

# The Effectiveness of Splints in Temporomandibular Joint Disorders

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## Abstract

TMD is defined as a muscular and articular disorder. The primary goal in the treatment of temporomandibular joint disorder is to ease pain or mandibular dysfunction with Conservative treatments such as splint therapy, and manipulation. occlusal splint insertion and physical treatment are the most commonly used conservative alternatives through which approximately 90% of all TMD cases can be successfully treated. The aim of the study was to assess the effectiveness of splints in temporomandibular joint disorders. Sample was collected from June 2019 to March 2020 from Saveetha Dental College and Hospitals, Chennai. Data collected is tabulated in Excel and statistical analysis using SPSS is done to obtain results. Out of 61 patients, 59% were male and 45.9% were female. The mean age of the participants is 33.21 years. Within the limitations of the study, it was concluded that splint therapy was effective for 59.02% patients with temporomandibular joint disorder patients. Also, splint therapy was more effective in males (32.79%) as compared to females (26.23%).

**Keywords:** TMD; Splint therapy; Myofascial pain; TMJ; Internal derangement

## Introduction

Temporomandibular joint disorder is defined as a muscular and articular disorder<sup>1</sup>. Temporomandibular joint is formed by condylar process of mandible and mandibular fossa in the base of the skull. This term includes anatomical, histological, and functional anomalies in the functioning of the muscular and/or articular components of the system that are accompanied by highly varied clinical signs and symptoms. Most common symptoms include discomfort, pain, and disturbances of mastication. TMD is a prevalent disorder

most commonly observed in individuals between the ages of 20 and 40 years<sup>2</sup>. Therefore this is termed As non-specific term, temporomandibular joint disorder. Accordingly, TMD is characterized by clinical signs of pain or malfunction occurring jointly or separately. Dental anxiety is a common problem which results in the avoidance of dental care, and is one of the factors to increase pain as patients do not seek help immediately<sup>3,4</sup>. Therefore immersive virtual reality is an effective distraction tool to alleviate the anxiety of the patient<sup>5</sup>. The characteristic signs are pain in the TMJ joint, articular sounds, pain in the muscles of mastication and anomalies in mandibular movements<sup>6</sup>.

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Oral health care environment has become a helpful setting for early detection of most of the lesions etc in patients<sup>7,8</sup>. Sometimes TMD can also occur due to certain pre malignant conditions such as oral submucous fibrosis that causes limited mouth opening and severe pain<sup>9,10</sup>. It has been observed that BTX injections can be the least invasive method, which can provide

relief of intractable symptoms in patients who have failed to show any improvement with the conventional modalities of TMD treatment. Injecting measured doses of BTX into specific sites in the major muscles of mastication can achieve sufficient masticatory muscle relaxation, decreased pain, and improved function and mouth opening<sup>11</sup>. The primary goal in the treatment of temporomandibular joint disorder (TMD) is to ease pain or mandibular dysfunction<sup>12</sup>. It is very important for the patient to be aware of the various basic procedures and treatments carried out in order to cooperate with the dentist<sup>13</sup>. Most management strategies aim to eliminate symptoms. TMD treatment can be divided into two categories: conservative method and surgical method.

