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Research Article

Evaluation and Co-Relation of Temporomandibular Disorders Concerning Dental Anomalies in Adolescents and Early Adulthood

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Abstract: Temporomandibular joint disorder (TMD) is a complex, multi-factorial etiology. TMDs in the pediatric population may go unreported in most cases and can negatively impact their quality of life and their learning ability. To evaluate and correlate parafunctional habits in the causation of temporomandibular disorder in adolescents and early adulthood. 340 subjects with adolescents and early adulthood from 6-18 years were included in the present study. Detailed parameters relevant to TMJ disorder, including the clinical examination findings, were recorded in the structured case sheet. Further, these subjects were categorized into symptomatic and asymptomatic TMDs. Of the 340 study population, 194 (57%) were identified as suffering from TMD. A significant difference was recorded in diet practice and oral habits with the patients suffering from TMDs ($p<0.05$). There was a significant difference in the habits of symptomatic patients. A high prevalence of TMDs in adolescents and early adulthood was found in women with bruxism and nail-biting oral habits. Active screening of children with various predisposing factors is recommended to aid in the early recognition and treatment of TMDs.

Keywords: Diet, Oral Habit, Malocclusion, Adolescent, Early Adulthood Temporo-Mandibular Joint Disorder.

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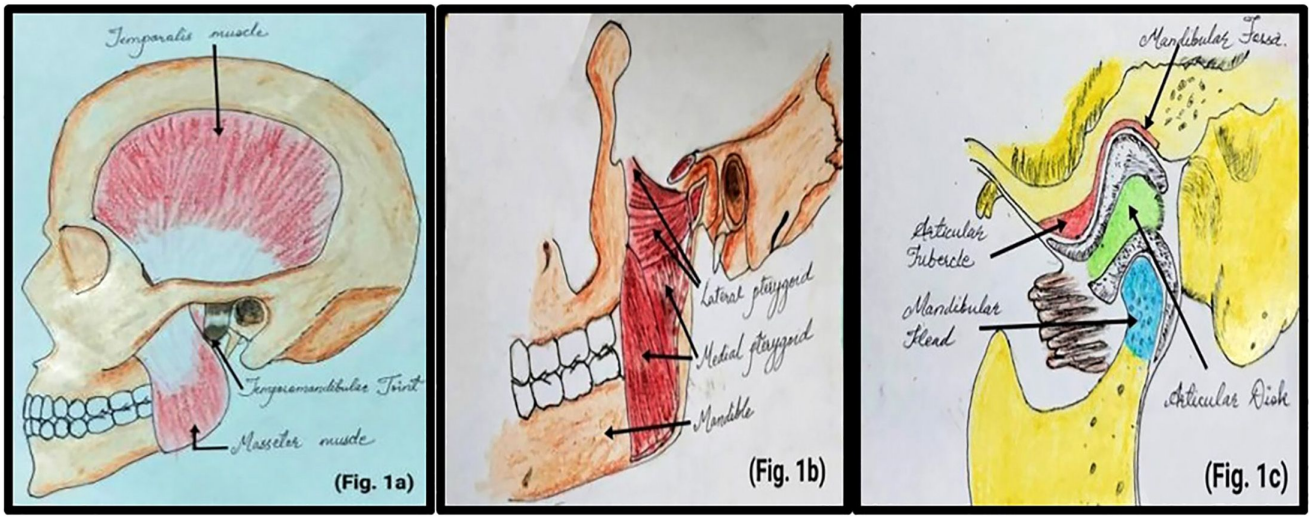
1. INTRODUCTION

