Comparison of diagnosis of temporomandibular joint disorders based on RDC/TMD Axis I and DC/TMD Axis I

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 ABSTRACT
Introduction: The Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) has become the most widely used diagnostic protocol for research in temporomandibular disorders (TMD). The invalidity of RDC/TMD in clinical application causes the revision of RDC/TMD to be the Diagnostic Criteria for Temporomandibular Disorder (DC/TMD). The purpose of this study was to determine the differences in diagnosis of TMD between RDC/TMD examination and DC/TMD Axis I on students of Faculty of Dentistry, Padjadjaran University. **Method**: The type of this research was comparative survey approach using clinical examinations and questionnaires. The sample was collected from 48 people using random sampling techniques. The diagnosis of TMD was obtained by filling in the symptom questionnaire and clinical examination based on RDC/TMD Axis I and DC/TMD Axis I, which is then entered into the RDC/TMD diagnosis algorithm and DC/TMD decision tree. **Results**: The results showed that from 48 samples there were 36 (75%) people with the same diagnosis of RDC/TMD and DC/TMD, and 12 (25%) people with different diagnoses between RDC/TMD and DC/TMD. **Conclusions:** Based on the results of the study, the diagnosis of TMD based on RDC/TMD were still categorized the same as the diagnosis based on DC/TMD.
Keywords: temporomandibular disorders, Research Diagnostic Criteria Axis I

INTRODUCTION

The temporomandibular joint (TMJ) is a joint that connects the mandible or lower jaw to the skull and regulates jaw movement;[1] one of the most complex, vulnerable, and highly used joints in the movement of the human body.[2] Temporomandibular joint disorders (TMDs) are a term commonly used for problems related to the jaw joint, involving the muscles of mastication, the TMJ and related structures or both.[3] The prevalence of TMD is 40-60% of the world's population.[4] The TMDs are most common in people ages 20-40 years, and is more common in women than in men.[5]

The Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) has been the most widely used diagnostic protocol for the research of TMDs since its publication in 1992.[6] Then in 2010, a revised RDC/TMD was developed.[7] Diagnosis of RDC/TMD Axis I did not reach the target set at sensitivity 0.70 and specificity 0.95.[8] The invalidity of RDC/TMD in clinical application led to revision of RDC/TMD to become Diagnostic Criteria for Temporomandibular Disorder (DC/TMD).[9] The DC/TMD provides a comprehensive assessment of the most common TMDs, based on a biopsychosocial model of chronic pain.[6]

The two main goals of DC/TMD are to improve and standardize diagnostic groups for further research on TMDs, and to improve clinical care.[10] The differences in clinical examination procedures for RDC/TMD and DC/TMD are in the location of pain, static landmarks, mobility, TMJ examination, palpation of muscles and TMJ.[11]

The DC/TMD also consists of two axises, namely Axis I which is the procedure for clinical examination, and Axis II which is a questionnaire of disease history and psychological factors.[6] Axis I DC/TMD protocol is a very specific and reliable diagnostic criteria that includes valid screening for the detection of pain-associated TMDs as well as valid diagnostic criteria for distinguishing those most associated with pain from TMDs (sensitivity 0.86, specificity 0.98) and intra-articular disturbances (sensitivity 0.80 and specificity 0.97). The Axis II protocol retains the original RDC/TMD screening instrument plus a new instrument for assessing jaw function and additional behavior and psychosocial factors.[6] Based on the above background, this study aims to see if there are differences in the diagnosis of TMDs based on RDC/TMD and DC/TMD examinations.

METHODS

This type of research is a comparative survey approach using clinical examination and questionnaires. The population of the study was preclinical students of the 2015 Faculty of Dentistry, Padjadjaran University as many as 186 people. Sampling employed random sampling technique.[12] According to Fraenkel and Wallen[13], the minimum number

of samples for this type of causal-comparison research was 30.

The inclusion criteria in this study were preclinical students class of 2015 Faculty of Dentistry, University of Padjadjaran who were willing to participate in this study. Exclusion criteria were 1) moderate or have performed TMJ treatment, 2) has experienced trauma to the TMJ within 2 months, 3) currently taking non-steroidal anti-inflammatory drugs, and 4) currently under dental treatment.

Tools and materials used 1) basic examination tools; 2) informed consent as the respondent's consent form to participate in this study; (3) Axis I clinical examination questionnaire, 2010 Revised RDC/TMD diagnosis algorithm, Axis I clinical examination questionnaire, and DC/TMD decision tree diagnosis; and (4) a sheet of recapitulation of examination data on the TMJ.

