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The Diagnostic Accuracy of Three Questions and TMD Screening Questionnaire in Diagnosis of Temporomandibular Disorders amongst Patients with Bruxism

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Abstract

Objective: The objective of the study was to determine diagnosis of temporomandibular disorder using three screening questions and TMD screening questionnaire amongst patients with bruxism and to assess the diagnostic accuracy of three questions (3Q/TMD) and temporomandibular disorder (TMD) screening questionnaire in relation to clinical evaluation in the same patients.

Materials and methods: This study included 50 patients with history of bruxism, 18-50 yrs of age, selected from the outpatient department of our Institution. Clinical examination was done by a single, blinded oral physician including clinical signs and symptoms, articular sounds, quantitative and qualitative alterations in mandibular movements and arrived at diagnosis.

Results: When comparing both questionnaires on the basis of diagnostic accuracy, 3Q showed sensitivity of 92.6% (92.1-92.8), a specificity of 73.9% (73.5-74.1), positive predictive value 80.6% (80.4-80.8), negative predictive value of 89.5% (89.4-89.6). The TMD questionnaire showed sensitivity of 100%, specificity of 39.1% (38.8-39.2), positive predictive value of 65.9% (65.7-66.1) and negative predictive value of 100%.

Conclusion: In this study, the diagnostic accuracy of three questions and temporomandibular disorder screening

questionnaire for temporomandibular disorders among patients with bruxism was assessed, The three questions is a simple tool which is more precise, simple and accurate for screening temporomandibular disorders, especially among pain related disorders.

Keywords: Temporomanandibular disorders, Screening, 3Q, Bruxism, Diagnosis.

Introduction

Temporomandibular disorders are one of the common causes of chronic pain. Epidemiological studies in multiple countries (America, Sweden, Netherlands, Finland, Pakistan, India, Italy, Iran, Denmark, Brazil, United-Kingdom and Canada) have outlined a substantial prevalence of orofacial pain symptoms in the adult population, showing that approximately 5-60% of the population suffers from at least one of the signs of TMD [1]. Early diagnosis along with appropriate intervention is regarded important in order to prevent chronicity as well as to reduce the negative impact of the condition. Different assessment tools have been employed for the assessment of TMD, such as questionnaires (Manfredi et al., 2001), patient-history indices (Bevilaqua-Grossi et al., 2006; Fonseca et al., 1994), clinical indices and diagnostic criteria (Cavalcanti et al., 2010; de Lucena et al., 2006; Manfredini et al., 2011) [2]. TMD screening questionnaire was introduced in March 1990 in Journal of the American Dental Association by McNeill, Mohl, Rugh and Tanaka [3]. This group of screening questions and the methods of the screening examination are appropriate and have proven to be effective in practice since 1990. Ahead of the publication of the TMD pain screener, three screening questions (3Q/TMD) were introduced during 2010, in large parts of the primary and secondary dental health system in Sweden for the identification of patients with a potential TMD [4]. 3Q/TMD is an applicable, cost-effective and valid tool for screening a general adult population to recognize patients in need of further TMD examination and management [5]. This study will be done to check diagnostic accuracy of 3Q/TMD and TMD screening questionnaire as a screening tool in early diagnosis of TMD among patients with history of bruxism.

Aim And Objective

- The aim of the study is to determine TMD diagnosis using three screening questions and TMD screening questionnaire amongst patients with bruxism.
- To assess the diagnostic accuracy of 3Q/TMD and TMD screening questionnaire in relation to clinical evaluation in the same patients.

Materials And Methods

This study included 50 patients, 25 males and 25 females with history of bruxism, 18-40 yrs of age, selected from the outpatient department of our Institution. Subjects who were mentally incapacitated to give a valid response to question, and who are not willing to participate were excluded. All subjects were explained about the study and informed consent was obtained prior to start of the study.

All 50 subjects were given both 3Q questionnaire and TMD screening questionnaire.