The temporomandibular joint (TMJ) is one of the most complex joints in the human body, formed by articulating the mandibular condyle with the temporal cavity. TMJ plays a multifaceted role in our daily life and aids in various essential functions such as speech and mastication[1]. Temporomandibular joint disorders (TMD) are frequently reported orofacial problems, and it is a broad term encompassing the disorders on the masticatory muscles, the temporomandibular joints, and their associated structures[2] [Figure 1.a, b & c]. Literature evidence shows that TMD affects approximately 10% to 15% of the global adult population[3]. Several parafunctional habits have been reported amongst adolescents with TMD[4,5]. Pain is the most common feature of TMDs, but some cases are recognized during the clinical examination due to the inability to convey the symptoms in children [6]. Therefore TMDs hurt their ability to convey and concentrate on learning. The prevalence of TMD pain increases in girls throughout puberty as reproductive hormones increase the risk of developing pain[7]. The transition of dentition from primary to permanent may alter the biomechanics of the TMJ and may predispose it to the development of these disorders. The role of Cognitive, social, and biological factors in TMD is multifactorial as per Bio-psychosocial models[8]. Psychological measurement is important in consideration of diagnosis, assessment, and management of TMD, and it includes both physical (e.g. TMJ, occlusion, muscles) and psychological (e.g. personality, affective states, distress) factors[9]. Persistent chronic pain may be responsible for the change of psyche in affected individuals. Early tooth decay and premature tooth loss may change the position of the succedaneous tooth. Mandibular shifts are responsible for developing TMDs and hamper the biomechanics of masticatory muscles[10].Chewing pattern and dietary habits also stimulates the incidence of TMD[11]. Because of TMD pain, patients avoid eating many food items and the quality and quantity of food they consume alters, leading to nutritional imbalance[12].However, there is various evidence on the occurrence of TMDs in the paediatric population, which differ widely in the reports of prevalence rates. Symptomatic patients at a younger age should be treated as early as possible to prevent disease progression, as it was observed that TMD signs and symptoms increase with increasing age[13]. Identifying TMD in adolescents based on the signs and symptoms can help in detecting TMD at an early age, which will help to prevent or minimize TMD pain and reduce its impact on the quality of life of an individual adolescent[14]. Considering the previous studies done in India, prevalence of TMDs in the paediatrics population is 32.8% & 22.4% respectively, therefore screening of the paediatrics population for asymptomatic and symptomatic TMDs is required with a correlation of different complex etiological factors.[15,16]Hence, the present study was undertaken to evaluate and correlate parafunctional habits in the causation of TMD in adolescent and early adulthood; with the following objectives - Identification of prevalence of TMD in the paediatrics population and To find out the correlation of parafunctional habits with Helkimo index in symptomatic and asymptomatic TMD patients.In the present study, the Helkimo index was used as a rapid diagnostic test for TMDs, which is further compared with dietary habits, dental malocclusion, bruxism, nail-biting, thumb sucking, tongue thrusting, and mouth breathing habit in symptomatic and asymptomatic patients.



Spasm of masticatory muscles and subsequent tenderness is the characteristic finding in TMD patients. TM Joint pain in the pre-tragus area with reduced inter-incisal distance also contributes to TMD.

Fig 1. a, b & c – Shows masticatory muscles and joint structure responsible for TMJ movements.

2. MATERIALS AND METHODS

The present cross-sectional analytical study was carried out after obtaining approval from the Institutional Ethics Committee of Datta Meghe Institute of Medical Sciences (Deemed University) (Ref.No.DMIMS (DU)/IEC/2020-21/271). Total 340 subjects from adolescence and early adulthood reported to the outpatient Department of Oral Medicine and Radiology from February 2021 to December 2021 were included in the present study.

(a) Inclusion Criteria: Only subjects in the age group of 6 to 18 years seeking routine dental treatment (Asymptomatic) and presenting with primary TMD (Symptomatic) were included in the study.

(b) Exclusion Criteria: Subjects with a history of systemic illness, previous history of trauma or pathology in the head and neck region, and subjects already under treatment or treated for TMDs were excluded from the study.

The purpose of the study was explained to the parents, and after willingness to participate in the study and those who fulfilled the inclusion criteria and written informed consents were obtained from the parents. Detailed case sheet recording followed by a thorough clinical examination of the oral cavity and the temporomandibular joint was performed and recorded in the structured case sheet [Figure2.a, b, c &d]. Helkimo temporomandibular joint dysfunction index (HI) was recorded for all the subjects included in the study[17]. The study parameters such as Gender, Diet, Oral Habits, Malocclusion, and presence of decayed Molars were recorded in all patients, including those who reported the complaint of TMD(symptomatic) and those who presented with TMD on clinical examination(Asymptomatic)[Figure.3] & [Table 1]. The severity of symptomatic and asymptomatic TMDs was estimated based on the cumulative HI scores.

