



**Research Article**

**“COMPARATIVE EVALUATION OF EFFICACY OF TENS, HOLISTIC APPROACHES AND OCCLUSAL SPLINTS IN MANAGEMENT OF TMDS - RCT”**

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Temporomandibular joint dysfunction syndrome, TENS therapy, Acupuncture, Occlusal Splint, Naturopathy, Perceived stress Scale

**ABSTRACT**

To compare and evaluate the effects of Acupuncture, Occlusal splint and Pharmacological therapy in the treatment of Temporomandibular dysfunctions. A randomized controlled clinical study consisting of 60 patients between 18-58 years age group visiting dental opd diagnosed with Temporomandibular dysfunctions were divided into 3 groups A, B and C randomly. Group A received biweekly Trans-Cutaneous Electrical Nerve Stimulation therapy. Group B patients were given holistic therapies (Acupuncture, Facial massage and facial muscular exercises). Group C was given occlusal splint preferentially in upper arch. The duration of treatment was of three months and all the patients were analyzed using Pain Scale and Perceived stress scale before treatment and after 15 days, 1 month, 2 month and 3 months. All the results obtained were statistically analyzed. It was observed that the stress reduction in patients treated with Trans-Cutaneous Electrical Nerve Stimulation Therapy was significant followed by Acupuncture therapy and Occlusal Splint therapy respectively. In the present study the patients treated with Trans-Cutaneous Electrical Nerve Stimulation therapy had better reduction in pain comparing to acupuncture and occlusal splint therapy.

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**INTRODUCTION**

The Temporomandibular dysfunctions are recognized as the most common conditions of Chronic Orofacial pain.<sup>1</sup> Factors that cause discomfort are intertwined in complex manner, and clinicians often get puzzled over the appropriate therapy for patients with TMJ discomfort.<sup>2</sup> TENS therapy works by using an electrical pulse to stimulate muscle contractions so that muscles essentially massage themselves.<sup>3</sup> Today, the escalating costs of drugs and the limitations of modern medicines have led to the search and revival of alternative, indigenous systems of medicines all over the world.<sup>4</sup> Naturopathy is one of the holistic approaches to treatments of various pains.<sup>5</sup> Occlusal splint is also an effective treatment for many TMDs. It is a reversible non surgical option for the management of TMD and can reduce pathologic symptoms around the temporomandibular joint caused by excessive occlusal pressure on the joint<sup>6</sup>. A multidisciplinary approach is ideal in the management of TMD disorders. Understanding the pain neurobiology of the trigeminal system is the key to the development of better and safer therapeutics<sup>7</sup>. Therefore, this study is an effort to evaluate and compare the efficacy of current and new physical therapies and holistic therapies for the management of Temporomandibular Pain-Dysfunction Syndrome.

**MATERIALS AND METHODS**

The study was conducted in the Department of Oral Medicine and Radiology. Ethical approval was obtained from institutional ethical committee. It was a randomized controlled clinical study consisting of 60 patients between 18years and 58years age group visiting dental OPD diagnosed with Temporomandibular joint pain-dysfunction syndrome All the 60 patients were divided into 3 groups A, B and C randomly.

**Group A** consisted of 20 patients who were given biweekly TENS therapy along with hot fomentation and topical application of analgesic gel for 3 months.

**Group B** consisted of 20 patients who were given holistic therapies (Acupuncture, Facial massage and facial muscular exercises) for 3 months consisting of 15 sessions each; the first three ones were conducted on consecutive days and the rest of them on a three-per-week basis. All patients were advised to practice yoga daily in the morning.

**Group C** consisted of 20 patients who were given occlusal splints preferentially on the upper arch except when upper molars are absent; in that case, the splint was placed on the lower arch for a total of 5 weeks and after that a follow up period of 3 months. All the patients were followed up after 15 days, 1 month, 2 month and 3 month.

In all the Groups, if patient was not responding and severe discomfort and pain continues for more than 1 month, these

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patients were then excluded from the study group. All the results obtained were statistically analyzed.

