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### ORIGINAL ARTICLE

#### CORRELATION BETWEEN STRESS AND TEMPORO MANDIBULAR DISORDERS AMONG HEALTHCARE PROFFSSIONALS

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### ABSTRACT

**Background And Purpose:** Temporomandibular joint is termed as typical diarthrodial joint or freely movable joint. Temporomandibular dysfunctions are associated with pathological mechanisms that might lead to the presentation of any dysfunction. Inflammation or impingement of the surrounding muscles and the ligaments producing pain in peri-auricular region or in and around the mastoid process where tenderness is generally experienced in the masticatory muscles that might limit further jaw movements resulting in restriction of mouth opening. The objective of this study was to evaluate for any significant correlation between stress and Temporomandibular disorders among health care professionals. **Methods:** It is an Observational study, with a Sample size of 132 subjects of both the genders were randomly recruited from various departments of NET and RIMS, Raichur. Who were further assessed using Fonseca questionnaire for Temporomandibular dysfunction and Perceived stress scale for detecting their stress levels. Subjects were assessed for any TMJD using Fonseca questionnaire while Perceived stress scale was implemented to evaluate for their perceived stress levels and its impacts. **Results:** On comparing the data, the subjects within the age group of 25-30 years reported to be more susceptible towards TMJD and stress where females were more inclined towards stress whereas males were predisposed towards TMJD The underlying pathological mechanisms responsible for this gender variation has been studied and co-related with the available literatures and researches. Hence, Pearson's co-relation analysis depicted that there exists a high significant positive co-relation between TMJD and Perceived stress levels among the recruited health care professionals. **Conclusion:** The result of this study showed that the Temporomandibular dysfunction and stress are inter related in such a manner that an exaggeration of Temporomandibular joint dysfunction symptom production causes a spike in the perceived stress levels or vice versa among the subjects.

**Keywords:** Temporomandibular dysfunction, Stress, Fonseca questionnaire, Perceived stress scale

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## INTRODUCTION

Temporomandibular joint is the joint between temporal bone of skull and mandible or jaw which is termed as diarthrodial joint or freely movable joint. As it is an ellipsoid variety of synovial joint it has a joint capsule filled with synovial fluid within the synovial membrane that lubricates and nourishes the structures within the joint. It is also termed as a ginglymoid joint as it provides hinging movement in one plane and is also classified as arthrodial joint as it forms bicondylar articulation at both right and left Temporomandibular joint thereby enabling with gliding movements. Hence, this joint is also technically termed as Ginglymo Arthrodial joint<sup>1-2</sup>.

The joint can be easily palpated just in front of the ear during opening and closing of the mouth. It allows for depression, elevation, protraction, retraction, lateral or side excursion movements. One side of the Temporomandibular joint must work in synchronizaation with the contralateral Temporomandibular joint for coordinated dynamic functions<sup>3</sup>.

The primary muscles of the Temporomandibular joints are Medial and Lateral pterygoids that occupy the infratemporoal fossa, masseter and Temporalis which are superficially positioned whereas the accessory muscles are Buccinators, Muscles of Facial expression, tongue musculatures and suprahyoid forming the Floor of the Mouth<sup>4,5</sup>.

Masseter, Temporal and Lateral pterygoid are recruited for jaw closure whereas Medial or Internal pterygoid, Geniohyoideus, Digastric muscles are responsible for jaw-opening. Tension perceived by the articular ligaments

plays important role in the functioning of the temporomandibular joint and the proprioceptive feedback of the joint is regulated via the skin and through the peridontal ligaments<sup>6</sup>. The anterior aspect of the disc consists of superior fibro elastic fascia and an inferior fibrous layer where the superior portion of the disc remains in contact with the post glenoid process that prevents the disc from slipping during mouth opening while the lower portion limits vigorous rotational movements of the disc relative to the mandibular condyle<sup>7</sup>.