2.1. Ethical Statement

The present study was conducted as per the guidelines of Helsinki. 340 subjects from the paediatric population were included. The institutional Ethics Committee approved the and it was carried out by the ethical guidelines prescribed by the Central Ethics Committee on Human Research (C.E.C.H. R) government of India [Ref.No.DMIMS(DU)/IEC/2020-21/271]. After explaining the study to the participant's parents, written informed consent was obtained.

Clicking/popping may be present due to movements of the articular disc anterior to the head of the condyle and get repositioned by closing the mouth

Fig.2.a- Evaluation of TMJ bony component by palpating Pre tragus area bilaterally.

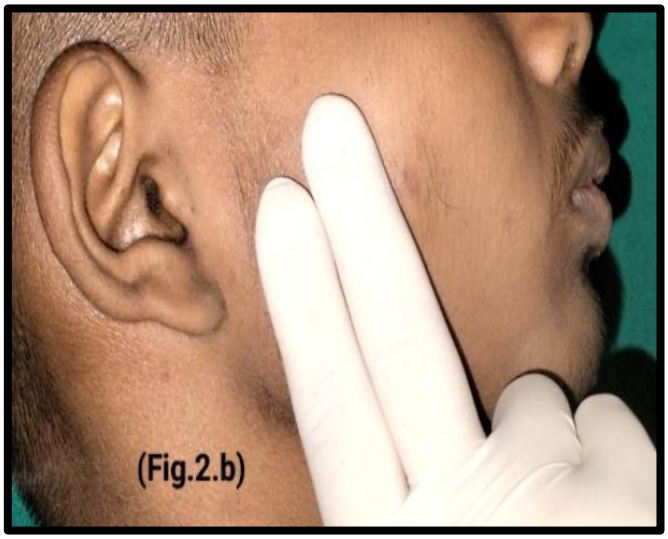


Fig.2.b-Evaluation of Masseter by asking the patient to clench his teeth.

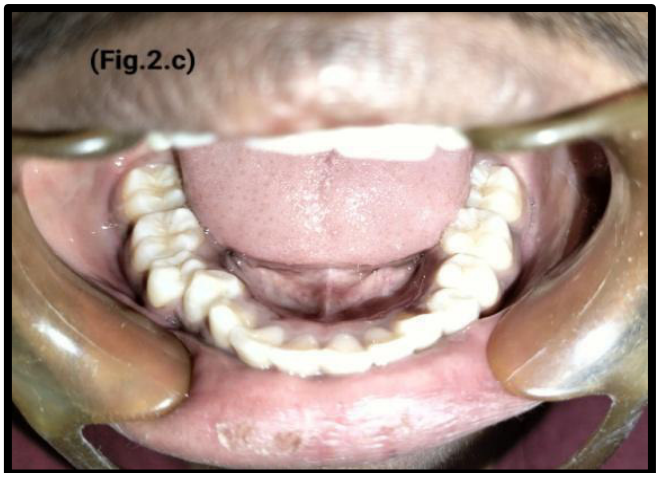


Fig2.c – Change in position of a permanent premolar is due to premature loss of a deciduous carious tooth.

Fig.2.d- Showing Class II molar relationship on the right side. Both 2.c&2.d clinical photographs of the same patient also suffered from bruxism and were diagnosed as TMD (Patients Id-49)

3. STATISTICAL ANALYSIS

The data obtained from the study were tabulated and statistically analyzed using Statistical Package for the Social Sciences - Version 21 (SPSS Inc., Chicago, IL, USA). Relevant data from the study were expressed in terms of percentages and in mean ± standard deviation. The chi-square test was used to compare the association of various parameters and the presence of TMD. In addition, independent t-tests and ANOVA were used to compare the HI scores with gender and various oral habits in symptomatic and asymptomatic TMD subjects. P value< 0.05 was considered to be statistically significant.

