



A COMPARATIVE STUDY BETWEEN CRANIOSACRAL THERAPY AND CONVENTIONAL PHYSIOTHERAPY TREATMENT FOR TEMPOROMANDIBULAR JOINT DISORDERS/DYSFUNCTION.

Physiotherapy

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ABSTRACT

Background and Objective: The temporomandibular joint (TMJ) is a unique synovial joint, consisting of the articular disc, articular eminence of the temporal bone, condyle of the mandible, capsule, synovial fluid, and various ligaments, muscles, retrodiscal pad, nerves and arteries. TMJ is formed by the articulation of the head/condyle of the mandible and articular eminence of the temporal bone. In TMJ there are signs & symptoms of disorder/dysfunction like pain, inflammation, swelling, unable to open & closing of mouth or limitation in a jaw movement, clicking sounds & internal derangement, osteoarthritis etc. TMJ is having several movements like mandible elevation, depression, protrusion, retrusion and lateral deviation. Previous study showed about 15% of the adults and 7% of the adolescents will suffer from the TMJ dysfunction¹. Previous research studies including our study showed that females are more affected with TMJ dysfunction than the males^{1,2}. TMJ dysfunction is associated with age, gender, overuse of TMJ, poor cervical posture which will contribute to the signs & the symptoms & cervical spine disorder². Many studies have been done to determine the effective treatment for temporomandibular joint dysfunction. Many previous studies showed the effectiveness of ultrasound and strengthening exercises on TMJ dysfunction. CST is another modern form of non-invasive hands-on technique which will work by cerebrospinal fluid flow to decrease pain & dysfunction. The aim of the study is to evaluate the effect of both & to compare the effectiveness of ultrasound along with isometric exercise and strengthening exercise versus CST with isometric exercises and strengthening exercises, which was evaluated by VAS scale & neck disability index scale in case of cervical affection. In this comparative study 40 patients were taken who were suffering from TMJ dysfunction & they were randomly allocated in two groups group A and group B. Group A was an experimental group who received CST for 2 consecutive week 6 session per week followed by isometric & strengthening exercise for 4 weeks and group B was a control group who received Ultrasound therapy for 2 consecutive weeks continuously 1 session per day followed by isometric & strengthening exercises for 4 weeks. For both the groups outcome measures were measured before & after treatment by using VAS scale & neck disability index scale questionnaire for cervical pain associated with TMJ disorder/dysfunction. In our study results have showed that there was a difference between pre-test and post-test scores of pain (VAS) in Group A. There was a significant difference was observed between pre-test and post-test scores of pain (VAS) in Group B. Group B had showed slight higher changes as compared to Group A in pain (VAS) scores. Also we had observed that there was a difference between pre-test and post-test scores of Neck disability index in case of cervical spine impairment both the Group A & Group B. Group B had showed slight higher changes as compared to Group A in Neck disability index scores statistically for cervical pain. Hence our study concluded that both the treatment is effective in the treatment of temporomandibular joint disorder/dysfunction. We can recommend both the treatment for the patients who is suffering from temporomandibular joint disorders/dysfunction. Both the treatment statistically showed similar effects in both the groups in reducing temporomandibular joint disorders/dysfunction & associated cervical spine disorder.

KEYWORDS

Temporomandibular joint dysfunction, Craniosacral therapy, Ultrasound, Strengthening exercises, VAS scale, Neck Disability Index Scale.