So, Temporomandibular joint dysfunctions are heterogenous group of conditions involving the joint and its peri-articular structures which may be either extra articular (involving surrounding muscles of joint) or intra articular (within joint). According to many reports, the extra-articular (musculoskeletal conditions) or myogenous origin conditions are most common cause of TMD accounting for at least 50% of cases.<sup>5</sup> It registers with frequent pathologies, which leads to discomfort, disability and negative effect on the quality of daily life.<sup>6</sup> Temporomandibular dysfunction can be broadly divided into muscular conditions and those affecting articular structures of the temporomandibular joint. Hence, there are varied potential factors leading to Temporomandibular dysfunction that may range from inflammation or impingement of the muscles and the ligaments producing pain and tenderness mainly in the masticatory muscle due to reduced blood-supply to the tissues of the respective muscles leading to excessive accumulation of metabolic waste products reproducing pain, spasm and fatigue<sup>8</sup>.

Also the surrounding musculatures might limit jaw movements with click-sound reproduction during repetitive attempts of mouth opening.

It might also be related to the alteration in the position of the condyle in the glenoid fossa. Also Temporomandibular dysfunction can be considered as the subgroup of cranio-facial pain disorders of head and neck<sup>10</sup>, where any alteration in the mandibular dynamics might also involve the entire orofacial area. It might also be associated with poor posture, para functional habits, dental restoration and orthodontic treatment, emotional stress and injury with or without anatomical variation of disc or any pathophysiological mechanism in the respective muscles<sup>11</sup>.

Although, the etiology of temporomandibular joint dysfunction is considered to be idiopathic but many components may be included like Bio mechanical, Neuromuscular, Biopsychosocial & Biological components. The Bio mechanical factors include: occlusal, overburdening and para functional habits like bruxism whereas the Biological component encompasses surplus production of estrogen hormone that may lead to temporomandibular dysfunction. Some of the biopsychosocial factors responsible are: Stress, tension and depression that commonly inclines a subject towards Temporomandibular disorder<sup>13</sup>. Many studies have reported that the incidence of Temporomandibular disorders is 2.65 times higher in people having mental stress when compared to the non-stressed persons<sup>14</sup>. So any psychological condition like anxiety, stress or tension or any other systemic factors may predispose the condition.

According to the diagnostic criteria for Temporomandibular dysfunction and its clinical presentation, it has been divided into three basic groups:

Group 1- Muscle disorders (involving myofascial pain with and without mouth-opening limitation.

Group 2- Involving disc displacement with or without limitation in mouth opening

Group 3- Arthralgia, Arthritis and Arthrosis, where Arthralgia presents with joint pathology such as disc displacement and reproduction of joint click-sounds. Most commonly chronic orofacial pain affects 31% adults and 11% of children and adolescents among the general population<sup>12</sup>. Where females are more affected than males suggesting a ratio of 5:3 whose incidence increases with the increase in the age above 40 years<sup>9</sup>.

The Neuro anatomical and neuro physiological interconnection between orofacial area and cervical spine involves masticatory system and posture alignment such that any alteration from the normal mechanism may cause restriction in spinal flexibility presenting with limitation in cervical rotation, flexion or extension. So prolonged cervical flexed posture seems to be associated with stress where the mandibular condyle is pushed back against the meniscal tissue, causing inflammation, pain in ear and peri auricular region, and progressive degeneration<sup>13</sup> at the articular surfaces.

Patients with Temporomandibular joint dysfunction are twice more likely to exhibit chronic daily headache patterns with or without migraine which suggests that the presence of former condition increases the likelihood of experiencing the later condition. Hence, Temporomandibular dysfunction presents with headache in temporal area secondary to Temporomandibular joint pain which is modified by jaw movement or function or para-function. Therefore, there exists a strong bidirectional relationship between primary headache and Temporomandibular joint dysfunction<sup>15-18</sup>.

**Objective of the Study:** To find out the correlation between Stress and Temporomandibular disorders among Health Care Professionals.