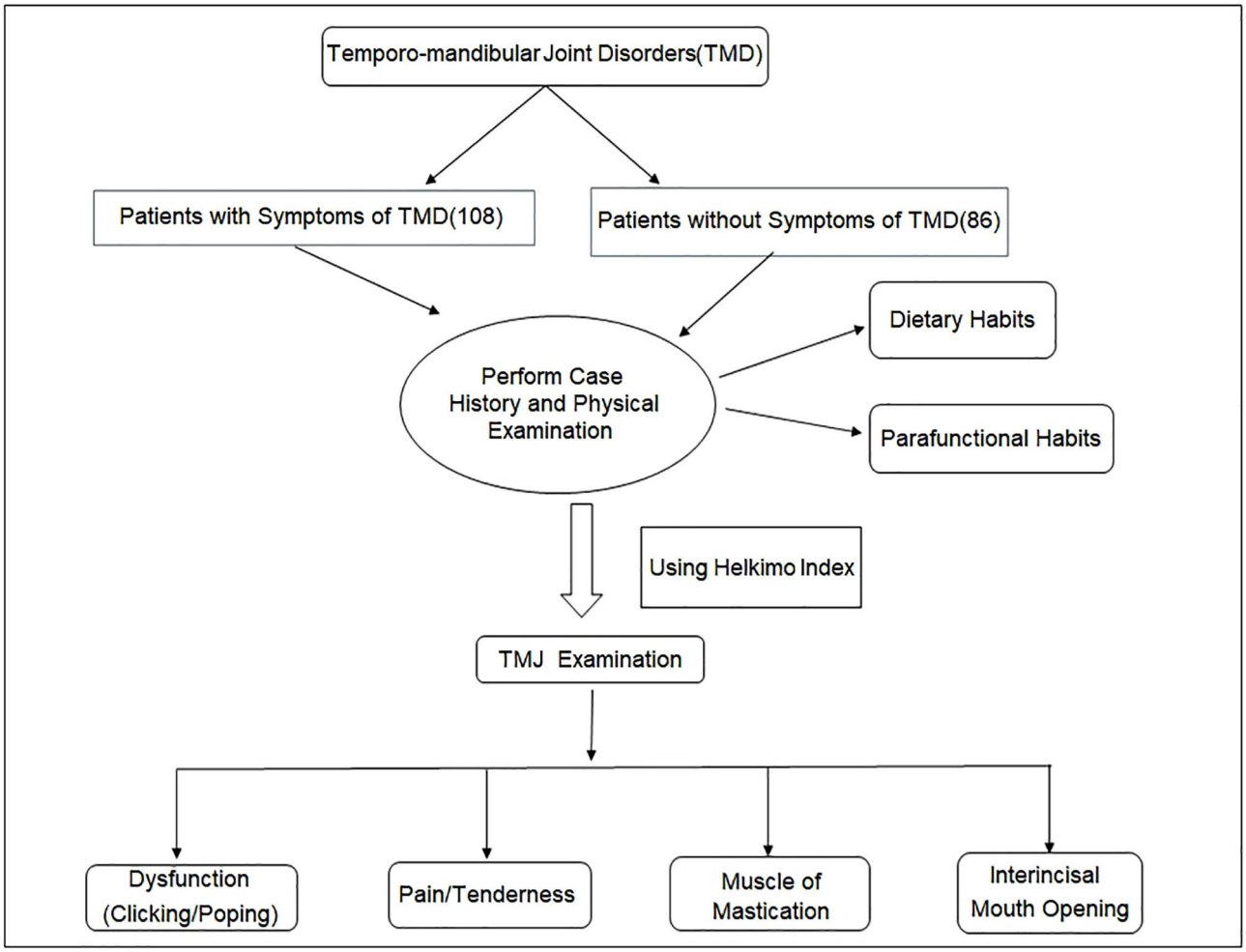


Fig 3-Diagnosis of Temporomandibular Joint Disorder in Adolescents And Early Adulthood(TMD) in (n=340)

Table I- Associated Dental Hard and Soft Tissue Pathology Mimicking Temporomandibular Joint Disorders

Associated Dental Hard and soft tissue pathology	Region	Nature of Pain	Aggravating factors	Clinical findings
Carious teeth/ Root pieces	Affected tooth	Intermittent to continuous dull pain	The temperature of Food and beverages	Carious /carious- broken tooth
Pulpo-periodontal abscess with or without discharge	Affected tooth	Intermittent to continuous dull pain	Pain on mastication	Visible swelling /draining sinus
Cracked tooth	Affected tooth	Intermittent dull or sharp pain	Chewing & Mastication	Often difficult to visualize the crack
Pericoronitis with the third molar	Affected tooth	Intermittent throbbing pain	Impaction of food particles and biting forces	Inflamed peri coronal flap, swelling, corresponding lymphadenopathy