INTRODUCTION

The temporomandibular joint (TMJ) is a unique synovial joint. It is having superior joint and inferior joint. Inferior joint is a hinge joint and superior joint is a gliding/plane joint. TMJ is formed by the articulation of the head/condyle of the mandible and articular eminence of the temporal bone along with the articular disc in between. TMJ consist of the articular disc, mandibular fossa of the temporal bone, head/condyle of the mandible, capsule, synovial fluid, retrodiscal pad, fibrocartilage, various ligaments, nerves, arteries and various muscles which plays a vital role in the functioning of the TMJ. There are mandibular movements like mouth closing/mandibular elevation, mouth opening/mandibular depression, protrusion, retrusion, and lateral excursions/deviation which occur in TMJ joint. TMJ is having various functions & it is capable to withstands with all the forces/stress which will occur during mastication/chewing, swallowing/deglutition, & during phonation. In Temporomandibular disorder/dysfunction (TMJ) there can be an overuse of the muscle or any internal derangement, where there will be abnormal placement/position & function is seen between the articular disc and the articular surfaces, or abnormality in any of the structure or osteoarthritis, R.A etc. TMJ dysfunction also impact the cervical spine as muscles which are working on mandible also affecting the cervical spine². Previous studies showed that cervical spine dysfunctions are associated with the temporomandibular disorders (TMDs)². If cervical spine is involved in TMJ disorder/dysfunction the patient complain of pain, tenderness and loss of ROM of all cervical movements². Previous studies showed that in the world, more than a 450 million people were suffering from chronic facial pain in which female showed more affection 10% and men showed 6% of affection². The previous study showed that TMJ dysfunction cases were increasing as age is increasing specially after 40 years². TMJ can have degeneration which may not be related to aging but it can be due to the pre-existing pathology. TMJ is having inflammatory conditions like capsulitis & synovitis. Capsulitis is defined as inflammation of a joint capsule & synovitis is characterised by fluctuating swelling/inflammation which

is caused by effusion in the synovial membrane. Temporomandibular joint also affected by Capsular Fibrosis where there is a restriction of the movement due to intracapsular fibrous adhesions. Capsular fibrosis is characterized by a mandibular opening of less than 40 mm (commonly less than 25 mm) because of adhesions that limit extensibility of the TMJ capsule. TMJ osteoarthritis refer as an aging process leading to pain & because of aging process tissue become less supple, less elastic thereby it leads to functional difficulties and also the tissue cannot able to withstand with all the forces, and there can be subchondral bony changes like breaking in cortical bone and degenerative changes, also there can be pathological changes in the articular disc². In TMJ there are 5 stages of internal derangement which is associated with pain, TMJ opening & closing, & disc position with respect to the articular surfaces². The 1st classification begins from the stage 1 where there will be no pain but there will be clicking of the joint, till stage 5th where the patient complains of severe pain & also degenerative changes occur in the bone². Another condition in TMJ is articular disc displacement with or without reduction. If disc displacement with reduction is not treated then it will lead to disc displacement without reduction. Mechanical stress is the most common cause in various condition. Usually patient come with the complaint of jaw pain, swelling, inflammation over cheek bones, tenderness, earache, headache, and facial pain, limitation in jaw movements while closing & opening of a mouth, difficulty in biting, chewing, swallowing, clicking sounds during jaw movements, pain, loss of ROM & muscles tenderness over cervical spine & poor sleep quality due to pain, if it not treated it will become chronic & thereby leads to poor quality of life. Overuse of the jaw muscles, poor posture or forward head posture, teeth grinding (bruxism) will create excessive stress on the jaw muscles, jaw clenching (often stress-related), gum chewing, etc these all will give rise to myofascial pain or TMJ dysfunction. There can be a Structural pain also which is mainly related to the bone either because of fracture/dislocation/direct trauma/fall³. Previous study suggests that around 5% to 15% of adult population affected by TMD disorders yet 50% of the population was

having the symptoms of TMD¹. Previous studies showed that around 70% of patients who is having TMJ disorder/dysfunction complain of cervical spine disorders including headache also^{5,6,7}.

