



# **Comparative Evaluation & Correlation of Severity of Temporomandibular Joint Disorders and Airway Difficulty in Class I and Class II Vertical Growth Pattern Cases**

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## **Authors' contributions**

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

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**Study Protocol**

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## **ABSTRACT**

**Introduction:** There are contradictory opinions regarding the role of occlusal factors in the initiation of TMDs. These patients rarely visit or are referred to Orthodontists or dentists which also accounts for these TMDs being undiagnosed. There is conflicting evidence where most often TMDs are linked to occlusal prematurities. Undiagnosed. There is conflicting evidence where most often TMDs are linked to occlusal prematurities. There is a need to assess TMJ dysfunction before beginning of orthodontic treatment so that necessary precautions can be taken while ongoing orthodontic treatment. Also, between the stages of orthodontic treatment. TMJ evaluation will be helpful in monitoring any signs of TMJ dysfunction and TMD disorders so it can be identified and therapeutic measures can be taken. Many studies have been conducted to measure the

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pharyngeal airway difficulty; however, comparison with Class II individuals and the correlation between the variables involved in Class II malocclusion with airway measurements and TMD clinically has not been conducted, which encouraged the present study.

**Materials & Methods:** Total 50 patients in the age group of 18-30 years visiting the outpatient Department of Orthodontics will be selected after screening and divided into two groups as follows: Group A (Control Group) - 25 class I malocclusion patients. Group B (Experimental group) - 25 class II Division -1 malocclusion in patients having vertical growth pattern. For clinical evaluation of TMD The routine diagnostic pre-treatment records will be taken for each selected patient. For clinical evaluation of airway difficulty SUSMITA Airway Prediction Analysis will be used. The cases will then be subjected to MRI scan for 3Dimensional evaluation of TMJ and Airway. The results obtained will then be subjected to statistical analysis for evaluation, comparison & co-relation.

**Expected Outcome:** There exists a positive co-relation between severity of TMDs and airway difficulty in class II vertical growth pattern cases.

*Keywords: Temporomandibular joint; airway; class II malocclusion; vertical growth.*

## 1. INTRODUCTION

Orthodontic treatment aims to achieve a healthy & balanced dentition. Healthy dentition is a pre requisite for good esthetic, phonetics and self-esteem of an individual [1]. In India and worldwide most of the young adult population have malocclusion with varying severity? Also, an estimated 30-40% of the young population suffer from mild to moderate temporomandibular joint disorders (TMDs) especially in the age group of 20-30 years. Most often the mild to moderate severity of TMJ disorder go 'unnoticed' as they are often mistaken for normal earaches or ENT related problems [2] There are contradictory opinions regarding the role of occlusal factors in the initiation of TMDs. These patients rarely visit or are referred to Orthodontists or dentists which also accounts for these TMDs being undiagnosed. There is conflicting evidence where most often TMDs are linked to occlusal prematurities. However, a study done by Turp et al in the year 2012 concluded that "Occlusal factors contributes to a very small percentage to temporomandibular joint disorders [2].

TMD is a Multifactorial complex disorder and the etiology of TMD has often been conflicting subject of debate in Orthodontics. Although in the earlier era it was attributed to occlusal discrepancies only, after 1960's and 1970's occlusal discrepancy and emotional stress are considered as primary etiological factors for TMDs. With increase in number of research work in TMD patients Psychosocial, Psychological and Physical factors have also been included in Etiology. Dahlstorm and Carlson et al [3], in the systemic review on TMD's and oral health related quality of life suggested that, "There is a very

high impact on oral condition (health) related quality of life in TMD patients. Another lifestyle disease affecting the Quality of life is Airway Difficulties which, if goes untreated may lead to OSA. There is likelihood that those suffering from Airway difficulty may to certain extent be affected by psychological stress which make them prone for development of TMDs [4-6]. Therefore there exist a question as to what extent these two Lifestyle pathologies are inter-related?.

Various methods are used for evaluation of TMJ dysfunction which include Tomogram, MRI, Helkimo index etc., But Helkimo is a pioneer in developing indices by which severity of TMDs can be clinical evaluated very effectively [7]. Helkimo index measure the severity and pain of TMJ disorders & consist of three types: Anamnesis, clinical, occlusal dysfunction [8-11]. This index is excellent means to grade the disease severity, measure effectiveness of TMD. The only limitation is in anamnesis INDEX Where the grading is done only in 2 categories not 3. For overcoming this limitation Craniomandibular index was used along with Heilkimo Index [12].

Craniomandibular index was introduced by Friction and Schiffman to measure severity of mandibular movements, joint noise, joint muscle and joint tenderness by using simple clinical methods, clearly defined criteria and ease of scoring [13]. Multiple studies have concluded that the use of these two indexes allows a safe evaluation and grading of signs and symptoms of temporomandibular joint (TMJ) disorders [14].

