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Effectiveness of MET and Cyriax (Transverse Frictional Massage) on pain and function in patients with chronic plantar fasciitis: A comparative study

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Abstract

Objective: To compare the effectiveness of MET and Cyriax (Transverse Frictional Massage) on pain and function in patients with chronic plantar fasciitis.

Background: There is limited study available that supports that MET and Cyriax can be used in treatment of chronic plantar fasciitis.

Study Design: Comparative Study.

Methods: Ethical clearance was taken from college and consent was taken from the 40 subjects diagnosed with chronic plantar fasciitis and divided into 2 equal groups by random chit method. Pre and Post outcome measures of NPRS (Numerical Pain Rating Scale) for pain and FAAM (Foot and Ankle Ability Measure) for function were taken. Group A underwent MET and self-stretching and Group B underwent Cyriax and self-stretching. Self-stretching includes stretching of plantar fasciitis, gastrocnemius and soleus muscle.

Results: Mean values for NPRS was 2.3 ± 0.47 and 3 ± 0.45 for Group A and Group B respectively. Mean values for FAAM was 12.49 ± 5.95 and 20.05 ± 5.06 for Group A and Group B respectively.

Conclusion: In the present study it was found that Cyriax along with self-stretching was significantly more effective on pain and function than MET along with self-stretching in patients with chronic plantar fasciitis.

Keywords: Plantar fasciitis, MET, Cyriax (Transverse Frictional Massage), NPRS, FAAM

Introduction

- "Plantar Fasciitis" is used to describe a painful heel with inflammation of the plantar fascia at its origin, as opposed to the pain originating along the course of the fascia caused by repeated trauma [1].
- It is a thickened fibrous sheet of connective tissue that originates from the medial tubercle of the calcaneus and attaches to the plantar surface of the metatarsophalangeal joints [2].
- The condition is prevalent in both active and sedentary population of any age [1, 2, 4].
- It is more likely to occur in people who are obese, spend most of the day on their feet or have limited ankle dorsiflexion [1, 2, 4].
- It is the most common cause of heel pain with a lifetime prevalence of 10 percent and prevalence increases with age [1, 4].
- Numerous conservative treatments like stretching, strengthening and modalities have been used to relieve the symptoms of plantar fasciitis [1].
- MET is used in various musculoskeletal disorders for variety of purposes like lengthening of shortened structure, increasing range of motion and resolving trigger points as it utilizes isometric contraction of muscle for a brief period and causes post isometric relaxation [1].
- Cyriax originated from therapeutic friction massage advocated by James Cyriax [2].
- Cyriax's deep friction massage is theorized to make scar tissue more mobile, to facilitate healing through controlled micro trauma and to aid the alignment of soft tissue fibers to normal [2].
- Stretching exercises are effective in restoring or increasing the extensibility of muscle tendon unit and therefore regain and achieve the flexibility and range of motion required for necessary or desired functional activities [3].

2. Need of Study

- Lifetime prevalence of Plantar Fasciitis is 10% [1,4].
- There are a few studies available on effectiveness MET on pain and function in patients with chronic plantar fasciitis
- There are a few studies available on effectiveness Cyriax on pain and function in patients with chronic plantar fasciitis
- There are no studies on comparison of effectiveness of MET and Cyriax on pain and function in patients with chronic plantar fasciitis.
- Hence, the present study has been conducted.

3. Aim

- To compare the effectiveness of MET and Cyriax on pain and function in patients with chronic plantar fasciitis.

4. Objectives

- To compare the effect of MET and Cyriax on pain and function in patients with chronic plantar fasciitis at the end of 4 weeks.

5. Hypothesis

Null Hypothesis

- There will be no difference in the effect of MET and Cyriax on pain and function in patients with chronic plantar fasciitis.