**OBSERVATION AND RESULTS**

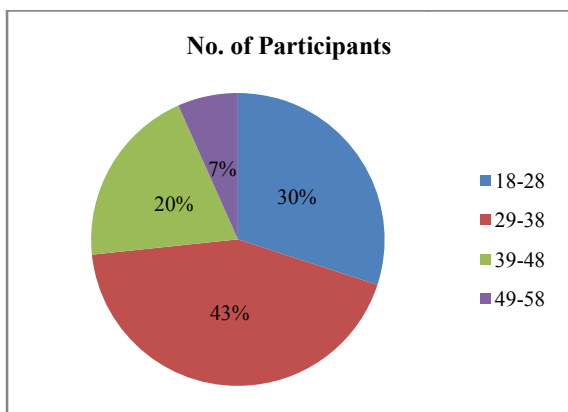
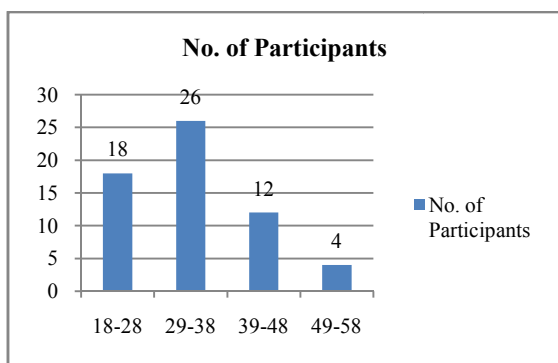
The average age study population was found to be 33.75 yrs with peak incidence seen in the 29-38 yrs age group followed by 18-28yrs. Our study consisted of 51.66% females and 48.33% males. Thus, it was concluded that temporomandibular disorder is seen more in Females and middle age group.(Table 1 & 2 and Graph 1 & 2)

**Table 1** Tabulation of no. of cases in each age group

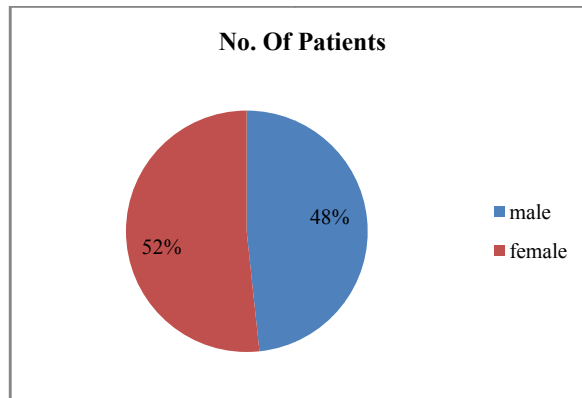
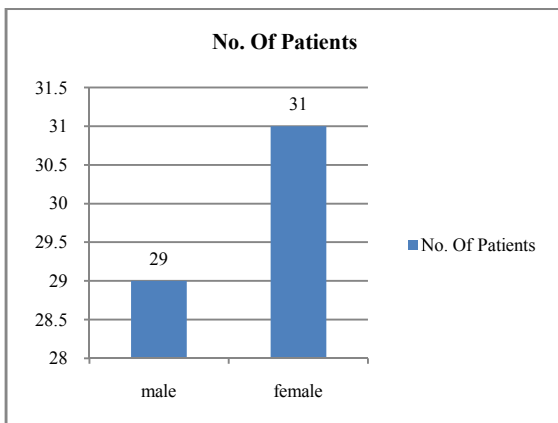
Age ranges	No. of Participants
18-28	18
29-38	26
39-48	12
49-58	04