Conservative treatments include medication, habit modification, counseling, physical therapy, splint therapy, and manipulation<sup>14</sup>. NSAID Medications such as ketorolac and paracetamol are taken by patients for temporary relief due to its effectiveness<sup>15,16</sup>. Surgical treatments include arthrocentesis, arthroscope, arthroplasty, discectomy, and temporomandibular joint (TMJ) reconstruction<sup>17</sup>. Orthognathic surgery involves movement of jaws in all three planes, patients having TMJ dysfunction undergoing orthognathic surgery are likely to have significantly improved signs and symptoms post surgery<sup>18</sup>. It is observed that sometimes temporomandibular joint disorders can occur due to maxillofacial trauma, or road traffic accidents that affect the TMJ directly or indirectly as well<sup>19,20</sup>. Oral splints (OS), or occlusal splints, are removable occlusal devices used for the diagnosis of TMDs as well as therapy for the dysfunction of the relationship between the mandible and the maxilla<sup>21</sup>. A conservative, reversible method is widely accepted to be the first choice for TMJ treatment. As one of the conservative treatments, oral splint has been frequently used for internal derangement and myofascial pain treatment<sup>22</sup>. As for the mechanisms of occlusal splint therapy, wearing an occlusal splint is considered to cause alterations in mechanical sensitive input arising from periodontal tissue and spindle afferents in the jaw closing muscle and decrease in intra-articular pressure in TMJ<sup>22</sup>. Occlusal splint is often successful, but the length of time required to reach a pain-free normal range of motion is suboptimal<sup>23</sup>. Although oral splints are sometimes designed to stabilize the occlusion, or prevent wear of the dentition, a common application in the management of TMDs aims to protect the TMJ

discs from dysfunctional forces that may lead to disc perforations or displacements<sup>24</sup>.

Previous studies have been done that stress on the importance of conservative splint therapy to ease pain caused due to TMD. However a number of challenges are faced while the study is conducted. According to Lee, Hye-Sung, et al, conservative splint therapy is highly effective, but these do not achieve a satisfactory outcome in some cases. A surgical method should be considered in such cases<sup>25</sup>. According to Adibi SS, et al<sup>26</sup>, Gray R, et al<sup>27</sup>, it explains about the importance and need of splint therapy however it requires a longer duration of action to accomplish a pain free state and patient cooperation is a limitation in the study. Splint therapy can only be successful if minor cases and cannot treat complicated TMD conditions.

This study aims to improve quality and to enable Increase maximum mouth opening, to limit parafunctional habits that act as a predisposing factor for TMD. The main goal is to decrease the pain and discomfort for the patients. Appliances are often used in conjunction with other forms of treatment such as physiotherapy or medication. The aim of this study was to assess the effectiveness of splint therapy in patients with temporomandibular joint disorder based on age and gender of the patient.

## **Materials and Methods**

### **Study setting**

The setting to conduct the study is a university setting. This enables easy retrieval of data over a specific period of time. The study was conducted with the approval of the Institutional Ethics Committee [SDC/SIHEC/2020/DIASDATA/0619-0320]. One guide and one researcher were involved in the study.

### **Sampling**

Data is collected from June 2019 to March 2020 and cross verification is done with photographs. Sampling bias is minimised by the inclusion of all the data available and exclusion of inappropriate data. Internal validity consists of samples from University which has proper records and gives proper recall and review results and external validity is that the results can be generalised as samples of One ethnic group is chosen.

Data collection and Statistical analysis

Data to conduct the study is obtained by reviewing patients records and analysing the data of 100 patients reporting to the institute. Excel tabulation based on age, gender, TMD and splint therapy entered. Results are generated using the statistical analysing tool SPSS. Incomplete/censored data is managed by excluding it from the data. Analyses used is a descriptive analysis – mean, range with tables and charts done using statistical software SPSS. Independent variables are age, sex and dependent variables a splint therapy and effectiveness the type of analysis done is correlation an association.

Results And Discussions

A total of 61 patients were assessed. The age range was from 15 to 56 year. The details on age distribution is given in (Figure 1). The mean age of the participants was 33.21. Out of the 61 patients, 33 (54.10%) were males and 28 (45.90%) were females, as shown in (Figure 2). Moderate-quality evidence suggests that splint therapy reduced pain in the temporomandibular joint (TMJ) area . It was observed that 36 patients (59.01%) found the splint therapy to be effective while 25 patients (40.98%) did not find splint therapy completely effective, as shown in (Figure 3). Association between effectiveness of splint therapy due to TMD with age and gender of the patient was done, as shown in (Figure 4 and 5).