4. RESULTS AND OBSERVATION

Table 1- Demographic Details and Percentage ofTMD in the study population (n=340)

Variables	Study population with percentage
Males	144 (42.35%)
Females	196 (57.67%)
Male: Female Ratio	1:1.36
Mean age	11.3 ± 1.9 years
Age Range	6-18 years
Patient-reported with Symptomatic TMD n (%)	108 (32%)
Diagnosed on the clinical examination -asymptomatic TMD n (%)	86 (25%)
The overall prevalence of TMD in the study population n (%)	194 (57%)

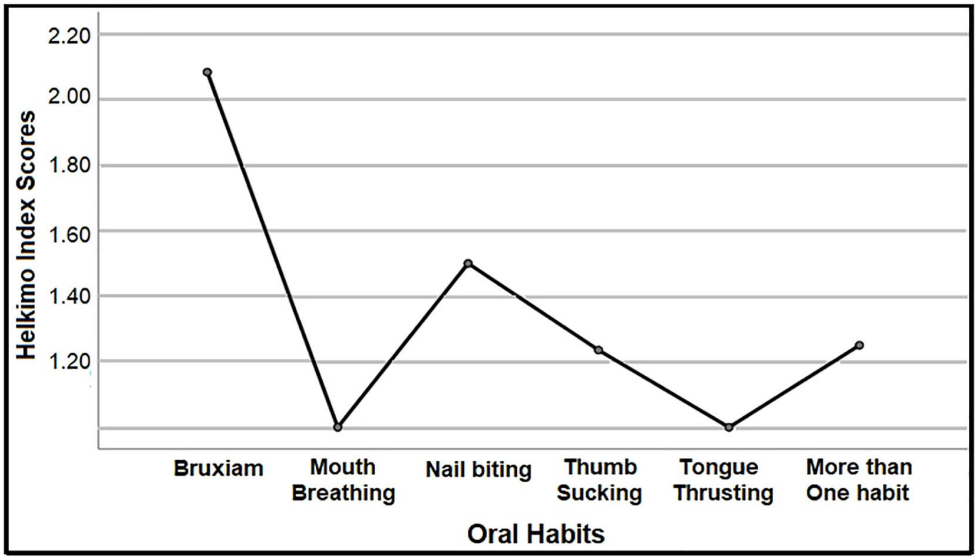
Out of 340 subjects,144(42.35%) were male and 196 (57.64%) were female with male to female ratio of 1:1.36, mean age was 11.3±1.9 with an age range of 6-18 years was present. Out of 340 subjects, 194(57%) were presented with TMD (both symptomatic and asymptomatic), 108(32%) were symptomatic, and 86(25%) were diagnosed on clinical evaluation (asymptomatic) were enumerated in (Table no. 1).

Table 2: Association of TMD Cases with Gender, Diet,Oral habits, and Malocclusion			
		Presence of TMD (n=194)	P value
Gender	Females	119 (60.7%)	0.112
	Males	75 (52.08%)	
Diet	Non-Vegetarian	140 (72.91%)	<0.001
	Vegetarian	54 (36.48%)	
Habits	With habits	117 (67.63 %)	<0.001
	Without habits	77 (46.10%)	
Malocclusion	With Dental Malocclusion	110 (57.59)	0.822
	Without Skeletal Malocclusion	84 (56.37)	
Decayed Molars	Absent	168 (57.93%)	0.434
	Present	26 (52%)	

Comparing various parameters with the prevalence of TMD, TMD cases were more prevalent in females 119(60.7%) compared to males 75(52.08%), with male to female ratio of 1:1.58. We observed a statistically significant difference in diet practice and oral habits with the prevalence of TMD. 140 (72%) of subjects were non-vegetarians (p< 0.001), and 117(67.63%) subjects had various oral habits (p< 0.001). Also, no significant difference was noted in the occurrence of TMD concerning Malocclusion and Decayed teeth (P > 0.05). (Table 2).