Craniosacral Therapy concept was given by Dr. William Garner Sutherland D.O. He described that the movements are occurring in the articular surfaces of the skull bone. It is a non invasive, hands on treatment. CST is based on the concept of respiratory mechanism. In CST there will be flow of cerebrospinal fluid which in turn leads to the rhythmical movements of the cranial bone, brain, craniosacral membrane, spinal cord & the sacrum. This rhythmical movements can be altered by the therapist, when the therapist gently place his or her hand on the skull of the patient while the patient will be in supine lying on the CST table & the therapist will apply the pressure to restore the therapeutic function. In CST this rhythmical movements is palpable by the therapist & even patient while taking treatment can feel the motions in the cranium bone. CST is used in the treatment of almost all the diseases/disorders and many forms of dysfunction, like migraine, muscle strain, low back pain, headache, temporomandibular dysfunction. During procedure no machine or modality is required, Also number of studies have been done to investigate the effectiveness of physical therapies for TMJ pain. These therapies include massage, electrotherapy, exercise therapies as well as bio-behavioural intervention^{8,16}. Physiotherapy is a non invasive method that includes manual therapy, electrotherapy, physical exercises, stretching, strengthening exercises which is been used in the treatment for TMD disorder/dysfunction and cervical spine impairment⁹⁻¹⁶. In this study rehabilitation is specifically designed to decrease the signs & symptoms in the TMD dysfunction/disorders which is an essential for pain reduction and improvement of the functions of TMJ and related to cervical spine and increasing the person's quality of life. Physiotherapy exercise & ultrasound modality and craniosacral therapy are found to be effective in the treatment of temporomandibular joint disorders/dysfunction and improving pain, range of motion & functional disability⁸⁻¹⁶. Hence the purpose of this study is to find out the effect of both the treatment for TMJ dysfunction/disorder and associated cervical spine impairment & to compare the effectiveness of ultrasound along with isometric exercise and strengthening exercise verses CST with isometric exercises and strengthening exercises. The outcome measures for this study is VAS scale & neck disability index scale. VAS is having good reliability and validity to measure pain hence it is used in this study to assess patients presenting with the pain^{17,18}. VAS scoring has been taken for the measurement of pain pre treatment & post treatment. Neck disability index scale (NDI) is a good instrument for assessing patients with the cervical/neck pain^{19,20}. Hence for assessing cervical pain pre treatment and post treatment we used neck disability index scale in this study.

Aims & Objectives

The main aim of the study is to find out the effective treatment for the patients suffering from the TMJ disorders/dysfunction & associated cervical spine impairment, also to compare the effectiveness of CST along with isometric exercise & strengthening exercises verses effectiveness of ultrasound along with isometric exercise & strengthening exercises for TMJ disorder/dysfunction.

NEED OF THE STUDY

In Temporomandibular joint dysfunction/ disorder pain, inflammation, swelling, locking of the mandibular movements with or without pain, degeneration, cervical spine involvement are quite common. Many studies had been done to investigate the effective treatment in the reduction of signs & symptoms in patients who is suffering from TMJ disorders by using ultrasound therapy and physical therapy exercises. To our knowledge none of the studies had been done to evaluate the effectiveness of CST with the combination of isometric exercise and strengthening exercises verses ultrasound along with the isometric exercises and strengthening exercises in the reduction of signs & symptoms in case of temporomandibular joint disorders/dysfunction and secondly to compare the effectiveness of both the treatment in the patients. So our aim is to recognize the effective treatment and to compare the effect of both the treatments for the patients suffering from the temporomandibular joint disorder/dysfunction & associated cervical spine impairment.

MATERIALS & METHODOLOGY

Study Design- Comparative study

Study Duration- 1 year

Sample Size- 40

Material Used

1. Consent form
2. Data collection sheet
3. Visual analogues questionnaire
4. Neck disability index questionnaire scale
5. Ultrasound & gel
6. Treatment table and chair
7. CST table

Inclusion Criteria

1. Both gender- males and females
2. Age between 18years to 55years
3. Pain whether acute, sub acute or chronic pain associated with TMJ
4. Inflammation, swelling, redness IN TMJ
5. Clicking sounds in TMJ
6. Decreased ROM or difficulty in mouth opening/closing
7. Locking of the jaw while mouth opening or closing of mouth
8. Difficulty/pain with functional activities in TMJ like - while chewing, talking, yawning, swallowing, speaking.
9. Patient present with cervical pain or headache associated with TMJ disorders/dysfunction.

Exclusion Criteria

1. Fracture
2. Surgical history
3. Subjects who are not willing for study.
4. Incomplete Questionnaire filled by participants.
5. Presence of trauma or post trauma
6. Malignancy/cancer
7. Jaw dislocation
8. Congenital disorder
9. Infections
10. Autoimmune disease
11. Dental procedures
12. Unstable joint
13. Neurological disorder
14. Pregnancy

