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Immediate Effects of Instrument Assisted Soft Tissue Mobilization on Pain, Flexibility and Balance in Housewives Having Foot Pain

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ABSTRACT

Background: Instrument-Assisted Soft Tissue Mobilization (IASTM) is modern, non-invasive treatment that acts as possible therapeutic approach for musculoskeletal issues. Research is essential to enhance the understanding of IASTM's therapeutic capabilities, to establish a strong evidence foundation to validate its immediate advantages & to advance the clinical management of foot pain, aiding a significant & frequently overlooked demographic population.
Method: Study conducted on 40 Housewives (Ahmedabad) having generalized foot/heel pain. Pre-intervention pain was assessed with NPRS, flexibility was evaluated by measuring ankle dorsiflexion and plantarflexion through goniometry and balance was tested using Timed-Up and Go test. IASTM was administered using EDGE Tool over calf region for 5-7 minutes, 30 strokes over each leg. Post intervention, the data was gathered once again utilizing the previously referenced methods.
Result: The mean age of participants was 38.9±6.9 years. Statistically significant differences were identified pre and post intervention &are as follows: NPRS=3.57º; Right Dorsiflexion=3.15º; Right Plantarflexion=4.52º; Left Dorsiflexion=3.17º; Left Plantarflexion=4.1º; TUG=1.22 seconds. On comparison, significant improvements are evident in all pre-post outcomes assessed ($p<0.001$).
Conclusion: These preliminary findings suggest that IASTM does produce an immediate effect in alleviating pain, enhancing flexibility and aiding balance in housewives experiencing foot pain.

Keywords: IASTM; Foot Pain; Flexibility; Balance; Housewives

INTRODUCTION

Domestic tasks encompass a wide range of activities that are essential for maintaining a household, including cleaning, cooking, mopping, organizing, and acquiring essential supplies. These tasks can consume a significant portion of an individual's day, often requiring considerable physical, emotional, and cognitive effort. According to the World Health Organization, women make up 42% of the global workforce, with a higher likelihood of being employed in

informal sectors, including domestic work, agriculture, and handicrafts. In India, over 60% of women are predominantly involved in domestic labour. [(1)]

Foot discomfort is a common ailment that can greatly hinder daily routines, especially for those who are on their feet for extended periods. For homemakers, the demands of household tasks, extended standing, and inadequate footwear can result in persistent foot discomfort, often manifesting in conditions such as plantar fasciitis, heel spurs, and Achilles tendinitis. This discomfort not only restricts movement but also diminishes overall quality of life, leading to challenges with flexibility and balance. Therefore, it is essential to explore effective treatment strategies to alleviate symptoms and enhance functional capabilities. This study is essential to fill the existing gap in knowledge regarding the efficacy of IASTM and on its potential as a quick and effective therapeutic modality. Research is needed to evaluate the immediate effects of IASTM on an overlooked population as the subject is quite untrodden.

Instrument-Assisted Soft Tissue Mobilization (IASTM) is a form of myofascial therapy aimed at soft tissue mobilization, drawing on the principles of cross-friction massage developed by James Cyriax. [(2)] It is a modern, non-invasive treatment that acts as possible therapeutic approach for musculoskeletal issues. The main objective of IASTM is to enhance tissue flexibility, reduce pain, and accelerate recovery by disrupting adhesions and boosting circulation. Despite the increasing amount of evidence backing the advantages of IASTM in musculoskeletal rehabilitation, there is still a lack of research on its immediate impact on pain reduction, flexibility, and balance—especially in housewives, a demographic often neglected. IASTM utilizes a stainless-steel tool designed with a beveled edge, tailored for various anatomical regions. Featuring both concave and convex surfaces, this instrument is adept at targeting specific areas of the body. The technique involves applying multidirectional strokes to the skin at an angle of 30° to 60° over the impacted soft tissue, effectively addressing restrictions within the fascia and surrounding lesions. This approach elicits a localized inflammatory response, thereby kickstarting the healing process. [(3)] The aim of the study is to assess and comprehensively understand the immediate effects of IASTM on pain, flexibility and balance in housewives having foot pain. The objectives of this study are to determine the immediate effect of IASTM on pain by NPRS, to determine the immediate effect of IASTM on flexibility by ankle ROM and to determine the immediate effect of IASTM on balance by TUG test in housewives having foot/heel pain.