## MATERIALS AND METHODOLOGY

**Materials:** Fonseca Questionnaire, Perceived Stress Scale, Pen/Pencil/Marker

**Sources of data:** For the purpose of data collection, 150 Health care professionals were assessed within the age group of 25-40 years of both the genders from various departments of Navodaya Educational Trust group of Institutions (Medical, Dental, Physiotherapy, Nursing, Pharmacy and Paramedical) and also from various departments of Raichur institute of medical sciences (RIMS), Raichur having pain in the TMJ or in the masticatory muscles will be conducting for the study.

**Research Design and Setting of Study:** It is an **Observational** Study. The individuals recruited for the study were from various departments of Navodaya Educational Trust group of Institutions and Raichur institute of medical sciences, Raichur on meeting the Inclusion and Exclusion criteria.

**Inclusion criteria:** Age between 25-40 years, Patients of both the Genders, Full time Students and Staff associated with Health care professionals, Able to give informed consents and interested to participate in the study.

### Variables:

**Dependent variables:** Fonseca Questionnaire, Perceived Stress Scale

**Sampling techniques:** Adopted to select the subjects with Temporomandibular joint pain amongst health care professionals of Navodaya

Educational Trust group of Institutions who all are attending the physiotherapy department.

$N=131.8 \cong 132$ , 132 is the minimum sample size.

Subjects of 132 were recruited for conducting the study.

### Methods of data collection:

One hundred and fifty subjects were randomly selected for the study from various departments of NET institutions and RIMS, Raichur on fulfilling the inclusion criteria.

The Subjects were assessed using Fonseca questionnaire for Temporomandibular joint dysfunction and also screened using Perceived stress scale for estimating their stress levels.

**Statistical test:** After obtaining the data, it was entered in Microsoft Excel; the data was analyzed using Epi info software V.7.0.

The Qualitative data of Age and Gender distribution in the recruited participants were evaluated using the Chi-square test, mean, frequency and percentage analysis.

The co-relation between the quantitative data collected by implementing the questionnaires was statistically studied by Pearson's co-relation analysis. A value of "+1 was claimed positive co-relation" whereas "-1 states negative co-relation" between the domains to be studied.

The data obtained using the questionnaires will also be statistically evaluated using "two tailed t-test" to analyze for its degree of statistical significance in the expected co-relation between the variables to be studied.

p value < 0.05 indicates statistical significance, while p < 0.001 indicates high statistical significance.

**Procedure:** 132 subjects who fulfilled the mentioned inclusion criteria were randomly allocated for the study. The written consent was individually obtained from all the interested candidates but prior to implementation of the Questionnaires format on the selected subjects. The questionnaires were in detail explained to the subjects for the smooth and effective conduction of the study.

A brief explanation of the entire process was given to prepare the selected subjects after obtaining their informed consents. It was followed by implementation of Fonseca Questionnaire used for assessing the severity of the Temporomandibular disorders and Perceived stress scale was conducted too assess the stress level indicating Mild, Moderate or Severe levels of stress in the selected participants of the study.

**Fonseca questionnaire:** This Questionnaire comprised of components related to presence of pain in the Temporomandibular joint and also reported for any pain in the surrounding structures of head and back of the neck. It also checked for the chewing and grinding mechanisms.

This Questionnaire evaluated for the presence of any para functional habits, muscular limitation, production of any joint click-sounds or perception of malfunction like occlusion and also detected emotional stress in the individuals.

Results were obtained by the three categorized scoring system: 10, 5 (or) 0. which were

allocated in response to their typical answers "Yes, Sometimes (or) No" respectively.

The summated score values estimated the pain severity levels at the Temporomandibular joint

Before the implementation of the questionnaire a thorough explanation about its components was given to each of the subjects individually. Later they were asked to analyse and rate their response in perspective to the given questions of the format.

The final values were obtained by calculating the respondent scores that determined the level of severity of temporomandibular joint pain among the participants.

**Perceived stress scale:** This questionnaire included components that measured an individual's perception of global stress in any aspects of life to determine how much level of stress was being perceived by the individual during the last month of the scale implementation.