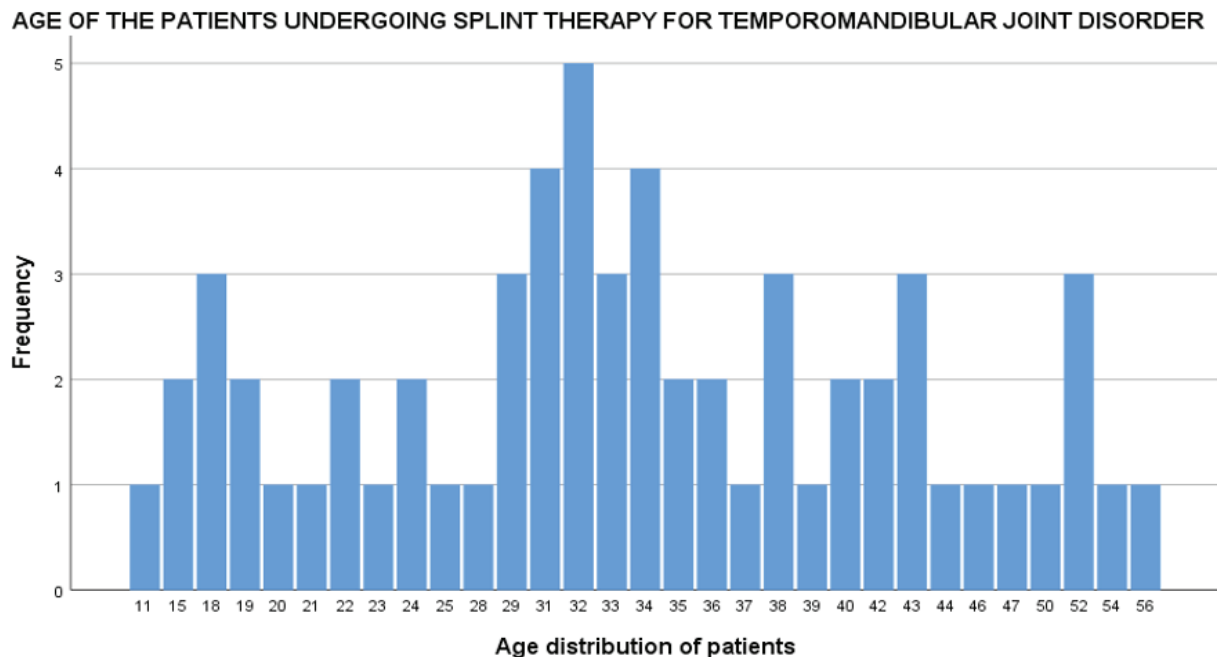
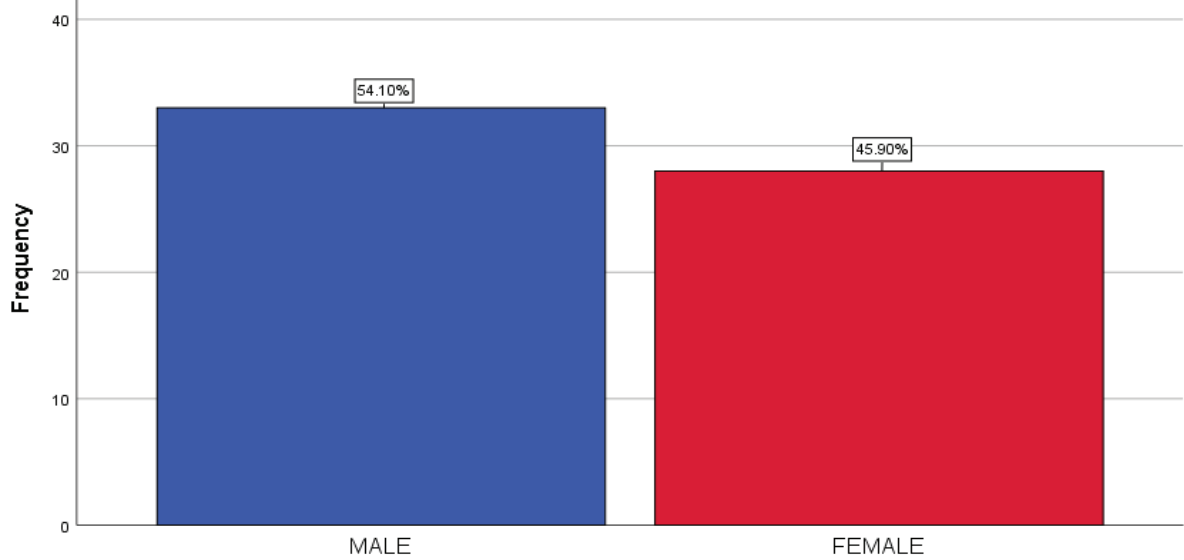