A **3Q questionnaire** contains following questions: (closed ended questions)

Q1. Do you have pain in your temple, face, jaw, or jaw joint once a week or more?

Q2. Do you have pain once a week or more when you open your mouth or chew?

Q3. Does your jaw lock or become stuck once a week or more?

The **TMD screening questionnaire** includes the following questions:

1. Do you have difficulty or pain, or your mouth, as for instance, when yawning? both, when opening?

2. Does your jaw get ‘stuck,’ ‘locked,’ or ‘go out?’

3. Do you have difficulty or pain, or talking, or using your jaws? both, when chewing,

4. Are you aware of noises in the jaw joints?

5. Do you have pain in or about the ears, temples, or cheeks?

6. Does your bite feel uncomfortable or unusual?

7. Do you have frequent headaches?

8. Have you had a recent injury to your head, neck or jaw?

9. Have you previously been treated for a jaw joint problem?

Note: If any one of the first three questions is answered yes, its coded as positive; for questions 4 to 8, two should be answered yes, and for question 9, a yes for two other questions from 4–8 is required for coding positive.

Clinical examination was done by a single, blinded oral physician including clinical signs and symptoms, palpation of joint, muscles, and qualitative alterations in mandibular movements and diagnosis was arrived.

TMJ joint examination:

- Mouth opening
- Pain : Right Left
- Clicking : Opening Closing
- Mandibular movements: Deviation Deflection Protrusive Lateral
- Trismus
- Masticatory muscles examination:
  - Tenderness
  - Function

Results

Statistical analysis was done by IBM SPSS (IBM Corp. 2011). IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp. Table 1 denotes Contingency between 3Q responses and actual diagnosis. Of the 25 cases that were correctly diagnosed as case positive by 3Q, 17 were TMJ arthralgia, 7 were disc displacement with reduction and 1 was Myalgia (Figure 1). ROC (Receiver operating characteristic) curve (Graph 1) for 3Q showing true positive against false positive rate. AUC (Area Under the Curve) was 0.85 and was statistically significant ($P<0.001$). Table 2 denotes contingency between TMD-Q responses and actual diagnosis. Of the 27 cases that were correctly diagnosed as case positive by TMD Q, 18 were TMJ arthralgia, 7 were disc displacement with reduction and 2 was Myalgia (Figure 2). ROC curve (Graph 2) for TMD Q showing true positive against false positive rate. AUC (Area Under the Curve) was 0.72 and was statistically significant ($P<0.001$).

Discussion

Bruxism is one of the common causes associated with TMD disorders. It is commonly believed that teeth grinding or jaw clenching (i.e., bruxism) causes TMD pain due to overloading of the musculoskeletal structures [6]. A variety of biological, psychological, and social factors may reduce the adaptive capacity of the masticatory system, thus resulting in TMDs [7].

This study has been carried out to find the diagnostic accuracy of two questionnaires as a screening tool in diagnosis of TMD. We have selected subjects with self-reported bruxism, and screening done using the questionnaires and later diagnosed clinically. In a previous questionnaire survey by Huhtela et al (2016) among 4403 Finnish University students, it was found that self-reported bruxism was strongly associated with symptoms of temporomandibular joint disorders [8]. This study was in line with previous studies by Raphael et al (2012) [9], Blanco Aguilera et al (2014) [10], Karibe et al (2015) [11].