It is a need to assess TMJ dysfunction before beginning of orthodontic treatment so that

necessary precautions can be taken while ongoing orthodontic treatment. Also, between the stages of orthodontic treatment. TMJ evaluation will also be helpful in monitoring any signs of TMJ dysfunction and TMD disorders so it can be identified and therapeutic measures can be taken.

TMDs are associated with deviation in Joint and Disc morphology for which MRI Scan is a gold standard as has been proven by previous studies. It can be a useful tool of early diagnosis of Disc displacement or alteration in joint spaces.

From the previous studies it could be concluded that "TMDs are more often observed in Skeletal Class II malocclusion (Vertical growth pattern) which is a Dentofacial defect caused by a growth abnormality and is associated with mandibular retrusion relative to upper facial structures. This defect is also associated with functional abnormality, mostly affecting airways (upper) and the temporomandibular joint. According to Muto et al, craniofacial deformity which includes short mandibular body length, mandibular retrognathism and clockwise rotation of mandible, thus lead to decreased pharyngeal airway. "These findings indicate a strong association between that of nasopharyngeal obstruction (Airway/ Breathing difficulty) and Class II (vertical) cases". The cases suffering from Airway /Breathing difficulty are also prone to higher level of stress due to lack of sleep and therefore may be more likely to also suffer from TMDs, with Stress being the common factor.

The study of airway and its association with mandibular position and size is very important in orthodontics because of its relation with obstructive breathing disorders, specially sleep apnoea. This piece of knowledge indicates that mandibular advancement, whether orthopaedic or surgical for treatment.

Clinically a protocol "Sussmita" was Developed and copyrighted to grade and detect Potential risk. This can help in early identification of airway/breathing related risk. The assessment of Adenoids and Airway is routinely performed by various methods. However, MRI is considered as a gold standard as it is very accurate & is also nonionizing.

Many studies have been conducted to measure the pharyngeal airway difficulty; however, comparison with Class II individuals and the

correlation between the variables involved in Class II malocclusion with airway measurements and TMD clinically has not been conducted, which encouraged the present study.

## 1.1 Rationale

"By finding the co-relation between severities of TMD with breathing difficulty, potential risk of TMDs in Class II (V) cases can be diagnosed earlier and the treatment protocol can be established to provide complete treatment to these patients, thereby improving their overall quality of life".

## 1.2 Research Question

Whether there exists a co-relation between severity of TMD and degree of Airway/Breathing difficulty in Class two (II) vertical growth pattern cases as compared to Class one (I) cases???

## 1.3 Aim

To Evaluate, Compare and Correlate the Severity of Temporo-Mandibular Joint Disorder and Airway/Breathing Difficulty in Class one (I) and Class two (II) in cases of Vertical Growth Pattern.

## 1.4 Objectives

1. To evaluate the nature and severity of TMD CLINICALLY using Helkimo Index in Class one (I) and Class two (II) in cases of vertical growth pattern.
2. To evaluate the severity of airway difficulty clinically using SSSMITA Protocol Class one (I) and Class two (II) with vertical growth pattern cases.
3. To evaluate the morphology of TMD in Class one (I) and Class two (II) cases using MRI SCAN
4. To evaluate dimensions of Airways 3 dimensionally in Class one (I) and Class two (II) cases using MRI.
5. To compare clinically the nature & severity of TMD AND Airway difficulty between Class II with vertical growth pattern and Class I cases.
6. To compare the nature & severity of TMD AND Airway difficulty using MRI Scan in between Class two (II) with vertical growth pattern and Class one (I) cases.
7. To co-relate the severity of TMD with the severity of airway difficulty in Class one (I) and Class two (II) in cases of vertical growth pattern.

## 2. MATERIALS AND METHODOLOGY

Total 50 patients in the age group of 18-30 years visiting the outpatient Department of Orthodontics will be selected after screening and divided into two groups as follows:

The groups were divided into three groups as follows:

Group A (Control Group) - 25 class I malocclusion patients.

Inclusion criteria-

- "Beta angle—28-33°;
- "MP—32-36°;
- "Gonial angle-130°±7°;
- "Jarabck's ratio—62%-65%);
- "Anb -0- 2<sup>0</sup>

Group B (Experimental group) - 25 class two (II) Division -1 malocclusion in patients having vertical growth pattern.

- "(Beta angle—<26°;
- "MP—>36°—
- "Gonial angle—>137°;
- "Jarabck's ratio—<62%).
- "Anb - >2<sup>0</sup>

### 2.1 For Clinical Evaluation of TMD:

The routine diagnostic pre-treatment records will be taken for each selected patient which will consisted of:

1. Written dental and medical history.
2. Routine clinical examination& functional examination.

Subjects of respective groups will then be evaluated using Helkimo and Cranio-mandibular Index for severity of TMD and will be graded as mild, moderate or severe and compared.