It included 10 Questions and each question was rated on a scoring system ranging from (0-4) such that the final (or) total score ranged from (0-40) where (0-13) indicated low stress, (14-26) as moderate and (27-40) as high level of Perceived stress.

Similarly, the patients were given a thorough explanation about this questionnaire and its components before its implementation they were asked to analyse and answer the mentioned questions of the format.

The final scores were obtained from the scale summated reviews (or) scores that helped in determining their stress severity levels.

## RESULTS OF THE STUDY

### Distribution of participants according to Gender

|       |        | Number of Cases | Percentage |
|-------|--------|-----------------|------------|
| SEX   | MALE   | 67              | 50.8       |
|       | FEMALE | 65              | 49.2       |
| TOTAL |        | 132             | 100        |

**Table 1.** Shows the number of male and female participants recruited in the study.

| S.NO | AGE   | PERCENTAGE | CHISQUARE |
|------|-------|------------|-----------|
| 1    | 20-25 | 5.30       | 6.59      |
| 2    | 25-30 | 83.33      |           |
| 3    | 30-35 | 9.85       |           |
| 4    | ≥=35  | 1.52       |           |

**Table 2.** Distribution of recruited subjects based on Age category

| S.NO | GENDER | PERCENTAGE | CHI SQUARE |
|------|--------|------------|------------|
| 1    | MALE   | 50.8       | 3.757      |
| 2    | FEMALE | 49.2       |            |

**Table 3.** Showed that the distribution of samples based on the Gender category

| S.NO | QUESTIONNARIE          | AGE   | MEAN  | P-VALUE |
|------|------------------------|-------|-------|---------|
| 1    | FONSECA QUESTIONNARIE  | 20-25 | 24.29 | 0.777   |
|      |                        | 25-30 | 28.78 |         |
|      |                        | 30-35 | 26.92 |         |
|      |                        | ≥=35  | 25.00 |         |
| 2    | PERCEIVED STRESS SCALE | 20-25 | 18.57 | 0.295   |
|      |                        | 25-30 | 20.66 |         |
|      |                        | 30-35 | 19.08 |         |
|      |                        | ≥=35  | 15.00 |         |

**Table 4.** SHOWED that the distribution of samples based on the Age distribution

| S.NO | QUESTIONNAIRES         | GENDER | MEAN  | T-TEST | P-VALUE |
|------|------------------------|--------|-------|--------|---------|
| 1    | FONSECA QUESTIONNAIRE  | MALE   | 28.96 | 0.590  | 0.556   |
|      |                        | FEMALE | 27.63 |        |         |
| 2    | PERCEIVED STRESS SCALE | MALE   | 19.88 | 0.918  | 0.360   |
|      |                        | FEMALE | 20.75 |        |         |

**Table 5.** Analysis of Gender-distribution to compare the prevalence of Temporomandibular joint disorders using Fonseca questionnaire to the prevalence of stress evaluated using Perceived stress scale.

Table 5, Showed that the samples evaluated based on Gender distribution to compare between the two questionnaires (Fonseca, Perceived stress scale).

| Correlations          |                     |                       |                        |
|-----------------------|---------------------|-----------------------|------------------------|
|                       |                     | FONSECA QUESTIONNAIRE | PERCEIVED STRESS SCALE |
| FONSECAQUESTIONNAIRE  | Pearson Correlation | 1                     | 0.888**                |
|                       | Sig. (2-tailed)     |                       | 0.000                  |
|                       | N                   | 132                   | 132                    |
| PERCEIVEDSTRESS SCALE | Pearson Correlation | .888**                | 1                      |
|                       | Sig. (2-tailed)     | .000                  |                        |
|                       | N                   | 132                   | 132                    |

**\*\* . Correlation is significant at the 0.01 level (2-tailed).**

**Table 6** Analysis of Pearson's Correlation between Perceived stress scale and Fonseca questionnaire

Table 6, showed the Pearson correlation between the Fonseca questionnaire and Perceived stress scale

|       |         | Number of Cases | Percentage |
|-------|---------|-----------------|------------|
| AGE   | 20 - 25 | 7               | 5.30       |
|       | 25 - 30 | 110             | 83.33      |
|       | 30 - 35 | 13              | 9.85       |
|       | ≥= 35   | 2               | 1.52       |
| TOTAL |         | 132             | 100.00     |

**Table 7.** Analysis of Age-distribution to compare the prevalence of Temporomandibular joint disorders using Fonseca questionnaire to the prevalence of stress evaluated using Perceived stress scale.