**Table 2** Tabulation of no. of cases in each gender group

Gender	No. of Patients
Male	29
Female	31

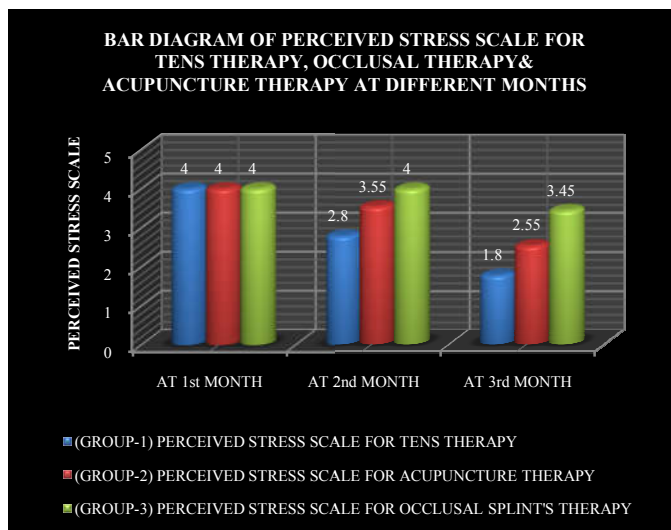


**Graph 1** Graphical representation of no. of cases in each age group

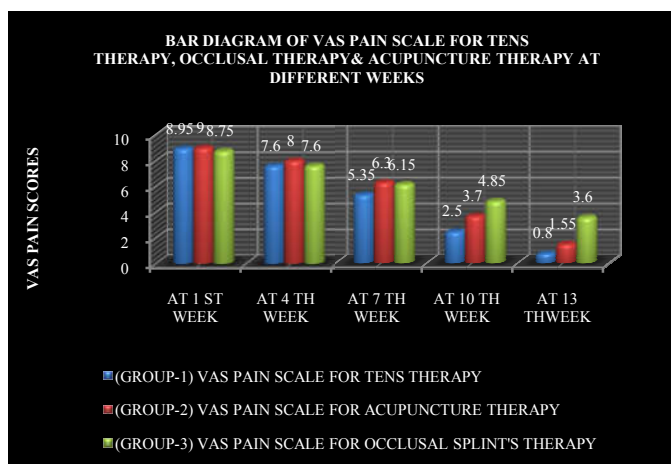


**Graph 2** Graphical representation of no. of cases in each gender group

In all the three groups the mean value of perceived stress scale and VAS scale at base line was in group 1, 2 and 3 dropped to on third month follow up which was found to be statistically significant. (P value for group 1= 0.001(perceived) & 0.0002(VAS); Group 2 = 0.0005(perceived) & 0.0004(VAS) and group 3 =0.0002(perceived) & 0.0001(VAS) ) (Table 3 & 4, Graph 3 & 4)



**Graph 3** The bar diagram of Perceived Stress Scale for TENS Therapy, Occlusal Therapy & Acupuncture Therapy at different months



**Graph 4** Bar diagram of VAS Pain Scale for TENS Therapy, Occlusal Therapy & Acupuncture Therapy at different weeks

**Table 3** Mean & Standard Deviation of Age & Perceived Stress Scale for Tens Therapy, Acupuncture Therapy and Occlusal Splint's Therapy at Different Months

S.No.	Groups & Gender	Age (In Years)	Time –Points (Mean ± S.D.)			
			1 <sup>st</sup> Month	2 <sup>nd</sup> Month	3 <sup>rd</sup> Month	
1	Group--1 (Perceived Stress Scale For Tens Therapy )	MALE (11)	33.309±15.52	4±0	2.78±.441	1.778±.441
		FEMALE (09)	34.22±10.91	4±0	2.78±.441	1.778±.441
		ALL (20)	34.050±13.304	4±0	2.8±.410	1.8±.410
2	Group--2 Perceived Stress Scale For Acupunct-Ure Therapy	MALE (07)	35.571±7.913	4±0	3.143±.378	2.143±.378
		FEMALE (13)	29.15±6.16	4±0	3.77±.439	2.769±.439
		ALL (20)	31.40±7.323	4±0	3.55±.51	2.55±.51
3	Group--3 Perceived Stress Scale For Occlusal Splint's Therapy	MALE (12)	35.417±7.077	4±0	4±0	3.42±.51
		FEMALE (08)	36.375±5.370	4±0	4±0	3.5±.535
		ALL (20)	35.80±6.313	4±0	4±0	3.45±.510

**Table 4** Mean & Standard Deviation of Age & Vas Scores for Tens Therapy, Acupuncture Therapy Occlusal and Splint's Therapy at Different Weeks

S.No.	Time-Points	(Mean ± S.D.)		
		Group--1 Vas Score For Tens Therapy	Group-2 Vas Sore For Acupuncture Therapy	Group-3 Vas Score For Occlusal Splint's Therapy
1	AGE (IN YEARS)	34.05±13.30	31.40±7.323	35.80±6.313
2	AT 1 ST WEEK	8.95±.22	9±0	8.75±.910
3	AT 2 ND WEEK	8.85±.37	9±0	8.6±.940
4	AT 3 RDWEEK	8±.32	8.85±.366	8.150±.933
5	AT 4 TH WEEK	7.6±.50	8±0	7.6±.995
6	AT 5 TH WEEK	6.8±.41	7.85±.366	7.1±.968
7	AT 6 TH WEEK	6.05±.51	6.95±.686	6.6±1.095
8	AT 7 TH WEEK	5.35±.59	6.30±.801	6.15±.988
9	AT 8 TH WEEK	4.4±.75	5.45±.686	5.65±1.089
10	AT 9 TH WEEK	3.45±.94	4.85±.671	5.4±1.231
11	AT 10 TH WEEK	2.5±.95	3.70±.657	4.85±.988
12	AT 11 TH WEEK	1.65±.75	2.65±.489	4.35±1.226
13	AT 12 TH WEEK	.95±.60	1.95±.510	4.050±1.276
14	AT 13 THWEEK	.80±.41	1.55±.686	3.6±1.188