The procedures were 1) submitting ethical clearance to the Ethics Committee of Padjadjaran University; 2) calibrating the RDC/TMD and DC/TMD Axis I examination; 3) screening students who met predetermined criteria; 4) preparing tools and materials to be used in research; 5) explaining to the respondent what would be done and the objectives to be achieved; 6) having understood and was willing to follow all research procedures, the respondent expressed his/her agreement by signing an informed consent form; 7) recording the identity data of the respondents who have filled out the approval letter; 8) examining TMD with RDC/TMD, followed by DC/TMD examination; 9) recording the data obtained in the examination sheet and then processed them using the 2010 revised RDC/TMD algorithm and DC/TMD decision tree.

RESULTS

This research was conducted from November to December 2018 at the Faculty of Dentistry, Universitas Padjadjaran Jatinangor after receiving an ethical clearence letter No. 2/7/UN6.KEP/EC/2018 from the Health Research Ethics Commission of Universitas Padjadjaran. The number of samples were 48 students who were selected based on predetermined criteria. Table 1 shows the distribution of the sample by sex and age; the number of samples were 39 women (83.2%) and 9 men (16.8%). Majority of the samples in this study were women because the population of preclinical students from the 2015 were mostly women.

Table 1 Distribution of samples by gender and age

Variable	Category					
	Male			Female		Total
Gender	9			39		48
	18.8%			81.2%		100%
	20	**21**	**22**	**23**	**34**	
Age	2	37	7	1	1	48
	4.2%	77%	14.6%	2.1	2.1	100

From the 48 research samples, the results of TMD diagnosis based on the 2010 Revised RDC/TMD and TMD/DC are seen at Table 2; the most TMD diagnoses based on RDC/TMD identified were disc displacement with reduction (27%), then myofascial pain (6.3%), and a combination of myofascial pain and disc displacement with reduction (6.3%). In 23 people (47.9%) none of the diagnoses were found. The most TMD diagnoses based on DC/TMD identified were disc displacement with reduction (27.1%), then the combination of myofascial pain and disc displacement with reduction as many 6.3%, in 21 people (43.75%) found none of the diagnoses.

From the results of the TMD diagnosis based on the 2010 Revised RDC/TMD and DC/TMD, conclusions were drawn about the similarities and

Table 2 Results of TMD diagnosis based on 2010 Revised RDC/TMD and DC/TMD Axis I

Diagnosis Results	RDC-TMD		DC-TMD	
	f	%	f	%
Ia Myofascial Pain	3	6.3	1	2.1
Ib Myofascial Pain with Limited Opening	1	2.1	1	2.1
IIa Disc Displacement with Reduction	13	27.0	0	0.0
IIb Disc Displacement without Reduction with Limited Opening	0	0.0	1	2.1
IIc Disc Displacement without Reduction without Limited Opening	0	0.0	2	4.2
IIIa Arthralgia	1	2.1	13	27.1
IIIb Osteoarthritis	0	0.0	0	0.0
IIIc Osteoarthrosis	2	4.2	0	0.0
Ia, IIa, IIIa	1	2.1	-	-
Ia, IIa	3	6.3	2	4.2
Ia, IIa, IIb	1	2.1	-	-
Id, IIa	-	-	2	4.2
Ie, IIc	-	-	1	2.1
None	23	47.9	3	6.3
Total	48	100.0	48	100.0

Table 3 Comparison of TMD diagnosis results based on RDC/TMD and DC/TMD Axis

Comparison of TMD Diagnosis	f	%	p-value
The same results of the diagnosis	36	75	
Disc displacement with reduction	11	22.9	
Myofascial pain	1	2.1	
Arthralgia	1	2.1	0.0966
Degenerative joint diseases	2	4.2	
No diagnosis found	21	43.7	
Different diagnostic results	12	25%	

Note: p-value is obtained from the results of the Wilcoxon-Mann/Whitney Test

and differences between the two methods. In Table 3, 36 people (75%) had the same diagnosis, while 12 people (25%) had different diagnosis. The findings of the diagnosis using the two methods were then analyzed using the one sample Wilcoxon–Mann/Whitney test method. Based on the results of hypothesis testing with the Wilcoxon-Mann/Whitney test, a p-value of 0.096 was produced. This value was greater than the 0.05 significance level, so the conclusion is that there was no difference in the diagnosis results between RDC/TMD and DC/TMD Axis I.

