (GAS) that aims to prepare body to defend it against the stressor. This GAS condition should not long last and continuous because it can make damage and physical disturbances in body, such as TMD.[6,26]

The stress that experienced by a human will activate the HPA which will lead to increase the masticatory muscle tonicity. The increased masticatory muscle tonicity is caused by three factor. Stress will stimulate HPA to increase gamma efferent activity through complex neural pathways and cause muscle contraction. Muscle contraction will increase masticatory muscle tone further.[6]

HPA will stimulate the hypothalamus to increase ACTH hormone production in case to respond the stress that experienced. Furthermore, that will trigger the increase of cortisol hormone secretion into the blood. Cortisol hormone or well known as a stress hormone was a hormone produced by the adrenal glands. The function of cortisol hormone is increasing the gluconeogenesis process. It will provide energy for body to face the stress. The increase of cortisol hormone also affect the activity and tonicity of the muscles in body simultaneously, including masticatory muscle.[6,15,26]

HPA activation will boost the hypothalamus to activate the fight/flight system through the sympathetic nerve as the body's response to stress. The fight/flight system was activated to prepare body for the heavy activities and to face the stress by increasing the blood flow with high nutrients and oxygen to the important organs, including the masticatory muscle. The fight/flight system will reduced capillary blood flow and lead to blood flow increased to the important parts such as the musculoskeletal and inner organs. The continual activity of the sympathetic nervous system will affects certain tissues including the masticatory muscle. The activity of sympathetic nervous system will increase masticatory muscle tone that will trigger the occurrence of hyperactivity in the masticatory muscles.[1,6,15,23,24]

The increased of masticatory muscle activity as a result of HPA activation that caused by stress conditions will lead to TMJ instability and TMD. The hyperactivity of the muscle will also cause hypoxia, which is caused by ischemia in the muscles which continuously contraction. The anaerobic condition caused by hypoxia will push the muscle to induce glycolysis process and break down the energy reserve to ensure the contraction of muscle. Glycolysis process of the masticatory muscle will induce the accumulation of lactic acid as a side effect that cause pain in the muscles.[1,6,15,23]

The masticatory muscle hyperactivity also increase the production of neurotransmitter serotonin. It will affect the balanced of catecholamine and trigger the localized pain in the masticatory muscles. The localized pain in the masticatory muscle was known as myofascial pain which is one of the symptoms of TMD.[6,24] Based on the results of this study, it showed that there is a meaningful correlation between stress and temporomandibular disorder in orphaned adolescent in Banjarmasin city. The results of this study also showed that the most experienced level of stress was moderate stress level and the most experienced symptoms of TMD was myofascial pain.

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