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ORIGINAL ARTICLE

Correlation of forward Head Posture with Temporomandibular Joint Dysfunction among Adults across Ahmedabad

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ABSTRACT

Aims: Evaluation of correlation between forward head posture and Temporomandibular joint dysfunction.

Settings and Design: It is an observational study.

Methods and Material: Image J Software, Plastic Scale (Ruler), Measure tape, Data collection form, Consent form Statistical analysis used: Spearman's correlation coefficient was used to find the correlations of: a.FHP with Mouth Opening, b.FHP with Left deviation of TMJ, c.FHP with Right deviation of TMJ, c.FHP with Protrusion of TMJ.

Results: This study shows that there is moderate correlation between forward head posture and mouth deviation in all side.

Conclusions: The finding suggests that, there is significant correlation of FHP and TMD. Further, the outcome revealed that TMD was seen in young adults aged between 20 years to 30 years, compared to older age groups. Moreover, among total of 50 individuals, 60% were FEMALES. Our study supports the all previous article stating the moderate to modest correlation.

Limitation of the study: The individuals were not divided in different groups according to their complaint of TMD. So, the conclusion can be generalized to large group of patients.

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KEYWORDS

• Forward head posture • Temporomandibular joint dysfunction
• Tobacco chewers.

Key Messages: The present study was conducted to assess correlation of FHP with TMD. The findings suggests that, there is significant correlation of FHP and TMD. Further, the outcome revealed that TMD was seen in young adults aged between 20 years to 30 years, compared to older age groups. Moreover, among total of 50 individuals, 60% were females. Hence, in this study we found that younger individuals are more affected with TMD compared to older individuals, especially Females.

INTRODUCTION

Forward head posture is one in which the head is positioned anteriorly at an increased distance from the LOG. The normal anterior cervical convexity is also increased with the apex of the lordotic curve at a considerable distance from the LOG compared to optimal posture.[1]

FHP is measured with Cranio Cervical Angle, which is defined as the angle between the line from the outer canthus of eye and the line from the tragus of the ear to spinous process of seventh cervical vertebra. In FHP, the CVA becomes lesser than 50 degrees.

The increase in FHP at alarming rate especially among young adults is worrisome, stated by Ramalingam V *et al.*[2] Further, in their cross-sectional study about prevalence and associated risk factors of FHP among university students, they found that 67% of participants were identified with FHP.

Many practitioners have done extensive conceptual analysis to establish the primary role a forward head posture in the appearance of some craniomandibular dysfunctions and internal derangements of the temporomandibular joints.[1]

TMJ is the most complex and evolved joint in humans, presents two articular surfaces: (i) the condyle of the mandible and (ii) the articular eminence (AE) of the temporal bone. AE is the anterior root of the zygomatic process of the temporal bone and has an anterior and a posterior slope, the latter being also known as the articular surface. AE is utterly important in the biomechanics of the TMJ, as the mandibular condyle slides along the posterior slope of the AE while the mandible moves.[3]

The TMJ is a heavily loaded joint with three cushioning layers of fibrocartilage in the disc, as well as in subarticular zones in the fossa and mandibular condyle.[4] TMJ represents the only mobile joint in the skull. Since the TMJ is connected to the mandible, the Right and left joints must function together and therefore are not independent of each other.[15]

According to the American Academy of Orofacial Pain, TMD is defined as "a collective term embracing a number of clinical problems that involve masseter muscle and the temporomandibular joint and associated structures, or both".[1]

It is characterized by

(i) pain in the pre auricular area and TMJ and/or muscles of mastication

(ii) limitations/deviations in mandibular range of motion

(iii) TMJ sounds during jaw function.

The relation between FHP and TMD stated by Cullen et al showed that when the head and neck move forward the brain tries to compensate for it. Hence, passive tensile forces develop in the hyoid and digastric muscles.