In the present study, out of 50 self-reported bruxism patients, 3Q questionnaire's affirmative prediction of 25 was in match with the present clinical diagnosis. And 17 patients were correctly diagnosed that they do not have

TMD disease. Of the 25 cases that were correctly diagnosed as case positive by 3Q, 17 were TMJ arthralgia, 7 were disc displacement and 1 was Myalgia. The ROC curve showed area under the curve to be as 0.85 (P<0.001), which is a good measure of the diagnostic ability of the questionnaire tool. Furthermore, the two screening questions on pain (Q1 and Q2) are strongly associated with a pain-related TMD diagnosis, as illustrated by the high sensitivity which is in supportive of results from study by Anna Leovgren et al (2018) where sensitivity for the two pain screening questions (Q1 and Q2) was high (0.83–0.94).[12]

Out of 50 patients, TMD screening questionnaire has predicted 27 affirmative to actual diagnosis. And 9 patients have correctly classified as not having the disorder. Of the 27 cases that were correctly diagnosed as case positive by TMD Q, 18 were TMJ arthralgia, 7 were disc displacement and 2 was Myalgia. The ROC curve was plotted and the area under the curve (AUC) was 0.73 which was statistically significant (P<0.001). This shows the tool (TMD Q) has 'acceptable/fair' diagnostic potential to diagnose the various TMJ disorders.

When comparing both questionnaires on the basis of diagnostic accuracy, 3Q showed sensitivity of 92.6% (92.1-92.8), a specificity of 73.9% (73.5-74.1), positive predictive value 80.6% (80.4-80.8), negative predictive value of 89.5% (89.4-89.6). In another study by Anna Lövgren et al (2018) [12] in a specialized orofacial pain clinic, the 3Q questionnaire had shown an expected high proportion of TMD diagnoses (44% had a pain-related TMD and 33% showed an intra-articular TMD) as well as a high variety of other chronic pain conditions.

The TMD questionnaire showed sensitivity of 100%, specificity of 39.1% (38.8-39.2), positive predictive value of 65.9% (65.7-66.1) and negative predictive value of 100%. While sensitivity and specificity are independent of the prevalence of a condition, positive and negative predictive values are related to the prevalence of the condition in the population of interest. Thus, the TMD questionnaire has high sensitivity, but lacks specificity. This may be attributed because of increased number of questions with multiple aspects pertaining to jaw movement, perceived pain, associated pain, and previous treatments.

There is an increasing prevalence in temporomandibular joint disorders among adolescents and young adults. Carolina Marpaung (2018) reported an alarming overall prevalence of pain-related TMDs among adolescents was 21.6% (26.1% for girls and 17.6% for boys) and that of TMJ sounds was 15.5% (19.3% for girls and 11.7% for boys) [13]. This could be pertaining to various factors such as social pressure, growing insecurities and need for acceptance amongst adolescents and young adults. The symptoms occur long before the patient seeks medical management and evolves as chronic pain which reduces quality of life and a management challenge. In a prevalence study of association between parafunctional habits and TMD among adolescents by Agarwal et al (2016) regarding severity, most students exhibited mild TMD (19.2%), (2.2%) had moderate TMD and (0%) had severe TMD [14].

With all the data from various studies around the world, it is imperative to lead screening for TMD among adolescents and young adults. Patients who have positive responses to a brief screening questionnaire will potentially benefit from a clinical examination. In this study we have potentially compared the diagnostic accuracy of two screening questionnaires, which may be used for screening general population, student population and in oro-facial pain clinics. The limitations of this study include less sample size. The study can be operated among a greater sample size, so that it can act as potential

screening tool among larger population and to provide prompt management and habit interception.

Conclusion

Within the limitations of the study, both 3Q and TMD Screening Questionnaire were tested, with reference to clinical diagnosis among patients with bruxism. The 3Q questionnaire is an effective tool in screening TMD disorders among bruxism patients. A positive result in 3Q questionnaire will prompt for further TMD examination and management. A prompt screening for TMD is utmost needed to diagnose the condition early and to prevent its progression. The 3Q Questionnaire can be used in orofacial pain clinics, as a general screening tool in public camps, or in suspected group as in this study, for further assessment.

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Legends Figure and Figure

Table 1: Contingency between 3Q responses and actual diagnosis.