Figure 1: Bar graph showing distribution of age of the patients undergoing splint therapy due to temporomandibular joint disorder. The mean age of the participants were 33.21 years. X axis represents the age distribution of the patients and Y axis represents the number of patients in each age group.

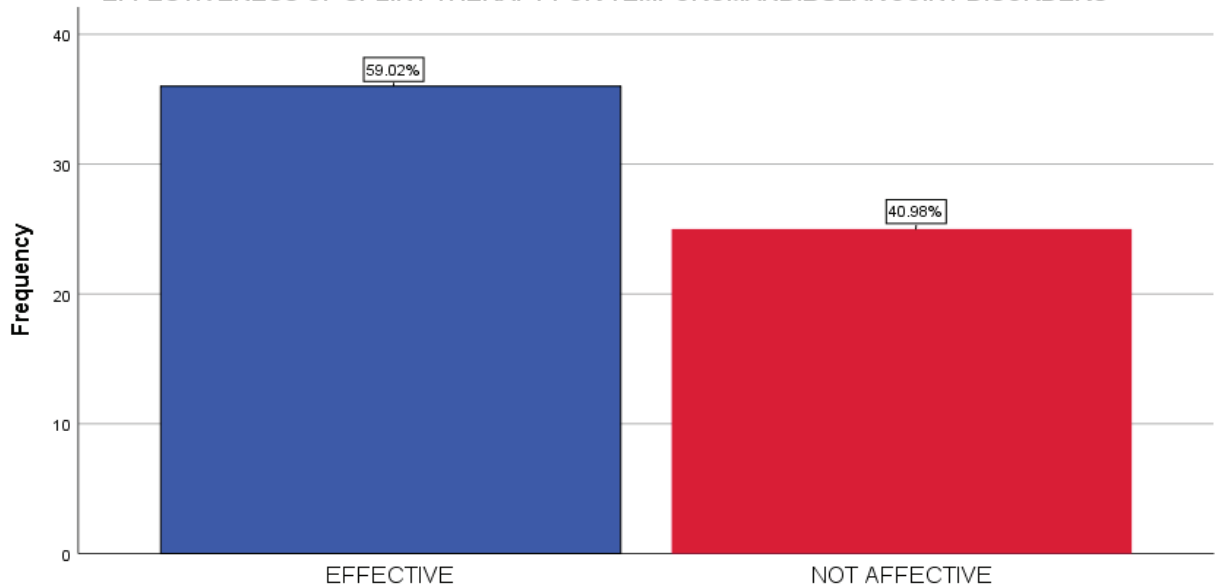
**GENDER OF PATIENT UNDERGOING SPLINT THERAPY FOR TEMPOROMANDIBULAR JOINT DISORDER**