Alternative Hypothesis

- H₁A: MET will be more effective than Cyriax on pain in patients with chronic plantar fasciitis
- H₁B: MET will be more effective than Cyriax on function in patients with chronic plantar fasciitis
- H₂A: Cyriax will be more effective than MET on pain in patients with chronic plantar fasciitis
- H₂B: Cyriax will be more effective than MET on function in patients with chronic plantar fasciitis

6. Materials

- Pen
- Paper
- Consent Form
- Numerical Pain Rating Scale
- Foot And Ankle Ability Measure (FAAM) Activities of daily living subscale

7. Methodology

- Study Type : Comparative Study
- Sample Size : 40
- Sampling Technique: Convenient
- Allocation Method: Random allocation with chit method.
- Study Population : Both males and females between the ages 30 to 50 years old diagnosed with plantar fasciitis.
- Study Setting : In and around clinics in the city
- Study Duration : Minimum 6 months
- Study Intervention : 3 days per week for 4 weeks

8. Inclusion Criteria

- Both males and females between the ages of 30 to 50

- years.
- NPRS between 3 to 7
- Pre diagnosed cases of Plantar Fasciitis having symptoms for more than 4 weeks.
- Not undergoing any other concurrent treatment.

9. Exclusion Criteria

- History of fracture or trauma in ankle or foot within past 6 months
- Previous surgery for foot or ankle complex
- Red Flags: Tumors, RA, OA and severe vascular diseases
- Congenital deformity of foot or ankle.
- Spasticity throughout the lower body.
- Subjects with referred pain due to sciatica or any other neurological disorders.

10. Procedure

Ethical clearance was taken from the ethical committee of the college.

Subjects were selected according to the inclusion and exclusion criteria from clinics in and around the city.

Subjects were explained about the study. Consent was taken from the patient who wished to participate in the study.

Subjects were divided into two groups Group A and Group B by random allocation by chit method.

Subjects were assessed pretreatment and NPRS and FAAM scores were recorded.

Subjects in Group A underwent MET for gastrocnemius and soleus muscle and self- stretching for plantar fascia, gastrocnemius and soleus muscle.

Subjects in Group B underwent Cyriax for plantar fascia and calf muscles and self-stretching for plantar fascia, gastrocnemius and soleus muscle.

Treatment for both groups was given 3 days per week for 4 weeks.

Post treatment NPRS and FAAM scores were recorded.

Group A	Group B
MET for gastrocnemius and soleus muscle given for a set of 5 repetitions 3 days a week for 4 weeks.	Cyriax given over plantar fascia and calf muscles for 10 minutes, 3 days a week for 4 weeks.
Self-stretching was taught for plantar fascia, gastrocnemius and soleus muscle with 3 repetitions and 20 seconds hold, done 3 days a week for 4 weeks.	Self-stretching was taught for plantar fascia, gastrocnemius and soleus muscle with 3 repetitions and 20 seconds hold, done 3 days a week for 4 weeks.

11. Interventions

Muscle energy technique

For gastrocnemius muscle, the subject was in supine position keeping the knee fully extended and the therapist on the affected side in walking position. The subject's ankle joint was dorsiflexed until a resistance was felt and was asked to hold this position and exert 20% of force towards plantar flexion for a period of 5 to 7 seconds. Then resistance was released and relaxation for a period of 5 seconds was given during which the ankle will be passively dorsiflexed to a new barrier. A set of 5 repetitions is given.



Image 1: Muscle energy technique for Gastrocnemius

For soleus muscle, the subject was in supine position keeping the knee slightly flexed and the therapist on the affected side in walking position. The subject's ankle joint was dorsiflexed until a resistance was felt and was asked to hold this position and exert 20% of force towards plantar flexion for a period of 5 to 7 seconds. Then resistance was released and relaxation for a period of 5 seconds was given during which the ankle will be passively dorsiflexed to a new barrier. A set of 5 repetitions is given.



Image 2: Muscle Energy Technique for Soleus

Cyriax

The subject was in comfortable position and therapist beside the subject. The massage involved pressure from the therapist's finger applied transversely to the involved tissue. The proper location was found through proper evaluation and palpation of specific tendon, ligament or muscle. The friction massage was given across the affected fibers. The therapist's finger and the subject's skin must move together as one. The friction massage was sweep and deep enough. The transverse friction massage was given vigorously and some discomfort was caused for a few minutes which reduced by a gentle start. It was given for 10 minutes thrice per week for 4 weeks over plantar fascia and calf muscles.



Image 3: Cyriax over plantar fascia



Image 4: Cyriax over calf muscles

Self-stretching

The subject was advised to be in cross sitting position with affected leg on the contra lateral leg and holding the ball of the foot by one hand and by the other hand pulling the toe back towards the shin until stretch was felt in the arch or plantar fascia.



Image 5: Plantar Fascia Stretch

For gastrocnemius stretch, the patient was told to lean forward, while keeping the heel on the ground and keeping the knee straight. For soleus muscle, the patient was told to lean forward, keeping the heel on the ground but the knee is bent.