Table 7, Showed that the samples evaluated based on age distribution to compare between the two questionnaires (Fonseca, Perceived stress scale).

## DISCUSSION

The principal idea of this research study was to evaluate the correlation between stress and Temporomandibular dysfunction among health care professionals. The observational study was conducted among 132 health care professionals by implementing Fonseca Questionnaire for evaluating Temporomandibular dysfunction and Perceived Stress scale was used for analyzing the stress levels among the recruited subjects.

Among the total recruited subjects, 110 were from same age group 25-30 years of the normal demographic population among health care professionals. Where males and female participants were 67 & 65 respectively giving an estimation of about 50.8% male and 49.2% females as shown in Table I AND TABLE II.

The data entered in Table - 2 was used to judge the significance of population variance on the basis of age-category using Chi-square ( $\chi^2$ ), a non-parametric test which indicated that within the age range of 25-30 years subjects contributed to about 83.33% of the total study which showed an estimated value of 6.59 in the study where, This finding can be appropriately supported by Raukten et al study conducted in India, stated that 50% of the population were from the age group of 24-34 years. Hence, this study population (25-30 years) can be considered to be a universal sample.

Also, Table-3 showed higher participation of males about 50.8% than females about 49.2% in this study and the gender distribution was then qualitatively analysed using Chi-square test which showed an estimated value of 3.757.

This Observational study was conducted using Fonseca Questionnaire to evaluate for any Temporomandibular joint disorders among the recruited health care individuals. So, the data evaluation in table-5 showed no statistical significant difference with p value 0.777 in the age distribution analysis among the participants but on comparison of the mean values, subjects with in the age group of 25-30 years showed higher mean value of 28.78. indicating that they were more prone to Temporomandibular joint dysfunction. Therefore TMJ DYSFUNCTION seems to be more prevalent among the age-group of 25-30 years old subjects. Also, the result of this table correlates with the study conducted by Ahuja Vet al, 2018 which concluded that Temporomandibular joint disorders were more prevalent in 21-25 years age-range<sup>19</sup>.

Similarly, the statistical analysis of age distribution on the prevalence of stress among Health care professionals observed in table-4 indicated that the subjects of the 25-30 years ago were more prone towards any stress. Although there was no statistical significance as the p-value was 0.295 but when their mean values were compared a higher mean value of 20.66 was observed respectively indicating that the subjects of 25-30 years were more prone towards perceived stress levels. The results of this study can be rightly correlated to the research conducted by Viviane Gontigo Augusto et al, 2016 stating that females of the age-group of  $24 \pm 7$  years were more susceptible to stress and stress-related disorders due to various potential factors like academic curriculum's or educational stress, carrier decisions, financial crisis, social responsibilities, personal or family pressure that leads to anxiety and depression<sup>20</sup>.

Anxiety was commonly seen in Temporomandibular joint disorder patients but couldn't explain if anxiety led to Temporomandibular joint disorder or Temporomandibular joint disorder symptoms just aggravated the anxiety levels. Temporomandibular joint disorders were 2.65 times higher in depressed-individuals compared to non-depressed persons<sup>21</sup>. Depression might play an important role in Temporomandibular joint disorders presentation but couldn't clarify if Depression led to Temporomandibular joint disorder-symptom product or chronic-pain associated with Temporomandibular joint disorders predispose the victim towards depression. Medical students and professionals were more succumbed to stress and its related disorders due to high tensed academic loads, increased clinical-pressure, personal factors and environmental stressors<sup>22, 23</sup>.