Variables	Actual Diagnosis		AUC (Area Under the Curve) for 3Q
3Q Diagnosis	No	Yes	0.85*
No	17	2	
Yes	6	25	
*=Highly significant			

Graph 1: ROC curve for 3Q

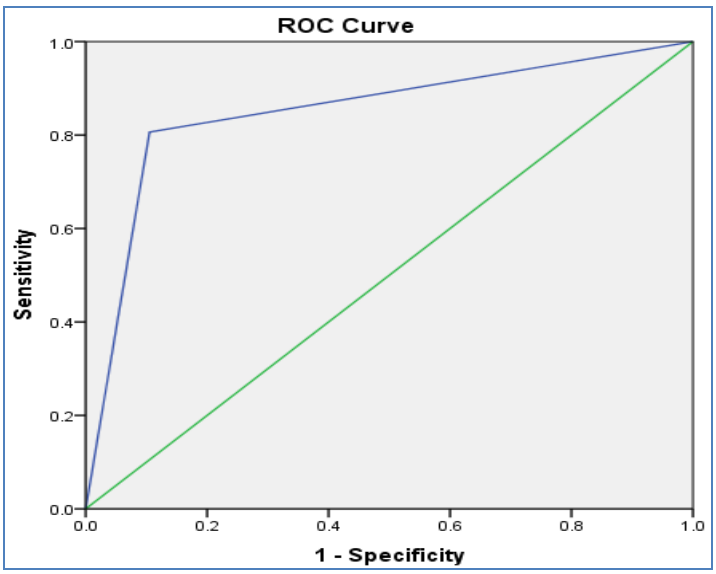

Table 2: Contingency table between TMD-Q responses and actual diagnosis:

Variables	Actual Diagnosis		AUC (Area Under the Curve) for TMD-Q
TMD Q Diagnosis	*No*	*Yes*	*0.72**
No	9	0	
Yes	14	27	
**=Highly significant*			

Graph 2: ROC curve for TMQ response.

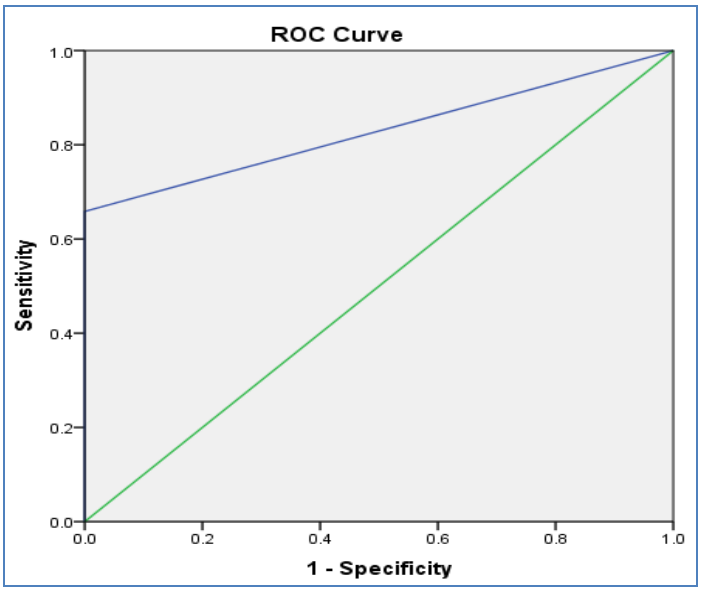

Table 3: Diagnostic values for the 2 types of questionnaire in identification of TMJ disorder

Questionnaire	Sensitivity	Specificity	PPV	NPV	+ LR	- LR
3 Q	92.6 (92.1-92.8)	73.9 (73.5-74.1)	80.6 (80.4-80.8)	89.5 (89.4-89.6)	3.56	0.10
TMD Q	100	39.1 (38.8-39.2)	65.9 (65.7-66.1)	100	1.63	0