**Gender distribution of patients**

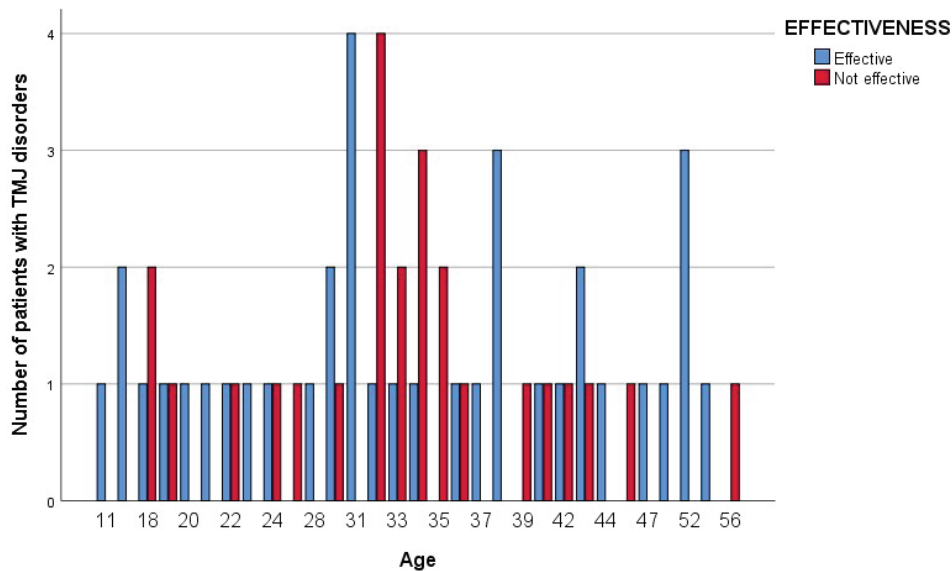
Figure 2: Bar chart showing distribution of gender of the patients undergoing splint therapy due to temporomandibular joint disorder. Blue denotes male participants with 54.1% and red denotes female participants with 45.90%. X axis represents the gender distribution of patients and Y axis represents the number of patients in each gender.

**EFFECTIVENESS OF SPLINT THERAPY FOR TEMPOROMANDIBULAR JOINT DISORDERS**

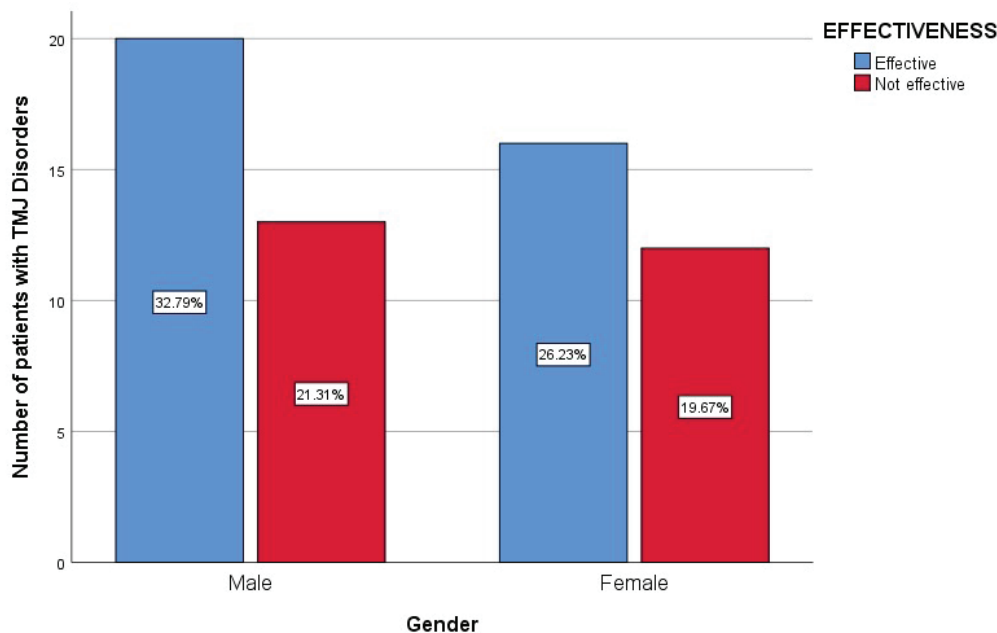


**Effectiveness of splint therapy**

Figure 3: Bar chart showing distribution of effectiveness of splint therapy among the patients with temporomandibular joint disorder. Blue denotes effectiveness of splint therapy due to TMD with 59.02% and red denotes non- effectiveness of splints therapy due to TMD with 40.98%. X axis represents the effectiveness of splints therapy in patients and Y axis represents the number of patients.