### 2.2 For Clinical Evaluation of Airway Difficulty

The cases will then be subjected to MRI scan for 3Dimensional evaluation of TMJ and Airway.

The results obtained will then be subjected to statistical analysis for evaluation, comparison & co-relation.

As the cases are not the diagnosed cases of Sleep Apnoea we are evaluating the factors that may predispose breathing (Airway) hence the AHI Score was is not taken.

### Chart 1. SUSMITA airway prediction analysis will be used

Clinical Parameter of SUSMITA Airway Prediction Analysis
1. Nasal competency- For Soft & Hard Tissue Analysis of Nasal Region
2. Mallampati scale- For correlating the size of Tongue to pharyngeal Size
3. Hypo-mental distance- For assessment of Mandibular Space (Muscular)
4. Thyro-mental distance- For Assessment of Mandibular Space as it affects breathing.

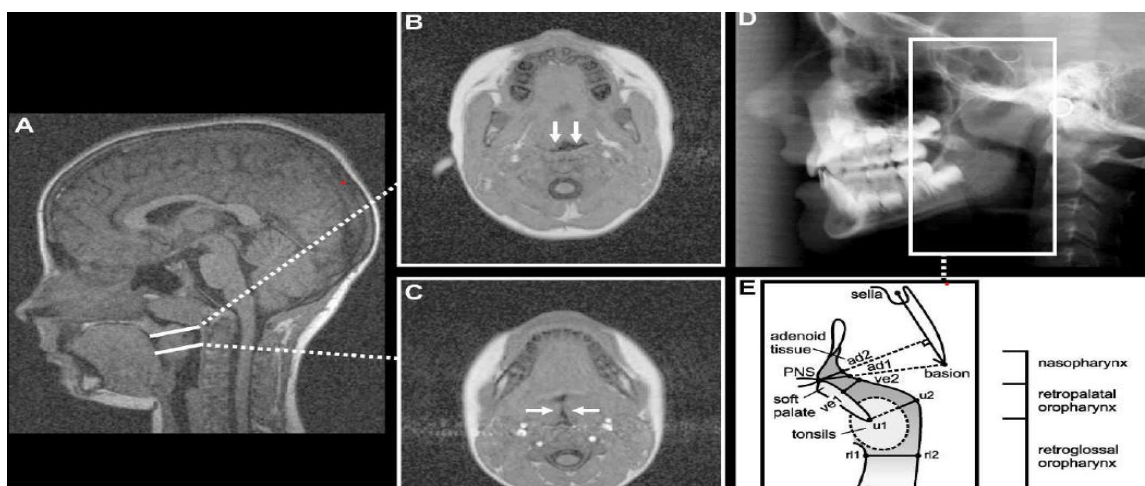


Fig. 1. Sleep apnoea

### 3. EXPECTED OUTCOME

There exists a positive co-relation between severity of TMDs and airway difficulty in class II vertical growth pattern cases. This could help in developing a treatment protocol for diagnosing and treating patients with class II vertical growth pattern cases with varying degree of severity of TMDs.

### 4. DISCUSSION AND CONCLUSION

There are number of symptoms occurring with varying intensity in patients affected by TMD which may be misdiagnosed, as those related to field of ENT and rarely a patient visits Dentist office, specifically seeking treatment for TMD. It is most often, one of the findings of detailed clinical examination done by the Orthodontist in patient seeking treatment for his malocclusion or sometimes, during treatment it may be a chance diagnosis. This fact is because there is no defined valid reliable and accurate signs & symptoms present of TMD, due to its multifactorial etiology [3]. The Helkimo, Amnestic & Dysfunction index is one such index which consist of an organized assessment & scoring system, which also allows reliable quantification of signs & symptoms of TMD. It is also well substantiated when used along with CMI index, as was the findings of Rodrigues et al, who found a strong co relation between the usages of Helkimo Index & CMI. They concluded that both indices were suitable for specific evaluation of TMD cases and whatever was the limitation of Helkimo index, could be overcome by including the CMI, which will be helpful in a more complete assessment of cases for TMD's [13]. A study done by Sonnesen et al evaluated & correlated various severity & Classes of malocclusions in children and TMD relationship where they found that there was an association between signs and symptoms of TMD and certain malocclusions having distal molar occlusion, increased overjet, & midline displacement.80 These are common features of Class II (Vertical) cases [14].

No study has evaluated the correlation between the severity of TMD and airway difficulty hence the expected outcome of this study could help in proper diagnosis and treatment of patients having class II malocclusion with vertical growth pattern [15-24].

### CONSENT

As per international standard or university standard, patients' written consent will be collected and preserved by the author(s).

### ETHICAL APPROVAL

As per international standard or university standard written ethical approval will be collected and preserved by the author(s).

### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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