MATERIALS & METHODS

This study is experimental, involving a selection of 40 housewives from Ahmedabad city who experience generalized pain in the foot and heel. The participants were chosen through a random sampling method. The mean age of participants was 38.9±6.9 years.

Inclusion Criteria includes housewives with age between 30-50 years, with pain around heel area or foot region with NPRS at present from 4-7 and having 4-5 standing hours each day.

Exclusion criteria include housewives with severe or past history of ankle injury, with any knee or hip injury or have undergone any surgical procedure and the ones having LLD.

The study utilized several materials, including the IASTM EDGE Tool, a universal half-circle goniometer, a plinth, as well as pen and paper for documentation purposes.

A total of 40 participants expressed their willingness to take part in the study. Informed consent was obtained from each individual. All subjects underwent screening based on established inclusion and exclusion criteria, which involved a comprehensive assessment of their pain

history. The objectives of the study and the procedures involved were clearly communicated to the participants in their native language before the commencement of the study. Prior to the intervention, the subsequent outcomes were evaluated.

The primary outcome was Pain as assessed with NPRS (Numeric Pain Rating Scale). Secondary outcomes included were Flexibility, evaluated by measuring ankle dorsiflexion and plantarflexion through goniometry and Balance was tested using Timed-Up and Go test. Patient position to be attained is prone with feet outside the plinth. Therapist position should be at the edge of plinth. Apply a cream or moisturizer to the affected area initially. Apply gentle, light strokes with minimal pressure, moving from distal to proximal maintaining the instrument at an angle of 30 to 60 degrees. IASTM was administered using EDGE Tool over calf region. Application time was of 5-7 minutes including 30 strokes over each leg.

STATISTICAL ANALYSIS

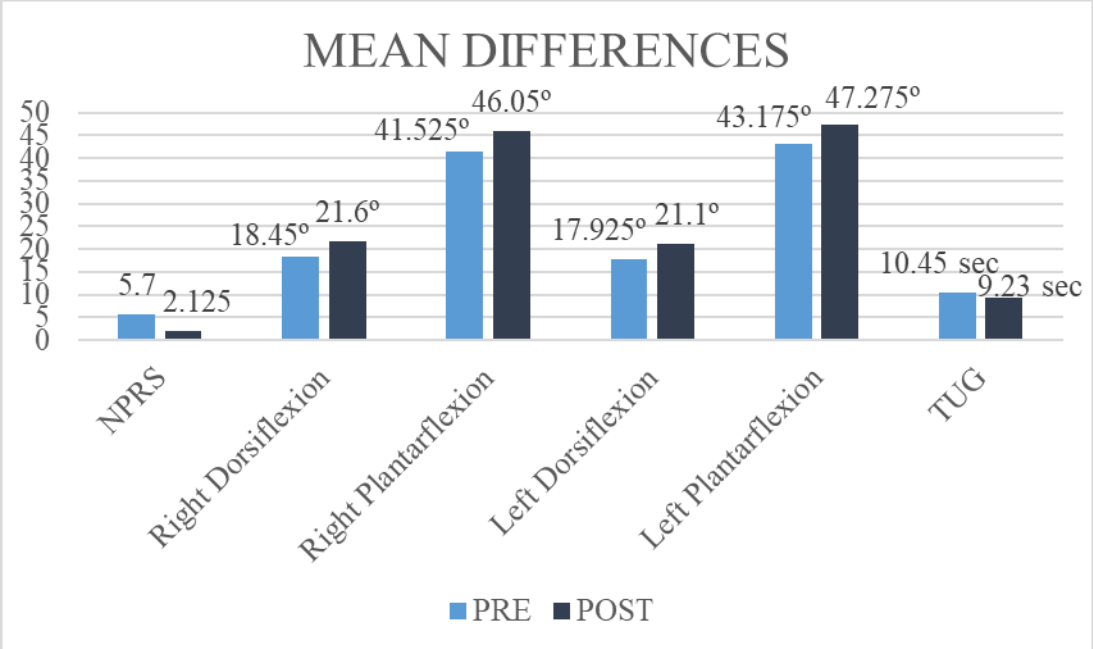
Post intervention, the data was gathered once again utilizing the previously referenced methods. Data that was gathered, was analyzed with the use of SPSS software (version 27.0). The research study achieved a zero dropout rate, indicating that all participants completed the study, ensuring a complete data set. Suitable statistical tests depending upon the distribution of the data were applied. Normality of the data of pain, range of motion and TUG scores was tested using Shapiro-Wilk test. Since most of the data was not normally distributed for all the outcome measures, statistical analysis was done using non-parametric tests, i.e for within group comparison was done using Wilcoxon signed Rank test.