Sustained hypercontraction of these muscles create greater stress on TMJ. As a result, mandible is forced to translate posteriorly and inferiorly. Forces from these muscles tend to open the mouth. So, the only recourse is to contract the jaw closers. Such as temporalis, masseter and medial pterygoid muscles. As a result, there is abnormal mandibular positioning, ligamentous strain and disc compression.[6]

Other study done by Beuno *et al* demonstrated the importance of gender in the development of TMD, with two times greater risk of women to develop it as compared to men.[7]

So, in our study we are going to evaluate the correlation of FHP with TMD. Many

research studies were done to evaluate the correlation of FHP with TMD. After studying those researches, this observational study was designed to evaluate the correlation of FHP with TMD among adults across Ahmedabad.

A Clinical Study related to Temporomandibular Joint Dysfunction Syndrome associated with Betel Nut Chewing was done by **Nawaz MK** *et al.* They studied the clinical course of TMD amongst 100 patients between the ages of 20 to 50 years. Clicking and pre-auricular pain appeared to be the predominant symptoms in all age groups. Results of this study showed that prolonged duration of betel nut chewing will cause the masticatory forces to be transmitted to TMJ and will cause TMD.[8]

Monalisa P *et al* did non experimental correlation study amongst 71 subjects with neck pain, FHP and symptoms of TMD. On the basis of findings, they stated that there is a significant relationship between TMD and FHP.[1]

A comparative study was done by **Saddu SC** *et al* to evaluate the head and cranio-cervical posture between individuals with and without TMD and its subtypes by photographic and radiographic methods. A total of 34 subjects were included in this study. Findings of Photographic head posture angle and radiographic cranio-cervical angle showed no statistically significant difference. Hence, this study confirmed that there is a negative association of head posture and TMD.[9]

SUBJECTS AND METHODS

Sample Size: 50 Adult populations across Ahmedabad.

Source of Data: AMC Dental Hospital, Ahmedabad, Local community, Ahmedabad.

Study population: Individual between the ages of 20 to 60 years in Ahmedabad, Tobacco Chewers etc.

Material used:

- Image J Software
- Plastic Scale (Ruler)
- Measure tape
- Data collection form
- Consent form

Study design: Observational

The CVA is the most frequently measured angle to assess FHP, and could discriminate the presence or absence of FHP. Standing position was more preferable than sitting position because standing is more sensitive to evaluate the FHP. Then the distance was measured between subject and camera, which was approximately 1 meter. Photo was taken in sagittal plane. Once the images were obtained, the smartphone image was introduced to ImageJ software to obtain the CVA.

Image J software is a Java-based image processing program developed at the National Institutes of Health and the Laboratory for Optical and Computational Instrumentation (LOCI, University of Wisconsin).[12] This application allows users to measure the CVA from a sideview photograph. By using it's toolbar, Reference markers were placed on the spinous process of C7 and on the tragus of the subjects' ears. From the reference marker placed on C7, a horizontal line was drawn to make an angle.

Fig. 1: Measurement of CVA using Image J software

Then, the full ROM of TMJ was measured by the ruler in different directions (mouth opening, protrusion and lateral movements of jaw including right deviation and left deviation) according to the following criteria

a) Measurement of mouth opening:

The individual will be instructed to open the mouth maximally. Then, the vertical distance from the incisal edge of the maxillary central incisor to the labioincisal edge of the opposing mandibular incisor was measured by the ruler.

b) Measurement of protrusion:

The initial position was the physiologic rest

position of the mandible (the space between the occlusal surfaces of the maxillary and mandibular teeth was averaged at 3 mm). From that position, the female was instructed to move her mandible anteriorly without tooth contact. Then, the distance from the incisal edge of maxillary central incisor to the incisal edge of mandibular central incisor was measured by the ruler.

c) Measurement of lateral movements:

The initial position was the physiologic rest position from which the individual will be instructed to move mandible as far as possible toward the right then toward the left. Then, the distance from labioincisal embrasure of maxillary central incisor to the labioincisal embrasure of the opposing mandibular incisor was measured by the ruler.[1]

RESULTS

In total 50 individuals with age group of twenty to sixty participated in this study. Data was collected and Statistical analysis was performed using Statistical Package for Social Sciences (SPSS) version 20. In present study, amongst the total of 50 individuals, 30 individuals were Female. Moreover, 32 individual's age was between 20 years to 30 years.