DISCUSSION

Several studies have shown that TMDs were more common in women than in men.[5,14,15] This may be due to hormonal factors which are one of the factors causing TMDs. The TMDs have been linked to the female hormones that disrupt the pain threshold. According to Menezes[16], women's estrogen levels may lead to higher joint tissue tenderness, resulting in a lower ability to withstand functional stress. However, this contradicts Gray *et al*.[17] which claims based on an epidemiological survey, the number of women and men with TMDs showed almost the same results in the population.

The same diagnosis between RDC/TMD and DC/TMD was myofascial pain, disc displacement with reduction, disc displacement without reduction with limited opening, disc displacement without reduction without limited opening, arthralgia, and osteoarthritis along with osteoarthrosis or degenerative joint diseases. The only diagnosis on RDC/TMD and not on DC/TMD is myofascial pain with limited opening. Meanwhile, the only diagnoses in DC/TMD and no RDC/TMD were local myalgia, myofascial pain with referral, headache attributed to TMD, and disc displacement with reduction with intermittent locking.

The diagnosis of RDC/TMD Group II was disc displacement divided into right and left joints. However, for testing the hypothesis, it is not differentiated so that it equates with the diagnosis of DC/TMD which is not distinguished from right or left.

Thus, if the respondent has disc displacement in one joint, disc displacement is detected. The diagnosis of RDC/TMD of osteoarthritis and osteoarthrosis is also equated with the diagnosis of DC/TMD of degenerative joint diseases, because osteoarthritis and osteoarthrosis represent a subdiagnosis of degenerative joint diseases hypothesis is not distinguished.

Based on Table 2, the diagnosis for RDC/TMD Group I were 9 people and DC/TMD were 10 people. To diagnose myofascial pain in RDC/TMD, it is necessary to have pain in at least 3 of the 20 areas of muscle palpation.[18] The RDC/TMD diagnostic algorithm for Group I is simpler than DC/TMD because there are only 2 subdiagnosis, while on DC/TMD there are 5 subdiagnosis. Five subdiagnoses in DC/TMD Group I made the decision tree diagnosis in Group I more complicated than RDC/TMD.

From the results of the diagnosis of Group I, there was only 1 person who had the same diagnosis, namely myofascial pain. The discrepancy was attributable to the greater number of subdiagnoses in DC/TMD Group I. New diagnoses in DC/TMD Group I, namely local myalgia, myofascial pain with referral, and headache attributed to TMD led to a significant difference in the diagnostic results in Group I diagnoses. Headache attributed to TMD was added to DC/TMD because there is an increasing in evidence that several forms of headache can occur in association with TMD.[19] The differential diagnosis in this study was most pronounced in Group I. The difference in detecting local myalgia and myofascial pain was that in local myalgia the absence of pain that extends beyond the palpated area, as opposed to myofascial pain.

The DC/TMD can be said to be more sensitive in diagnosing Group I disorders because there are more subdiagnosis. This is in line with Steenks[18] and Schiffman *et al*[6] which stated that DC/TMD is very pain oriented. However, this is not in line with Look *et al*[20] which stated that the RDC/TMD protocol can diagnose myofascial pain well.

Based on Table 2, the most common diagnosis

from this study was disc displacement with reduction. The prevalence of disc displacement with reduction increases with age, 6% in childhood, about 34% in adolescents, and 31-34% in adulthood.[21] According to Farrar and McCarty[22], nearly 70% of patients with TMDs experience disc displacement. In this study, 18 samples detected with disc displacement with reduction, 18 people in RDC/TMD and 17 people in DC/TMD. One of the symptoms of disc displacement with reduction is an abnormal mouth opening pattern, namely deviation.[23]

All samples that experienced disc displacement with reduction experienced clicking symptoms. In most cases, 70-80% TMJ clicking sound is caused by disc displacement in various directions, but mostly in anteromedial direction.[24] Abnormalities in joint structure and function, such as deformation of joint structures, and changes in synovial fluid quality lead to joint sounds on temporomandibular. This abnormality causes increased friction between the joint elements, resulting in joint sound.[25]

The most samples with the same diagnosis between RDC/TMD and DC/TMD was disc displacement with reduction so that it can be said that in diagnosing this disease, RDC/TMD is still reliable. This is in line with Look et al[20] and Lausten et al[26], which stated that the reliability of the RDC/TMD protocol can be trusted for the diagnosis of myofascial pain, arthralgia, disc displacement with reduction, and disc displacement without reduction with limited opening. However, what distinguishes between RDC/TMD and DC/TMD is the calculation of the RDC/TMD diagnosis algorithm which is divided into left and right joints.