PPV: Positive Predictive Value

NPV: Negative Predictive Value

LR: Likelihood Ratio

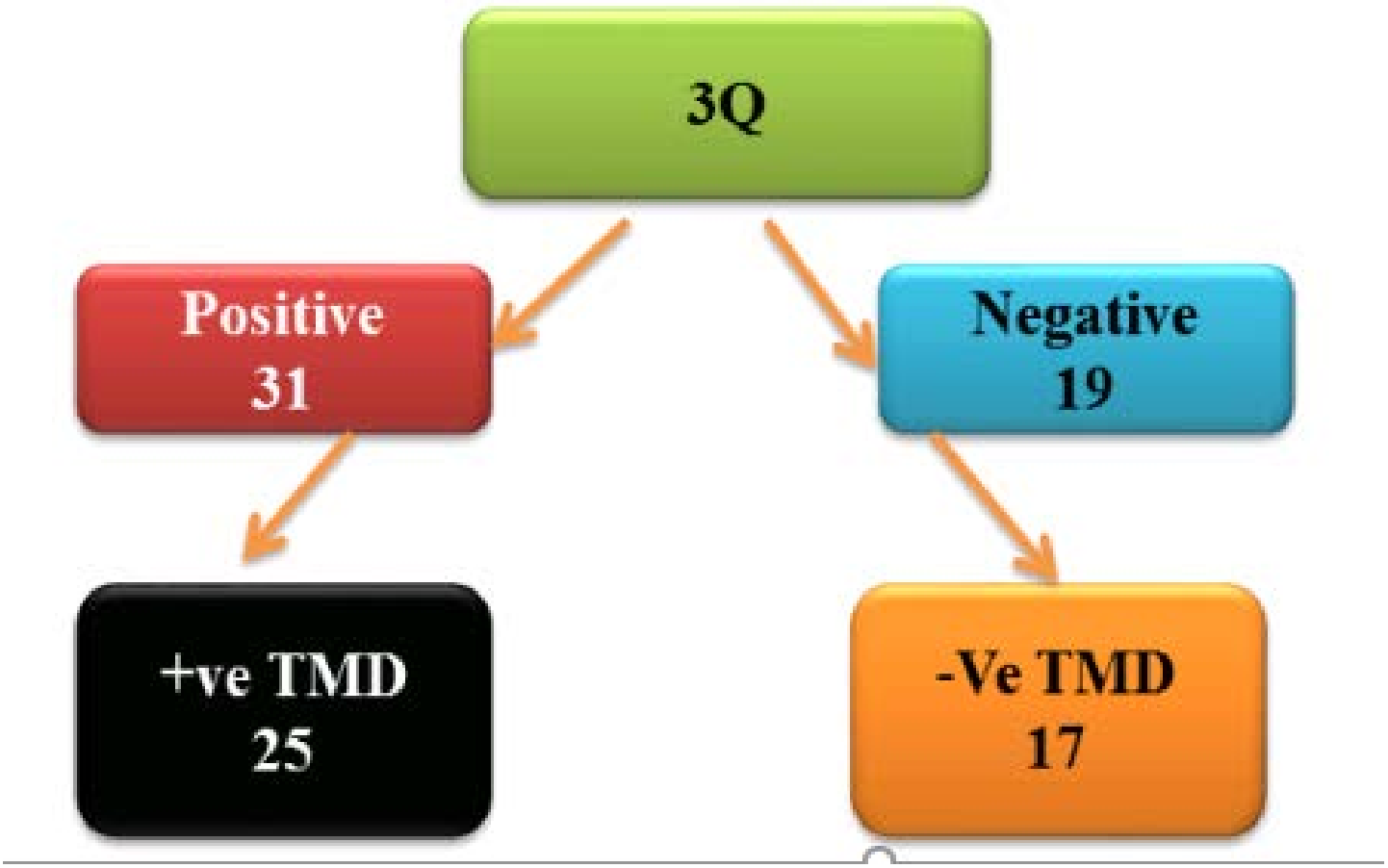