Procedure Methodology

40 Patients were taken for the study purpose, both males and females who were having age between 18years to 55years, they all were selected for the study purpose, who came to Opd and personally to therapists. They all were contacted for study purpose. There were 24 females & 16 males. All the participants were randomly divided into 2 groups. They all were having symptoms of TMJ disorder/ dysfunction, in which patients were having pain, inflammation, swelling and unable to open and close their mouth and cervical impairment. Some patients came with pain, inflammation, swelling over TMJ & they were having difficulty & pain during biting, chewing food, swallowing, speaking also they complaint of cervical pain & affected ROM. Some complaint of occasionally locking of the jaw while opening and closing of the mouth without pain. Some patients complaint of clicking sounds while jaw closing & opening. All the patients who met with the inclusion criteria were taken for the study purpose and they were explained about the purpose of study in their own language and they were requested to participate in the study. If the patients are willing to participate in the study design then their informed written consent were taken from all the patients. Then once the patients given their informed written consent & they were provided the general demographic data collection sheet which contain their name, age, gender, occupation, address, dominance, height, weight, BMI, working experience, fitness and activity level of a patients, type of eating habits, type of food intake. Before the treatments, all the patients were assessed in detail & history taking, examination had done which includes pain assessment by visual analogue scale (VAS), tenderness, TMJ was examined for any swelling or erythema/redness, inflammation, pain during chewing, talking, swallowing or drinking water. Palpation of a joint being done while patient is closing and opens their mouth^{21,22,23}

0-10 Numeric Pain Rating Scale



Joint range of motion of cervical spine assessed by goniometer, Cervical spine was assessed on the basis of neck disability index scale^{19,20}, manual muscle testing was done for all cervical spine movements. In addition, mandibular movement (MM) was assessed by assessing the range of lower jaw movements by using ruler²³. jaw clicking was assessed, during opening & closing of the mouth any deviation is present or no. Once the assessment & examination was done both the groups had 20 participants each. Group A was the experimental group and group B was the control group. In group A experimental group there were 11 females and 9 males. In group B which was a control group there were a 13 females and 7males. For experiment group Craniosacral therapy was given for consecutive 2 weeks 6 times per week once per day which was followed by strengthening exercises. In the exercises we gave isometric exercise & resistance strengthening exercises for mandible depression, elevation & also range of motion exercise and strengthening exercises for cervical spine for about 4 weeks along with it posture correction exercises and home exercises program. For mandible depression therapist kept her fingers under the patient's chin and applied resistance, simultaneously we asked the patient to open their mouth against the resistance & hold it for 5seconds initially or according to patient comfort then progress to 10seconds hold time and same exercise repeat it for 10 times. Another exercises is for mandibular elevation , here we asked the patient to open their mouth as much as possible and comfortably without any discomfort or pain. Once patient's open their mouth widely the therapist kept their finger in between the chin and the lower lip & applied resistance in downward direction & simultaneously we had asked the patient to close their mouth against the resistance hold it initially for 5seconds or according to patient's comfort then progress to 10 seconds hold time and repeat the exercise for 10 times. In control group which was group B, there the patients had received ultrasound one session for 2 consecutive weeks that is 6 session per week. U.S in pulsed mode in acute case & on continuous mode in the chronic case along with it cryotherapy for acute pain and subacute pain to decrease inflammation, swelling, was given and for chronic pain moist pack was applied and once after 2weeks as pain subsides to 40% -50% same exercises protocol were started for group B as well. In both group patient received exercises like isometric exercise, range of motion exercises, resisted strengthening exercise for TMJ & cervical spine , posture correction exercises, home exercises & along with these protocol , advices was given to the patients to avoid chewing gum, avoid foods that are hard to chew, eating soft food, practice good posture, not chewing on the mouth or tongue, avoid opening of a mouth widely. Post treatment all the patients had been assessed once again.

RESULTS

Table 1: Comparison Of Group A And Group B With Gender

Sex	Group A	%	Group B	%	Total	%
Male	9	45.00	7	35.00	16	40.00
Female	11	55.00	13	65.00	24	60.00
Total	20	100.00	20	100.00	40	100.00