Image 6: Gastrocnemius stretch



Image 7: Soleus Stretch

12. Outcome Measures

- Numerical Pain Rating Scale (NPRS)
Reliability and validity of NPRS
Reliability = 0.96 and 0.95
Validity = 0.86 to 0.95
- Foot And Ankle Ability Measure (FAAM) Activities Of Daily Living Subscale
Reliability and validity of FAAM
Reliability = 0.89
Validity = <0.05

13. Review of Literature

- Bibhuti Sarkar *et al.* [1] studied efficacy of MET as compared to Myofascial Trigger Point Release in Chronic Plantar Fasciitis. A total number of 45 subjects of chronic plantar fasciitis were include both males and females. Group A was given MET along with self-stretching. Group B was given MTrP release along with self-stretching. Group C received 12 sessions of self-stretching. The treatment was given over period of 4 weeks. Outcome measures VAS for pain and for function FFI was used pre and post treatment. The study concluded that MET and Myofascial Trigger Point release along with stretching exercises are effective in reducing pain, improving pressure tolerance and improving function in subjects with chronic plantar fasciitis.
- Trupti Rasal *et al.* [2] studied the effect of Cyriax on pain and function in patients with plantar fasciitis in a RCT study. A total number of 30 diagnosed subjects both males and females were included. Group A was given Cyriax 3 days per week along with stretching, strengthening and ultrasound. Group B was given conventional treatment 3 days per week. Outcome measures used were NPRS for pain and FAAM for function used pre and post treatment. The study concluded that Cyriax was more effective on pain and conventional therapy was more effective on function in patients with plantar fasciitis.
- Renin Ordine *et al.* [3] studied the effectiveness of Myofascial Trigger point manual therapy along with self-stretching for plantar heel pain in a RCT study. A total number of 60 subjects were included both males

and females. Group A was given self-stretching protocol. Group B was given self-stretching protocol along with MTrP. Mixed model ANOVA'S (pain and function) were used to examine the effects of each intervention after the period of 1 month. The study concluded that MTrP along with self-stretching was more effective on pain and function in subjects with plantar heel pain.

- Charles Cole *et al.* [4] gave a evidence based review of diagnosis and therapy on plantar fasciitis. Plantar Fasciitis causes heel pain in active as well as sedentary adults of all ages. It occurs in people who have long standing jobs and limited dorsiflexion as well as more likely to occur in people who are obese. Interventions like stretching, shoe inserts, steroid injections may be beneficial. It is believed that the pain is caused by acute or chronic injury to origin of plantar fascia caused by cumulative overload stress.
- Avnee Sarin *et al.* [5] studied the effectiveness of Cyriax Manual Therapy Vs. Muscle Energy Technique in subjects with Tennis Elbow on pain, grip strength and functional disability. A total number of 45 subjects were included and divided in three groups, where Group A received ultrasound, static stretching and eccentric exercises, Group B received ultrasound, Cyriax, static stretching and eccentric exercises and Group C received ultrasound, MET, static stretching and eccentric exercises for 2 weeks. The study concluded that Cyriax and MET are equally effective in decreasing pain, functional disability and increasing grip strength in subjects with Tennis elbow.

14. Discussion

In the present study, 40 subjects both males and females between the age of 30 to 50 years were selected according to the inclusion and exclusion criteria. The selected subjects were divided into 2 groups Group A and Group B by random allocation by chit method.

Group A received Muscle Energy Technique for gastrocnemius and soleus muscle and self-stretching for plantar fascia, soleus and gastrocnemius muscle. Group B received Cyriax over plantar fascia and calf muscles and self-stretching for plantar fascia, soleus and gastrocnemius muscle. Both groups received treatment for 4 weeks, thrice each week.

The pre and post outcome measures used were Numerical Pain Rating Scale (NPRS) for pain and Foot And Ankle Ability Measure (FAAM) Activities of Daily Living Subscale for function.

In Group A, it was observed that Muscle Energy Technique along with self-stretching when given for 4 weeks is effective on both pain and function in patients with chronic plantar fasciitis. The pre and post scores of NPRS and FAAM show considerable difference.