**Figure 4:** Bar chart depicting the association between age and effectiveness of splint therapy in TMD patients. X axis represents the age of the patients and Y axis represents the number of patients with TMD. Blue bars represent effectiveness of splint therapy due TMD and red bars represent non effectiveness of splint therapy due to TMD. The splint therapy was highly effective in the age group of 31 years with 6.56% followed by 38 and 52 years with 4.92%. Splint therapy was not effective in the age group 32 years with 6.56% followed by 34 years and 35 years with 4.92% and 3.28% respectively. Chi square analysis was done ( $p = 0.78$ ;  $p > 0.05$  which was statistically not significant)



**Figure 5:** Bar chart depicting the association between gender and effectiveness of splint therapy in TMD patients. X axis represents the gender of the patients and Y axis represents the number of patients with TMD. Blue bars represent effectiveness of splint therapy due TMD and red bars represent non effectiveness of splint therapy due to TMD. The splint therapy was highly effective in males with 32.79% followed by 26.23% in females. Splint therapy was not effective for some male patients with 21.31% followed by 19.67% in females. Chi square analysis was done ( $p = 0.41$ ;  $p > 0.05$  which was statistically not significant)

According to this study, The mean age of participants is 33.21 years. Similarly in a study by Wassell, R. W.

Et.al, The patients reporting of the temporomandibular joint disorder were aged 18 years and above with the mean age of 30.2 years. In another study by Lee .HS. et al, the mean age of participants reporting with TMD and for a conservative management was 22.59 years<sup>25</sup>. Therefore these studies support the results of our study that the age group encountered for TMD are aged between 18 to 65 years.

In a study by Jokestad et al, out of 76 patients, 45 were males and 31 were females. In a study Contradicting to our finding by Lee HS., et al, out of 43 patients, 3 were males and 40 were females<sup>25</sup>. This difference in the ratio of male and female is due to a limited sample size and limited population in each study.

According to this study, splint therapy was effective and reduced pain and discomfort caused by TMD in 36 patients (59.01%) however almost 25 patients (40.98%) did not find treatment with splint therapy alone to be very effective in reducing the discomfort due to TMD. In a similar study by Ebrahim, et al, more than 50% of the patients were found to have complete relief of pain post splint therapy<sup>28</sup>. Carraro and Caffesse, et al claimed that the adoption of occlusal splint reduced TMJ pain by approximately 70% and muscle pain related to increased muscle activity by around 85.2%<sup>29</sup>. Similarly, Wassell R.W. et al, stated that 17 out of 36 patients had less than a 50% reduction in pain at six weeks. The pain for a few participants did not reduce immediately and took up to 6 to 12 months for complete ease of pain<sup>30</sup>. Similarly in a study by Madani AS. et al, Out of 20 patients in their study, The numbers of pain-free patients due to splint therapy were 12 in group 1, 5 patients were pain-free post physical therapy in group 2 and 9 patients were pain-free post physical therapy in addition to splint therapy group 3. It was concluded that splint therapy appeared to be the best treatment method for reduction of pain and discomfort with TMD compared to the other two methods studied as 12 patients out of 20 were pain-free<sup>31</sup>. Limitations of a study is a limited population covered and a small sample size. Larger samples could be taken and assessed over a longer period of time<sup>32</sup>. Future scope of the study is that other parts of the population should be studied.

### Conclusion

Within the limitations of the study, it was concluded

that splint therapy was effective for 59.02% patients with temporomandibular joint disorder patients. Also, splint therapy was more effective in males (32.79%) as compared to females (26.23%).

**Conflict of Interest :** There were no conflicts of interest as declared by the authors.

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**Ethical Clearance:** It is taken from "Saveetha Institute Human Ethical Committee" (Ethical Approval Number- SDC/SIHEC/2020/DIASDATA/0619-0320)

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