Chi-square=0.4170, p=0.5190

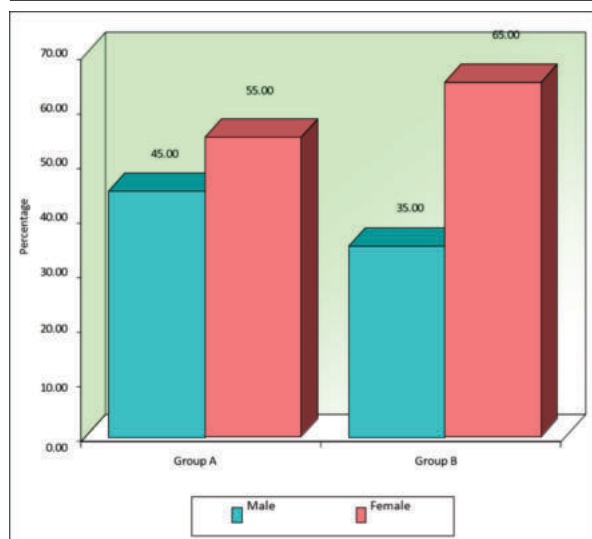


Figure1: Comparison Of Group A And Group B With Gender

Table 2: Comparison Of Group A And Group B With Age Groups

Age groups	Group A	%	Group B	%	Total	%
21-30yrs	5	25.00	3	15.00	8	20.00
31-40yrs	5	25.00	9	45.00	14	35.00
>=41yrs	10	50.00	8	40.00	18	45.00
Total	20	100.00	20	100.00	40	100.00
Mean	38.85		37.65		38.25	
SD	10.34		7.47		8.93	

Chi-square=1.8650, p=0.3940

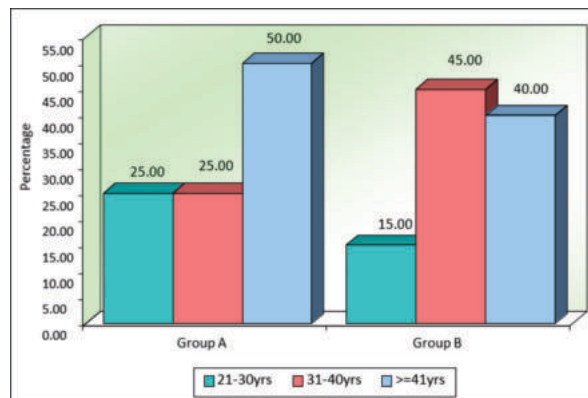


Figure 2: Comparison Of Group A And Group B With Age Groups

Table 3: Normality Of Pretest And Posttest Scores Of Neck Disability Index And Pain Scores In Group A And Group B By Kolmogorov Smirnov Test

Variables	Times	Group A		Group B	
		Z-value	p-value	Z-value	p-value
Neck disability index	Before	0.5470	0.9260	0.4810	0.9750
	After	0.7790	0.5780	0.6300	0.8230
	Difference	0.5250	0.9460	0.8080	0.5310
Pain (vas)	Before	0.9510	0.3270	0.8540	0.4590
	After	0.7180	0.6800	0.7200	0.6780
	Difference	1.7840	0.0030*	1.2690	0.0500*

*p<0.05

Table 4: Comparison Of Group A And Group B With Pre-test And Post-test Scores Of Neck Disability Index By Independent T Test

Times	Group A		Group B		t-value	p-value
	Mean	Std.Dev.	Mean	Std.Dev.		
Before	15.60	7.16	15.45	7.06	0.0667	0.9471
After	9.35	4.85	8.95	6.12	0.2292	0.8200
Difference	6.25	2.92	6.50	2.44	-0.2940	0.7703

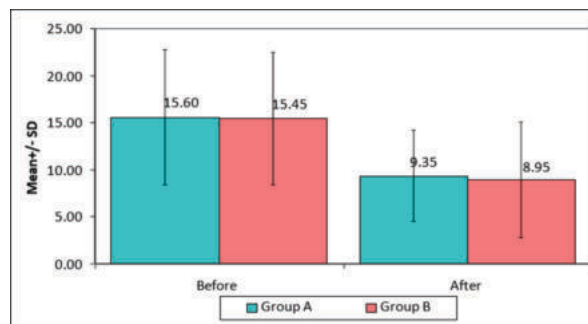


Figure 4: Comparison Of Group A And Group B With Pre-test And Post-test Scores Of Neck Disability Index.