Figure 1: graphic analysis of results – 3Q questionnaire

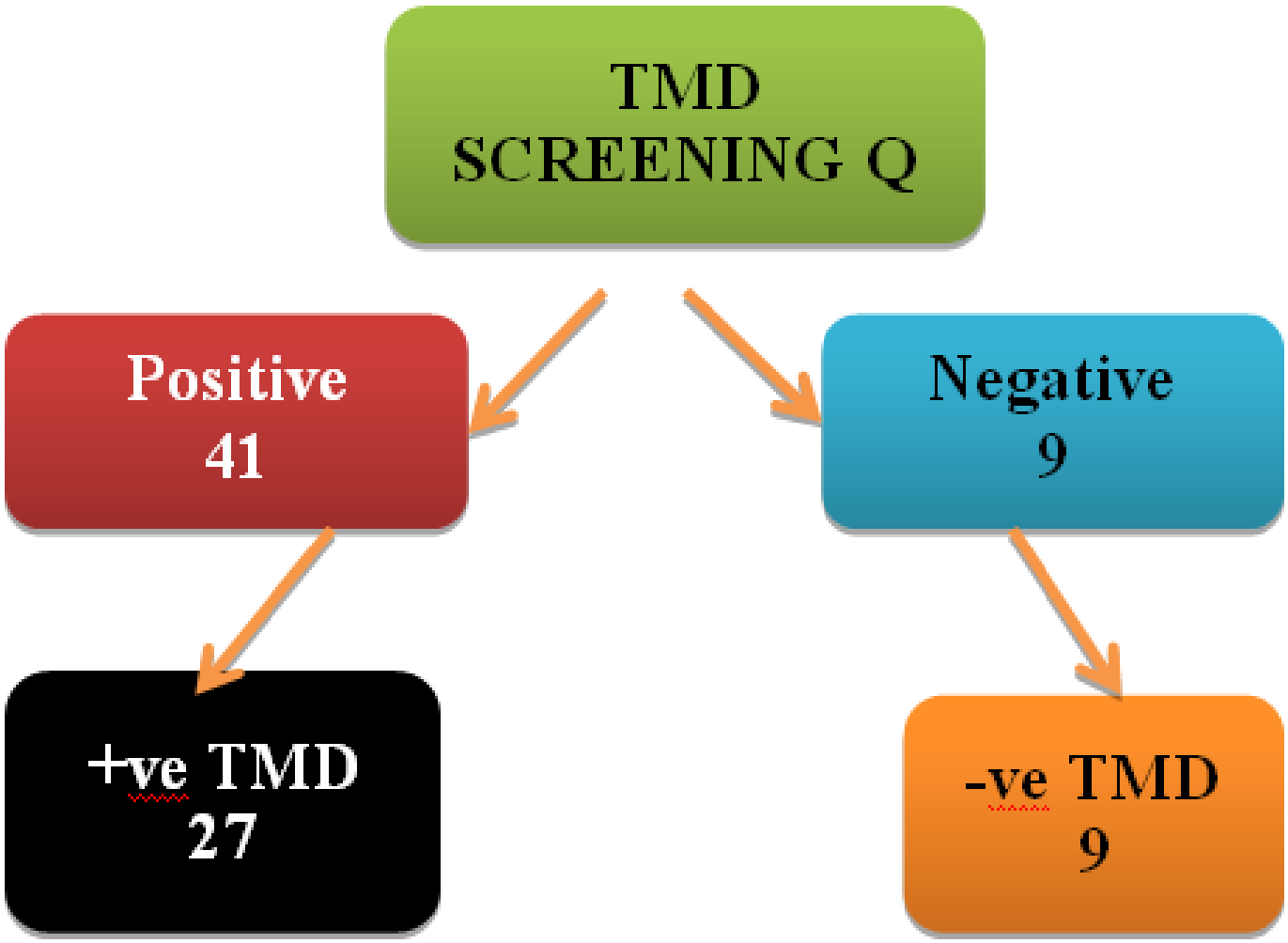

Figure 2: graphic analysis of results – TMD questionnaire