MET utilizes isometric contraction of muscle for a brief period, which is sensed within the Golgi tendon organs which transmits impulses to the posterior horn cells and has inhibitory effect at the anterior horn cell which causes a reduction in motor impulses and relaxation occurs improving the resting length of hyperactive muscle. This helps in relaxing the calf muscles and reduces load on plantar fascia which might have helped in improving function.

According to McPartland JM *et al.* MET releases endogenous cannabinoids which bind to cannabinoid receptors in the brain and produces reduction in pain perception which might have reduced the pain.

Self-stretching of plantar fascia, gastrocnemius and soleus muscle reduces tightness of fascia, muscles and increases the mobility of the muscles. Digiovanni BF, recorded that stretching increases elasticity and reduces excessive load on plantar fascia improving function and reducing pain.

In Group B, it was observed that Cyriax along with self-stretching when given for period of 4 weeks is effective in treatment of chronic plantar fasciitis as considerable difference was seen in the pre and post scores of NPRS and FAAM.

Cyriax is a soft tissue manipulation technique employed by Cyriax and Russell to reach the musculoskeletal structures, ligaments, tendons, etc. The purpose of the technique is to maintain mobility within the soft tissue structure of ligaments, tendons and prevent adherent scar formation.

The friction massage provides movement to the affected tissue itself and produces traumatic hyperemia and also encourages realignment and lengthening of fibers.

As per studies by Ashley Aisle, traumatic hyperemia results in enhancement of blood supply to the area which diminishes the pain by increasing the speed of destruction of Lewis P substance. Lewis P substance is a neuropeptide which acts as a mediator of pain transmission in CNS. So its destruction might lead to the reduction of pain and the subsequent reduction in pain intensity might have helped in improving the function.

The pre and post treatment scores of NPRS and FAAM were statistically analyzed and compared. For, intragroup pre and post outcome measure values of NPRS Wilcoxon Signed Rank Test was used and for FAAM, paired t test was used. For intergroup pre and post outcome measure values of NPRS Mann Whitney Rank Test was used and for FAAM unpaired t test was used.

Mean values for NPRS was 2.3 ± 0.47 and 3 ± 0.45 for Group A and Group B respectively. The obtained p value was $p < 0.0001$ (extremely significant) Mean values for FAAM Questionnaire was 12.49 ± 5.95 and 20.05 ± 5.06 for Group A and Group B respectively. The obtained p value was $p < 0.0001$ (extremely significant)

The result shows that both Muscle Energy Technique and Cyriax along with self-stretching are highly effective in reducing pain and improving function in patients with chronic plantar fasciitis but when compared Cyriax along with self-stretching is more effective in treatment of chronic plantar fasciitis.

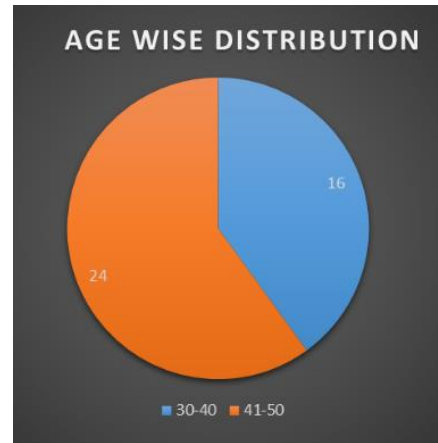
15. Conclusion

In the present study, according to the results, it is proved that MET and Cyriax are both effective on pain and function in patients with chronic plantar fasciitis but when compared Cyriax proved to be more effective on pain and function in patients with chronic plantar fasciitis.

16. Statistical Analysis

Table 1: Age wise distribution of data

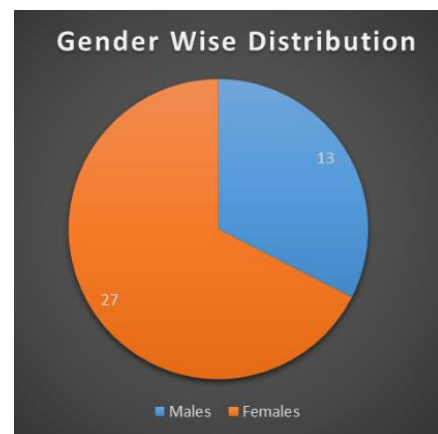
Age Wise Distribution	Number
30 – 40	16
41 – 50	24