**Table 5** One Way Anova-F Test for Comparing the Significant Difference among Different Weeks in Vas Pain Scale for Tens Therapy

Source of Variation	SS	df	MS	F	P-VALUE	F CRIT
Between Groups	731.25	12	60.94	53.14	0.0000	1.792
Within Groups	283.25	247	1.15		P<.05 (SIG.)	
Total	1014.50	259				

\*shows a significant difference b/w different pair of weeks at .05 level of significance. (p<.05)

**Table 6** One Way Anova-F Test for Comparing the Significant Difference among Different Weeks in Vas Pain Scale for Acupuncture Therapy

Source of Variation	SS	df	MS	F	P-VALUE	F CRIT
Between Groups	1772.05	12	147.671	518.105	0.0000	1.792
Within Groups	70.40	247	0.285		P<.05 (SIG.)	
Total	1842.45	259				

\*shows a significant difference b/w different pair of weeks at .05 level of significance. (p<.05)

**Table 7** One Way Anova-F Test for Comparing the Significant Difference among Different Weeks in Vas Pain Scale For Occlusal Splint's Therapy

Source of Variation	SS	DF	MS	F	P-VALUE	F CRIT
Between Groups	731.254	12	60.938	53.139	0.0000	1.792
Within Groups	283.250	247	1.147		P<.05 (SIG.)	
Total	1014.504	259				

\*shows a significant difference b/w different pair of weeks at .05 level of significance. (p<.05)

**Table 8** One Way Anova-F Test for Comparing the Significant Difference among Different Weeks in Perceived Stress Scale for Tens Therapy

Source of Variation	SS	df	MS	F	P-VALUE	F CRIT
Between Groups	48.533	2	24.266	216.125	0.0000	3.158
Within Groups	6.4	57	0.112		P<.05 (SIG.)	
Total	54.933	59				

\*shows a significant difference b/w different pair of months at .05 level of significance. (p<.05)

**Table 9** One Way Anova-F Test for Comparing the Significant Difference among Different Weeks in Perceived Stress Scale For Acupuncture Therapy

Source of Variation	SS	df	MS	F	P-VALUE	F CRIT
Between Groups	22.033	2	11.017	63.429	0.0000	3.159
Within Groups	9.900	57	0.174		P<.05 (SIG.)	
Total	31.933	59				

\*shows a significant difference b/w different pair of months at .05 level of significance. (p<.05)

**Table 10** One Way Anova-F Test for Comparing the Significant Difference among Different Weeks In Perceived Stress Scale For Occlusal Splint's Therapy

Source of Variation	SS	df	MS	F	P-VALUE	F CRIT
Between Groups	4.033	2	2.017	23.222	0.0000	3.159
Within Groups	4.950	57	0.087		P<.05 (SIG.)	
Total	8.983	59				

\*shows a significant difference b/w different pair of months at .05 level of significance. (p<.05)

Thus, showing that the stress and pain reduction in patient treated with TENS Therapy (Group-1) was significant and more followed by Acupuncture therapy (Group 2), and Occlusal Splint therapy (Group 3) respectively.

One way ANOVA-F Test for comparing the significant difference among different weeks in VAS pain scale and Perceived stress scale for TENS, Acupuncture and occlusal splint's therapy was found to be statistically significant. (Table 5, 6, 7, 8, 9 & 10)

## DISCUSSION

Temporomandibular disorders (TMD) are conditions clinically characterized by pain and dysfunction in the masticatory muscles, Temporomandibular joints (TMJs), and adjacent structures.<sup>8,9</sup> Although TMDs is not life-threatening, they can be detrimental to the quality of life. For appropriate diagnosis, it is appropriate to use both patient history and clinical examination, supplemented with adjunctive diagnostic procedures as needed, to develop a differential diagnosis.<sup>10</sup> The symptoms can become chronic and difficult to manage.<sup>11</sup> This study was carried out to evaluate the efficacy of TENS therapy in comparison to occlusal splint therapy and Acupuncture in the management of Temporomandibular Disorders.

In the present study the patients with Temporomandibular joint pain dysfunction syndrome were randomly divided into 3 groups. In group A, 20 patients were given TENS therapy along with hot fomentation and topical application of analgesic gel. In group B, 20 patients were given holistic therapies (Acupuncture, Facial massage and facial muscular exercises) and daily yoga session. The third group C consisting 20 patients were given occlusal splints preferentially on the upper arch.