Table 3 : Association of Helkimo Index (HI) inSymptomatic TMD cases				
	Gender	N	Mean(HI)	P value
Gender (n=108)	Male	37	1.57± .728	<0.001*
	Female	71	1.98± .948	
Oral habits (n=52)	Bruxism	12	2.08 ± .900	0.002**
	Mouth breathing	4	1.00 ± .001	
	Nail biting	10	1.50 ± .527	
	Thumb sucking	17	1.23 ± .437	
	Tongue thrusting	5	1.00 ± .001	
	More than one habit	4	1.25 ± .500	

Statistically significant - Independent t-test
****Statistically significant – ANOVA test***

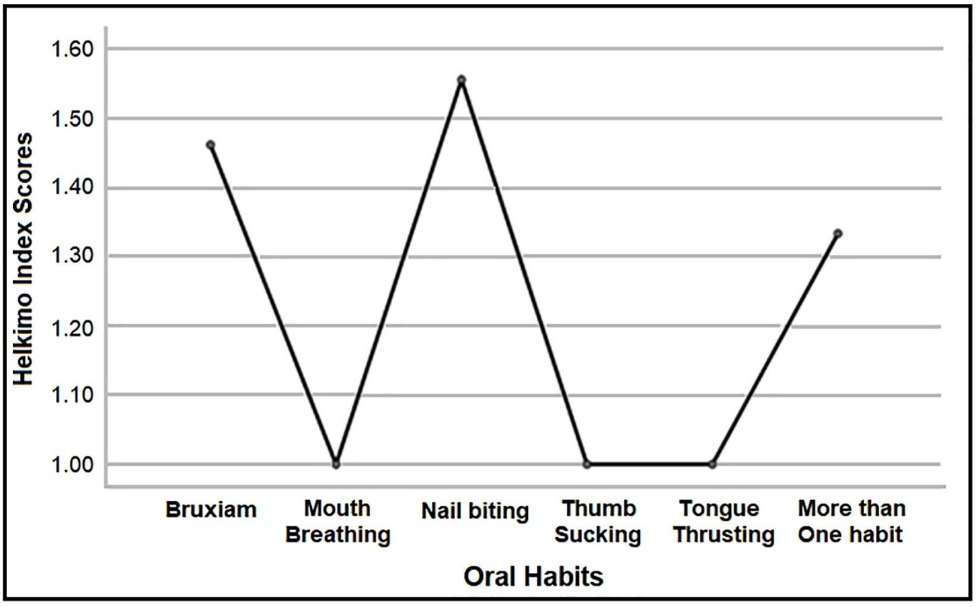


Graph:1 – Association of oral habits with Helkimo Index

4.1. Assessment of disease severity in symptomatic TMD

On comparison of the HI scores among 108 subjects who presented with symptomatic TMDs, females were reported to have higher scores (1.98 ± .948), indicating disease severity when compared to males (1.57 ± .728) with a p-value < 0.001. Among various oral habits, the scores were higher in subjects who had the habit of bruxism (2.08 ± .900), and the difference was statistically significant with a p-value of 0.002. (Table 3 & Graph 1)

Table 4 - Association of Helkimo Index (HI) inasymptomatic TMD cases				
	Gender	N	Mean	P value
Gender (n=86)	Male	38	1.13± .414	0.012*
	Female	48	1.27± .494	
Oral habits (n=65)	Bruxism	26	1.46 ± .760	0.354**
	Mouth breathing	4	1.00 ± .001	
	Nail biting	18	1.55 ± .921	
	Thumb sucking	10	1.00 ± .000	
	Tongue thrusting	1	1.00 ± .001	
	More than 1 habit	6	1.33 ± .516	



Graph:2 – Association of oral habits with Helkimo Index

4.2. *Assessment of disease severity in asymptomatic TMD*

Comparing the HI scores among 86 subjects who presented with asymptomatic TMDs, females were reported to have higher scores (1.27 ± .494), indicating disease severity compared to males (1.13 ± .414) with a p-value of 0.012. Among various oral habits, the scores were higher in subjects who had the habit of nail biting (1.55 ± .921), but the difference was not statistically significant (p=0.354). (Table 4, Graph 2)