Pie Chart 1: Age wise distribution of data

Table 2: Gender wise distribution of data

No of Males	No of Females
13	27

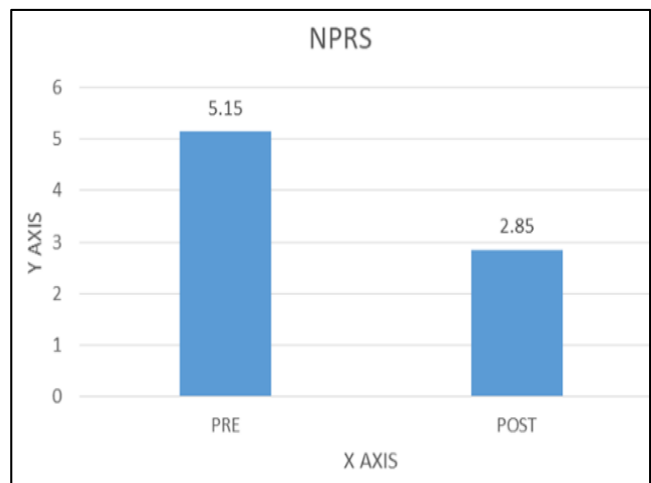


Pie Chart 2: Gender Wise Distribution

Graph showing NPRS values of Group A

Table 3: Pre and Post treatment scores of NPRS of Group A

	Pre	Post
Mean	5.15	2.85
SD	1.137	1.309
P Value	$P < 0.0001$	

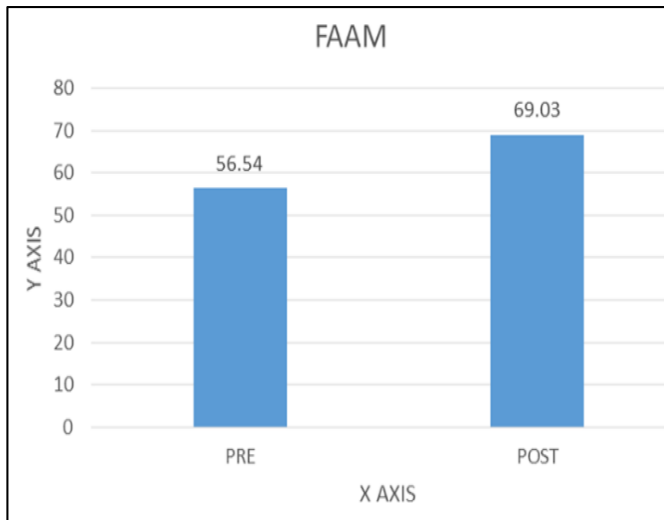


Graph 1: Graph showing Pre and Post Treatment scores of NPRS Group A

Graph showing FAAM values of Group A

Table 4: Pre and Post treatment scores of FAAM of Group A

	Pre	Post
Mean	56.54	69.03
SD	8.378	6.562
P Value	<0.0001	

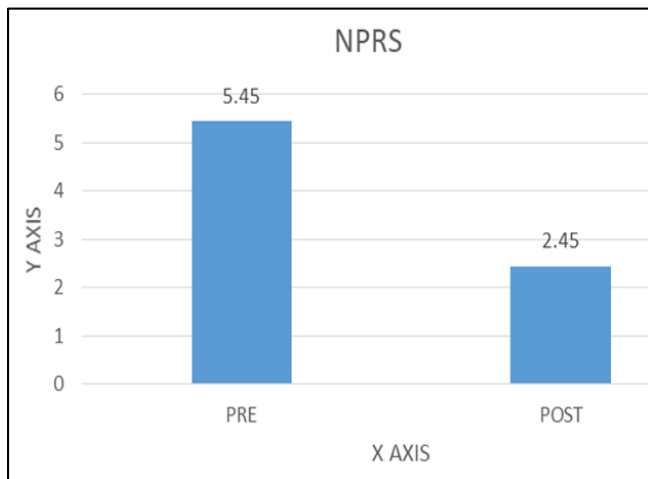


Graph 2: Graph showing Pre and Post treatment scores of FAAM of Group A

Graph showing NPRS values of Group B

Table 5: Pre and Post Treatment scores of NPRS of Group B

	PRE	POST
Mean	5.45	2.45
SD	1.099	1.099
P Value	<0.0001	

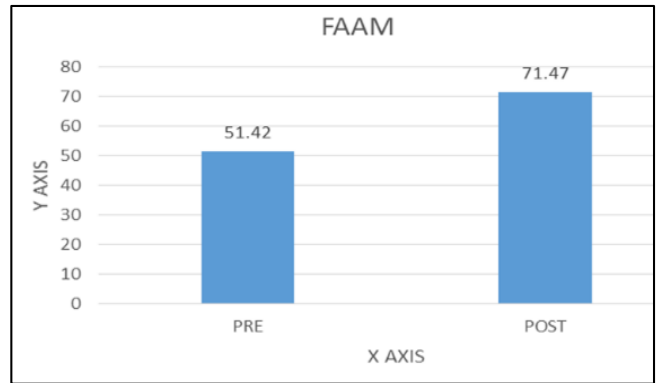


Graph 3: Graph showing Pre and Post treatment scores of NPRS of Group B

Graph showing FAAM values of Group B

Table 6: Pre and Post Treatment scores of FAAM of Group B

	PRE	POST
Mean	51.42	71.47
SD	8.218	7.174
P Value	<0.0001	

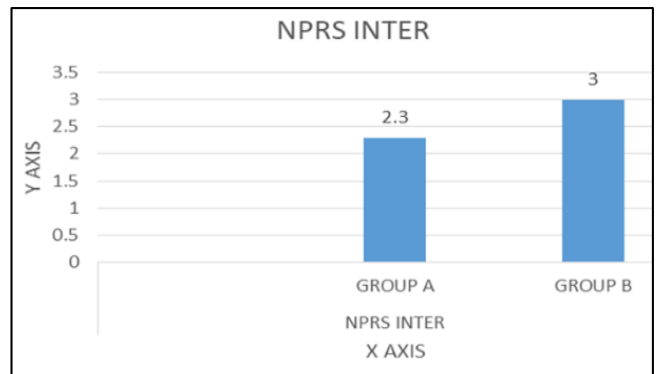


Graph 4: Graph showing Pre and Post treatment scores of FAAM of Group B

Graph showing NPRS value of Group A and Group B

Table 7: Values of post treatment scores of NPRS of Group A and Group B

	Group A	Group B
S Mean	2.3	3
SD	0.4702	0.4588
P Value	<0.0001	