In group A, patients showed drastic improvement (91.06%) in the intensity of pain, as measured on VAS (P=0.0002). There was also significant improvement (55%) in the Perceived stress scale (P=0.0001) in these patients. No remarkable negative effects were reported in our patients during the course of treatment. Thus in our study, TENS therapy proved efficient in treating Temporomandibular joint pain dysfunction syndrome. This was consistent with the studies done by M Shanavas, L Chatra *et al* (2014)<sup>12</sup>; A Mathur, S Shah *et al* (2019)<sup>13</sup>; H Puri, A Ramchandani *et al* (2020)<sup>14</sup> which have proved TENS therapy to be effective in treatment of treating temporomandibular joint pain dysfunction syndrome.

In our study, in group B patients, where holistic therapies (Acupuncture, Facial massage and facial muscular exercises) and daily yoga session were given to the patients, they showed significant improvement in the pain condition (P=0.0001). Noticeable improvement was also seen in the stress levels which was measured by perceived stress scale (P=0.0005) during the course of the treatment.

Although there are numerous surgical modalities and other treatments available for TMD disorders but sometimes patients are not willing for surgical procedures due to the fear or cost factor. Therefore in such patients holistic treatments can be useful.

A double blind randomized controlled trial was conducted by P Smith, D Mossdrop *et al* in 2007 in the TMD Clinic, at the School of Dentistry, The University of Manchester on 27 patients to compare the effect of acupuncture in the treatment of Temporomandibular joint myofascial pain, in order to establish the true efficacy of acupuncture. The results demonstrated that acupuncture had a greater influence on clinical outcome measure of TMJ pain.<sup>15</sup>

Smith *et al* compared acupuncture with a placebo and concluded that the former exerts a positive influence on the signs and symptoms of myofascial TMD pain.<sup>15</sup> Similarly in a previous study, Johansson *et al* compared groups treated with acupuncture and occlusal splints and found that both treatments satisfactorily reduced the symptoms of pain of muscular origin. However, this study had a short follow-up period (i.e. 3 months), and a longer follow-up time is required to completely assess the effects of acupuncture treatment.<sup>16</sup>

In the present study, in group C patients of Temporomandibular disorders who were given occlusal splint therapy showed not so significant improvement in pain (P=0.0004) and stress levels (P=0.0002). This may be due to the fact that splints are not comfortable enough in the initial wearing. In our study patients were advised to wear splints even during night in initial one week to rule out any Para-functional habits. Many patients also experienced pain in tooth region due to splints. This might have made patients more anxious thus delaying the treatment result. A retrospective study by H Kurita, K Kurashina *et al* in 1997 was done to evaluate the effect of maxillary full-coverage occlusal splint (stabilization splint) therapy for specific Temporomandibular disorders and their symptoms/signs on 232 patients suffering from chronic pain in joint movement and difficulty in mouth opening. The total remission rate was 41% and, including those reporting some improvement, the rate was 84%.<sup>17</sup>

Thus in the present study the patients treated with TENS therapy had better reduction in pain comparing to acupuncture and occlusal splint therapy. The reduction in pain measured on VAS scale was delayed in occlusal therapy compared to TENS and Acupuncture. This result shows that any treatment not only depends on physical treatment but also on mental perseverance of patient

The major positive aspect of our study was that we followed up the patient every week. The benefit of this study was that as an Oral Medicine specialist we were able to ponder over other treatment modalities for TMDs. The limitation of our study was the lack of patient knowledge and awareness for the newer modalities like acupuncture, facial massage, occlusal splint

and yoga. Patient counselling played a crucial role along with the treatments.

## CONCLUSION

In recent years there has been an increase in professional interest in Temporomandibular disorders. Because their etiologies and pathogenesis are not well known so the Temporomandibular joint disorders becomes difficult to manage and diagnose. Definitive diagnosis or proper treatment can only be achieved through a detailed understanding of the etiology, predisposing factors, and pathogenesis of TMJ disorders.

In this study it was observed that the patients treated with TENS therapy showed drastic improvement in intensity of pain as well as stress. The patients treated with holistic approach (Acupuncture, facial massage) had reduced stress levels but the reduction in intensity of pain was less significant comparing to TENS therapy. The third group where patients were treated with occlusal splint therapy showed the least improvement in pain and discomfort. Thus to conclude of all the three treatment modalities used in this study the most effective one in treating Temporomandibular disorders was TENS therapy followed by Acupuncture and occlusal splint. However individual role of the three treatment modalities in the treatment of TMDs need to be evaluated in further studies in large sample size, in order to improve treatment outcomes and avert more serious consequences.

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