Table 5: Comparison Of Pretest And Posttest Scores Of Neck Disability Index In Group A And Group B By Dependent T Test

Groups	Times	Mean	SD	Mean Diff.	SD Diff.	% of change	t-value	p-value
Group A	Before	15.60	7.16	6.25	2.92	40.06	9.5797	0.0001*
	After	9.35	4.85					
Group B	Before	15.45	7.06	6.50	2.44	42.07	11.9197	0.0001*
	After	8.95	6.12					

*p<0.05

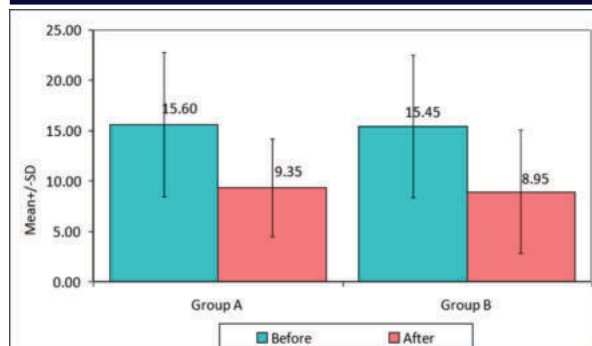


Figure 5: Comparison Of Pre-test And Post-test Scores Of Neck Disability Index In Group A And Group B

Table 6: Comparison Of Group A And Group B With Pre-test And Post-test Scores Of Pain (VAS) By Mann-whitney U Test

Times	Group A			Group B			U-value	Z-value	p-value
	Mean	SD	Mean rank	Mean	SD	Mean rank			
Before	6.50	1.19	17.35	7.30	1.30	23.65	137.00	-1.6906	0.0909
After	3.30	1.26	19.28	3.65	1.57	21.73	175.50	-0.6492	0.5162
Difference	3.20	0.52	17.03	3.65	0.67	23.98	130.50	-1.8665	0.0620

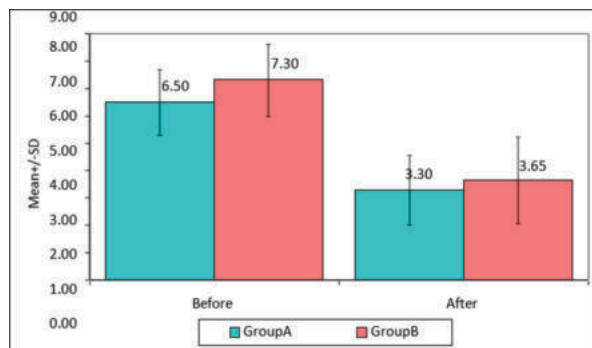


Figure 6: Comparison Of Group A And Group B With Pre-test And Post-test Scores Of Pain (VAS)

Table 7: Comparison Of Pre-test And Post-test Scores Of Pain (VAS) In Group A And Group B By Dependent T Test

Groups	Times	Mean	SD	Mean Diff.	SD Diff.	% of change	Z-value	p-value
Group A	Before	6.50	1.19	3.20	0.52	49.23	3.9199	0.0001*
	After	3.30	1.26					
Group B	Before	7.30	1.30	3.65	0.67	50.00	3.9200	0.0001*
	After	3.65	1.57					

*p<0.05

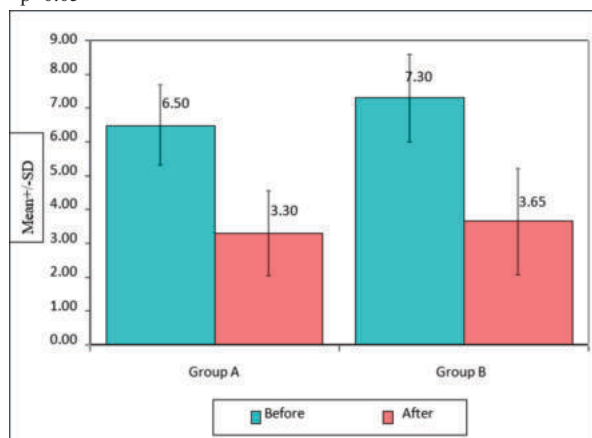


Figure 7: Comparison Of Pre-test And Post-test Scores Of Pain (VAS) In Group A And Group B

DISCUSSION

Table 1 explain about the Comparison of Group A and Group B with gender distribution. Table 1 depicts that there is no difference between Group A and Group B with gender distribution (Chi-square=0.4170, p=0.5190). Figure 1 represent the graphical representation of Comparison of Group A and Group B with gender distribution.