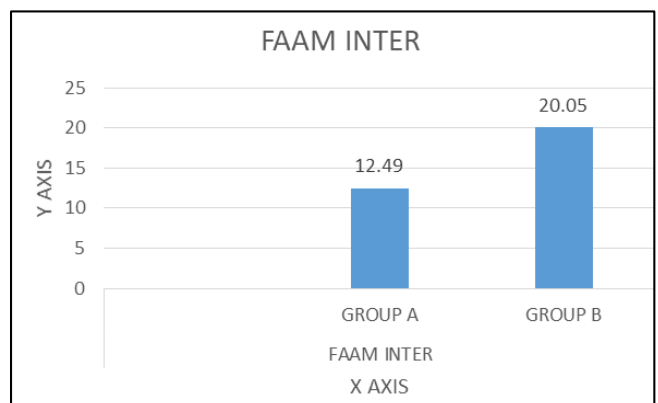


Graph 5: Graph showing values of post treatment scores of NPRS of Group A and Group B

Graph showing FAAM values of Group A and Group B

Table 8: Values of post treatment scores of FAAM of Group A and Group B

	Group A	Group B
Mean	12.49	20.05
SD	5.954	5.067
P Value	<0.0001	



Graph 6: Graph showing values of post treatment scores of FAAM of Group A and Group B

17. Result

- The present study conducted to compare the effect of MET and Cyriax on pain and function in patients with chronic plantar fasciitis. The statistical analysis was done using using Primer of Biostatistics version 7.0. The intra group analysis of NPRS was done using Wilcoxon Rank Test and FAAM was done using paired t test. The inter group analysis of NPRS was done using Mann-Whitney test and FAAM was done by unpaired t test.
- Mean values for NPRS was 2.3 ± 0.47 and 3 ± 0.45 for Group A and Group B respectively. The obtained p value was $p < 0.0001$ (extremely significant) Mean values for FAAM Questionnaire was 12.49 ± 5.95 and 20.05 ± 5.06 for Group A and Group B respectively. The obtained p value was $p < 0.0001$ (extremely significant)

18. Limitations

- Study has a small sample size
- Ankle ROM was not taken into consideration

19. Future Scope

- The study can be conducted separately in males and females.
- Further studies with larger sample size can be conducted.
- Study can be conducted in a particular profession.

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