5. DISCUSSION

Temporomandibular joint disorders may be present with and without symptoms, i.e. only with clinical signs. Our study attempted to evaluate the prevalence of symptomatic and asymptomatic TMDs in children and adolescents about various habits and predisposing factors. The prevalence of symptomatic TMD among the study subjects was 32%. Minghelli B et al[18]. found a prevalence of 25.2% in school-going students of south Portugal and Khotani et al. described a prevalence of 27.2% in Saudi Arabian children and adolescents [19]. Based on the various prevalence rates, it is understood that more than one-fourth of the school-going student population report some form of TMD. The increasing prevalence of TMDs among students can be related to various psychosocial and emotional factors prevalent in the student population, such as anxiety, fear, and depression, that could mediate the pathogenesis of TMD [19]. The overall prevalence, including both symptomatic and asymptomatic TMD in our study, was as high as 57%; similarly, high prevalence rate was reported by Taneja et al., who reported a prevalence of 51% among adolescents of Haryana, an Indian state [20]. We observed females to be more affected by TMDs than Males, but it lacked statistical significance. However, the disease severity score was significantly higher in both asymptomatic and symptomatic TMD females. Mazzetto et al., from their electromyographic analysis of TMD patients, reported a three-fold increase in TMD pain in females than males [21]. Nomura K et al. reported that severe pain related to TMD is nine times more prevalent in females than males [22]. Our observations are congruent with both of these studies. The higher prevalence of TMD in females was believed to be due to anatomic, psychological, and hormonal factors. Nociceptive transmission of the pain pathway in the peripheral and central nervous system is mediated by the activity of sex hormones. Female sex hormones estradiol and progesterone exert a more complex pro-nociceptive and anti-nociceptive action on the pain receptors contributing to a higher pain sensitivity [23].We found TMDs more prevalent among subjects with mixed dietary habits or non-vegetarians. Akmal et al. has reported similar findings in their study [24]. Al Shaban et al. reported consuming a hard diet as a factor contributing to the development of TMJ Disorders [25]. It was hypothesized that non-vegetarian or raw food, which is comparatively hard in consistency, exerts an increased load on the TMJ and amplifies the activity of the masticatory muscles [26].Our study showed a positive correlation between oral parafunctional habits and the occurrence of TMDs.Furthermore, we also found a significant difference in the disease severity related to habits in subjects with symptomatic TMDs. Subjects with bruxism had the highest scores, followed by nail-biting,

multiple parafunctional habits, and Thumb sucking. Subjects with mouth breathing and tongue thrusting habits showed comparatively lesser disease severity scores. Minghelli et al. [18] and Yadav et al. [27] have reported a similar influence of parafunctional habits on the development of TMDs. Bruxism and clenching are significant parafunctional habits that predispose the joint and the associated muscles to increased stress and fatigue. Literature evidence states that bruxism can induce shear stress over the articular disc and damage the chondrocytes [28,29]. Fougeront et al. considered TMD pain related to bruxism a protective pain adaptation mechanism because the perception of pain in the masticatory muscles may prevent the individual from clenching the teeth further [30]. Among asymptomatic TMDs, the severity scores were higher in subjects with the nail-biting habit, but it was not statistically significant.Malocclusion is considered a well-established major factor contributing to the development of TMDs [31-33]. But there exists a need for adequate evidence in the literature comparing TMDs between skeletal and dental malocclusions. In our attempt to compare the difference in the prevalence of skeletal and dental Malocclusion, we did not find any significant difference in the prevalence of TMDs among dental and skeletal Malocclusion. Also, we did not find any significant difference in the prevalence of TMDs among subjects with and without decayed molars. In our attempt to analyze various factors associated with temporomandibular joint disorders in adolescents and early adulthood. Our study has a few limitations, such as a hospital-based study. Further prospective studies involving multicentric school-based study protocol are warranted to facilitate a deeper understanding of TMDs in adolescents and early adulthood.

6. CONCLUSION

Our study analyzed various etiologic parameters associated with temporomandibular disorders. Temporomandibular joint disorders were found to be highly prevalent in adolescents and early adulthood with female bruxism and nail-biting oral habits. Therefore, we recommend active screening of children with various predisposing etiologic factors to aid in the early recognition and treatment of TMDs to prevent further disease progression.

7. ACKNOWLEDGMENT

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8. AUTHORS CONTRIBUTION STATEMENT

Dr. Rahul R Bhowate conceptualized and designed the study, and Dr.Pragati A Bhargava collected and analyzed the data and prepared the original draft. Both authors discussed the methodology and results and prepared the final manuscript**.**

9. CONFLICT OF INTEREST

Conflict of interest declared none.

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