Table 2 depicts the Comparison of Group A and Group B with age groups. The table depicts that there is no difference between Group A and Group B with age groups distribution (Chi-square=1.8650, p=0.3940) with mean and SD is 38.85±10.34 for males and 37.65±7.47 for females. Figure 2 shows the graphical representation of comparison of group A and group B with the age groups.

Table 3 explain about the Normality of pre-test and post-test scores of Neck disability index and pain scores in Group A and Group B by Kolmogorov Smirnov test. This table depicts that, the pre-test and post-test scores of Neck disability index follow normal distribution. Therefore, the parametric tests were applied. But the pre-test and post-test scores of pain (VAS) follow not normal distribution. Therefore, the no parametric tests were applied.

Table 4 shows the Comparison of Group A and Group B with pre-test and post-test scores of Neck disability index by independent t test this table depicts that there is no significant difference was observed between Group A and Group B with pre-test scores of Neck disability index (t=0.0667, p=0.9471), post-test scores of Neck disability index (t=0.2292, p=0.8200). Also no significant difference was observed between Group A and Group B with changes in scores of Neck disability index from pre-test to post-test (t=0.2940, p=0.7703). Figure 4 depicts the graphical representation of Comparison of Group A and Group B with pre-test and post-test scores of Neck disability index scale.

Table no 5 shows Comparison of pre-test and post-test scores of Neck disability index in Group A and Group B by dependent t test this table depicts that there is a significant difference was observed between of pre-test and post-test scores of Neck disability index in Group A (t=9.5797, p=0.0001). It means that, a significant of 40.06% changes was seen in Neck disability index scores after post-test in Group A. Also there is a significant difference was observed between of pre-test and post-test scores of Neck disability index in Group B (t=11.9197, p=0.0001). It means that, a significant of 42.07% changes was seen in Neck disability index scores after post-test in Group B. We concluded that, the Group B is showing slight higher changes as compared to Group A in Neck disability index scores. Figure 5 depicts the graphical representation of Comparison of pre-test and post-test scores of Neck disability index in Group A and Group B

Table no 6 shows the comparison of group A and group B with pre-test and post test score of pain by VAS by Mann-Whitney U test according to the table it shows that there is no such significant difference was observed between Group A and Group B with pre-test scores of pain (VAS) (Z=-1.6906, p=0.0909), post-test scores of pain (VAS) (Z=-0.6492, p=0.5162). Also no significant difference was observed between Group A and Group B with changes in scores of pain (VAS) from pre-test to post-test (Z=-1.8665, p=0.0620). Figure 6 depicts the graphical representation of the Comparison of Group A and Group B with pre-test and post-test scores of pain VAS

Table no 7 explain the comparison of pre-test and post-test scores of pain by using VAS in group A and group B by dependent t test. Here the table depicts that there is a significant difference was observed between pre-test and post-test scores of pain (VAS) in Group A (Z=3.9199, p=0.0001). It means that, a significant of 49.23% changes was seen in pain (VAS) scores after post-test in Group A. Also there is a significant difference was observed between of pre-test and post-test scores of pain (VAS) in Group B (Z=3.9200, p=0.0001). It means that, a significant of 50.00% changes was seen in pain (VAS) scores after post-test in Group B. We can concluded that, the Group B is showing slight higher changes as compared to Group A in pain (VAS) scores. Figure 7 shows the graphical representation of Comparison of pre test and post test scores of pain (VAS) in Group A and Group B.

CONCLUSION

With this study we concluded that statistically both the groups A & group B showed improvement in the temporomandibular joint disorder/dysfunction & associated cervical spine disorder. Both the group A and group B showed similar effects. Both the treatment plan

can be recommended for the patients who is suffering from temporomandibular joint disorders/dysfunction, as symptoms have been decreased in both the groups. But Group B showed statistically slight higher changes with few percentage as compared to Group A in Neck disability index scores and VAS questionnaire scoring when assessed post treatment.

Abbreviations

CST- Craniosacral therapy
 US- Ultrasound therapy
 TMJ- Temporomandibular joint
 VAS- Visual analogue scale
 NDI- Neck disability index scale
 BMI- Body mass index
 MM- Mandibular movement
 RA- Rheumatoid arthritis

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