The comparative analysis of gender-distribution for evaluating prevalence of Temporomandibular joint disorders among the selected subjects collected using Fonseca Questionnaire were enrolled in Table-5, which showed no statistically significant difference among the participants of both the genders but on comparison of their mean-values the Males demonstrated higher Mean value of about 28.96 compared to females stating that Males were more prone towards Temporomandibular joint disorders which can be co-related with the study conducted by Raquel A<sup>24</sup>.

Male at increased risk of developing Temporomandibular joint disorders than Females because males present with higher Maximal bite force than women having large X-sectional area and more number of large-diameter Type-II fibers in the masseter and surrounding musculatures due to hormonal

differences in between the gender, But females also tend to be prone towards Temporomandibular joint disorders due to disc-displacement with or without Myofascial pain and dysfunction syndrome or reduction in joint space (degenerative changes)<sup>25</sup>.

The statistical- analysis of the data for estimating gender-predisposition towards increased stress-levels collected by Perceived stress scale was evaluated in Table 5 which , showed no statistically significant gender difference among the recruited subjects, but on comparison of the mean value the females shows 20.75 which confirms that females were susceptible towards higher-stress levels where female students seems to be more burdening at their academics than males who were more likely to be stressed due to clinical related schedules<sup>26</sup>.

According to Milam et al, 2016 F:M ratio was 3-4:1 suggesting for higher incidence of bruxism presenting with tooth-clenching and alteration in masticatory muscle function in females with or without stress. The females have increased pain perception with lower pain threshold and tolerance The study conducted by Ahuja V et al 2018 also concluded that due to dominance of hormone like estrogen in females, they are more prone towards emotional disturbances, might present with muscle hyperactivity dominantly in the head and neck muscles suggesting for Craniofacial pain leading to para-functional activities. This hyper-activity in the muscles might be attributed to the Extra-pyramidal gamma motor system which is closely linked to the Limbic-system responsible for emotional-influence. This sustained muscular activity might also lead to localised pain due to ischemic hypoxia seen with increased lactic acid accumulation<sup>27</sup>.

Therefore, when the Pearson's- co-relation was done in Table-6 to find for any correlation between Perceived stress scale and Fonseca questionnaire, it gave a value of 0.888. Similarly, the same value of 0.888 was also observed when the correlation of perceived stress scale to Fonseca questionnaire was evaluated stating that there exist a positive correlation between the two measurement tools. Two-tailed t-test was also done to evaluate its statistical significance which indicated a value of 0.000 suggesting that there exists a statistically significant correlation between the mentioned scales i.e. with increase in the total score in one scale there will also be an increase in the final scores of the other scale and vice-versa. Hence, it can be concluded that with increase in stress levels, there might be a hike in Temporomandibular joint disorder symptom reproduction. Similarly, with increase in Temporomandibular joint disorders it might show an increase in the perceived stress-levels in the subjects<sup>28</sup>.

**Limitations:** The study lacked the large population size, 2.The long term follow up of the study is not done, A typical age group or Gender was not elaborately studied, This study also lacks the use of laboratory diagnostic procedures: EMG analysis, Cranio-Vertebral angle estimation, dynamometer assessment, vernier callipers and polysomnographic measures.

**Recommendations:** Studies should be done with large sample size with appropriate follow-up period. Prospective studies can be conducted to analyze various treatment efficacies in treating Temporomandibular joint disorders and also its impact in reducing stress levels.

## CONCLUSION

On implementation of this observational study, the results concluded that the severity of Temporomandibular joint disorders and the Perceived-stress levels showed highly significant positive correlation between the mentioned two domains among the health care providers. So, the findings suggested that with an increase in the gross score of Fonseca questionnaires there will be a positive spike in the total score of Perceived stress scale and vice-versa.

As stress has become an endemic in Health care profession, it contributes to health and stress related impacts which decrease the efficiency and productivity of the Health care professionals. Therefore, there arises the need to increase awareness among the individuals working under stressful conditions like Health care sectors.

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