Samples diagnosed with disc displacement without reduction without limited opening on DC/TMD were not diagnosed with RDC/TMD. This is in line with Look et al[20] which stated that the reliability of RDC/TMD for disc displacement without reduction without limited opening and osteoarthrosis was unreliable.

The undiagnosed sample with disc displacement without reduction without limited opening was caused by the calculation of the RDC/TMD diagnosis algorithm which included other combinations, namely Maximum Assisted Opening and Passive Stretch, namely Max 35 mm and Stretch 4 mm. This does not result in any diagnosis in the RDC/TMD diagnosis algorithm. The DC/TMD decision tree diagnosis is simpler in diagnosing disc displacement without reduction without limited opening because there is only a Maximum Assisted Opening requirement of 40 mm. This diagnosis in

DC/TMD also does not take into account whether the sample has clicked during opening, closing the mouth, lateral movement, and protrusion movement as in RDC/TMD.

Degenerative joint disorders are confirmed by the presence of joint crepitus sounds.[27] Osteoarthrosis is a subdiagnosis of degenerative joint diseases in DC/TMD Group III. From this study, there were 2 samples with osteoarthritis in RDC/TMD Group III, and degenerative joint diseases. This is not in line with Look et al[20] saying that RDC/TMD cannot be relied upon in diagnosing osteoarthritis, because samples can still be diagnosed using RDC/TMD examination.

Bernhardt et al[28] found the prevalence of osteoarthritis of the TMJ joint on clinical examination and MRI was 25% in the 20-49 years age group. The sample of this study was 20-24 years old, so it was included in the prevalence. Schmitter et al[29] found that the prevalence of osteoarthritis was 70% in the 73-75 years age group.

Steenks[18] said that RDC/TMD tends to result in too many diagnoses leading to overtreatment. This may be due to the RDC/TMD diagnostic algorithm that distinguishes the right and left joints in Groups II and III thereby increasing the possibility of differential diagnosis between the right and left joints. In this study, there was 1 person who had a different diagnosis between the right and left joints. Overdiagnosis also occurred in 1 person who was diagnosed with myofascial pain and arthralgia. The occurrence of overdiagnosis due to RDC/TMD arthralgia was assigned to Group III (other joint diseases), while DC/TMD arthralgia was assigned to Group I. Thus, it was impossible for a sample to experience more than 1 diagnosis in one group.

Based on Table 2, there were 23 people and 21 samples, respectively, whose diagnosis of TMD was not found. In Table 1, it can be seen that the age range of the sample in this study was 20-24 years. Factors that cause TMDs are psychological factors, such as anxiety and stress, structural factors (occlusion), functional (bruxism), genetic factors, orthodontic treatment and external trauma.[30] According to Kindler et al[31], psychological factors can trigger muscle hyperactivity, followed by biomechanical changes and pain. Psychological factors can also lead to increased production of neurotransmitters and serotonin, catecholamine imbalance, which causes pain, especially pain in the temporomandibular region. This thing shows that the possibility of stress levels in preclinical students from the 2015 Faculty of Dentistry, Universitas Padjadjaran, is not too high.

In this study, there were 21 people who were not detect TMDs. This suggests that TMD is less common among university students, as in the study of Minghelli,[32,] who evaluated university students in the health sector and found the prevalence of TMD to be only 37.3%. However, this contradidicts the study of Oliveira et al[33] on college students in Brazil, where the prevalence was 68.6%.

Based on Table 2 there are 48 samples in this study. The samples who had the same diagnosis were 36 people (75%) and no diagnosis was found in 21 people. Meanwhile, the other 12 people or 25% found different diagnosis results. This shows that RDC/TMD and DC/TMD show the same diagnostic results are still more dominant than the results of different diagnoses so that it can be said to be the same. This is in line with Reiter's[34] statement, that there was no significant difference between RDC/TMD and DC/TMD for Axis I diagnoses, including Group I (muscle disorders), Group II (disc disorders), and Group III (arthralgia, degenerative joint disease). However, this is not in line with the statements which state that DC/TMD is more valid than RDC/TMD.[6,35,36]

The conclusion of this study is the diagnosis of TMD based on RDC/TMD is still in the same category as the results of the diagnosis of DC/TMD with a similarity level of 75% which indicates that the same diagnosis is still more dominant than the results of different diagnoses.

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