Total **40%** of study participants were **male, 60%** of study participants were **female.**

Further, Spearman's correlation coefficient was used to find the correlations of:

a. FHP with Mouth Opening

b. FHP with Left deviation of TMJ

c. FHP with Right deviation of TMJ

d. FHP with Protrusion of TMJ

d) Descriptive Statistics 3.1

	N	Mini-mum	Maximum	Mean	Std. Deviation
FHP	50	40	49	44.68	2.781
Protrusion	50	.2	1.2	.732	.2217
Opening (cm)	50	1.5000	5.0000	3.672000	.8896319
RT Deviation	50	.0000	1.3000	.890000	.2970948
LT Deviation	50	.2000	1.5000	.906000	.2469487
Valid N (listwise)	50				

FHP with Mouth Opening 3.2

	Mean	Standard Deviation	Correlation Coefficient	P value
FHP	44.68	2.781	0.508	>0.01
Mouth Opening	3.672000	.8896319		

Spearman's rho test was used to analyze correlation of FHP and MOUTH Opening which interpret that there is Moderate Positive Correlation (P= >0.01)

FHP with Left Deviation of TMJ 3.3

	Mean	Standard Deviation	Correlation Coefficient	P value
FHP	44.68	2.781	0.418	>0.01
Left Deviation of TMJ	.906000	.2469487		

Spearman's rho test was used to analyze correlation of FHP and Left Deviation of TMJ which interpret that there is Modest Positive Correlation (P= >0.01)

FHP with Right Deviation of TMJ 3.4

	Mean	Standard Deviation	Correlation Coefficient	P value
FHP	44.68	2.781	0.519	>0.01
Right Deviation of TMJ	.890000	.2970948		

Spearman's rho test was used to analyze correlation of FHP and Right Deviation of TMJ which interpret that there is Moderate Positive Correlation (P= >0.01)

FHP with Protrusion of TMJ 3.5

	Mean	Standard Deviation	Correlation Coefficient	P value
FHP	44.68	2.781	0.485	>0.01
Protrusion of TMJ	.732	.2217		

Spearman's rho test was used to analyze correlation of FHP and Protrusion of TMJ which interpret that there is Modest Positive Correlation (P= >0.01)

DISCUSSION

The present study was conducted to assess correlation of FHP with TMD.

The findings suggests that, there is significant correlation of FHP and TMD. Further, the outcome revealed that TMD was seen in young adults aged between 20 years to 30 years, compared to older age groups.

Moreover, among total of 50 individuals, 60% were Females.

Hence, in this study we found that younger individuals are more affected with TMD compared to older individuals, especially Females.

Several research studies support our outcome, which are mentioned below.

Monalisa P *et al* (2020) stated in their study that there was a significant high correlation between TMD and FHP. They studied 71 individuals, which revealed that as the score of TMD index increases, the value for neck inclination angle reduces.[1]

Other study done by **Lee WY** *et al* revealed statistically significant difference. They stated that when evaluating the ear position with respect to the seventh cervical vertebra, the head was positioned more forward in the group with TMD.[14]

Meta-analysis was done by **Bueno** *et al*. In this study, five articles were selected with a combined sample of 2518 subjects. Women had higher prevalence of TMD in all Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) diagnostic groups.[7]

Further, the values of statistical analysis confirmed that there is, Moderate Correlation.

CONCLUSION

In conclusion, our study found a significant correlation between forward head posture and temporomandibular joint dysfunction (TMD) among adults across Ahmedabad.

The findings of this study have important implications for the prevention and treatment of TMD. Given the high prevalence of forward head posture in the general population, identifying and addressing this postural imbalance may be an important step in reducing the risk of TMD development or progression. Future research may want to consider longitudinal studies to further explore this association, as well as investigate potential interventions that could help mitigate or prevent the negative effects of forward head posture on TMD.

Overall, our study highlights the importance of considering the impact of posture on overall health and wellbeing, and suggests that addressing postural imbalances may be a critical aspect of promoting optimal physical function and reducing the risk of musculoskeletal disorders.

The limitation of our study is The individuals were not divided in different groups according to their complaint of TMD. So, the conclusion can be generalized to large group of patients.

Tobacco Chewers and Betel Nut Chewers were also part of this study, which is known to cause TMD in near future.

Support: NIL Self Funded

Conflicts of interest: NIL

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