RESULT

On comparison, significant improvements are evident in all pre-post outcomes assessed. The results show that Instrument Assisted Soft Tissue Mobilization is statistically significant in improving the pain, range of motion and TUG scores. ($P<0.001$).

VARIABLE	MEAN & SD
AGE	38.9750±6.98896
STANDING HOURS	5.2750±1.01242
PRE NPRS	5.7000±1.38119
PRE TUG	10.4568±1.23005

Table 1 – Baseline characteristics



Graph 1- It illustrates the average differences in pre- and post-assessments of the NPRS, Ankle Range of Motion (ROM), and Timed Up and Go (TUG) test results for all participants.

Statistically significant differences identified pre and post intervention are:

GROUP (n=40)		MEAN±SD	z value	p value
NPRS	Pre	5.7000±1.38119	-5.641	<.001
	Post	2.1250±.91111		
Ankle ROM	Pre Right DF	18.4500±1.72389	-5.484	<.001
	Post Right DF	21.6000±1.27702		
	Pre Right PF	41.5250±3.55172	-5.391	<.001
	Post Right PF	46.0500±3.50055		
	Pre Left DF	17.9250±2.34671	-5.550	<.001
	Post Left DF	21.1000±1.73649		
	Pre Left PF	43.1750±2.79090	-5.469	<.001
	Post Left PF	47.2750±2.74551		
TUG	Pre	10.4568±1.23005	-5.511	<.001
	Post	9.2338±1.14958		

Table 2 – Within Group Average Change Scores
DF=Dorsiflexion & PF=Plantarflexion

DISCUSSION

The aim of this study was to evaluate the short-term effects of Instrument Assisted Soft Tissue Mobilization on housewives experiencing foot pain. The study included a sample size of 40 participants. Pain levels were measured using the Numeric Pain Rating Scale (NPRS), while a goniometer was employed to assess the range of motion in ankle dorsiflexion and plantarflexion. Additionally, the Timed Up and Go (TUG) test was utilized to evaluate balance and functional mobility. Data collection and analysis were conducted using non-parametric statistical methods, specifically the Wilcoxon Signed Rank Tests.

The findings suggest that IASTM provides promising results in these domains, though there are several key points to consider when interpreting the data.

Graph 1 shows the significant decrease in pre (mean-5.7) and post (mean-2.125) scores on NPRS after application of IASTM. The discovery of pain is in line with previous research by Bhurchandi *et al.* illustrating the efficacy of IASTM in decreasing pain in different musculoskeletal disorders. [4]

Graph 1 indicates a notable enhancement in pre (mean-18.45º) post (mean-21.6º) on right side and pre (mean-17.925º) and post (mean-21.1º) on left side ankle dorsiflexion range of motion after the application of instrument assisted soft tissue mobilization. Additionally, there was a significant improvement in pre (mean-41.525º) and post (mean-46.05º) on right side and pre (mean-43.175º) and post (mean-47.275º) on left side ankle plantarflexion range of motion after giving instrument assisted soft tissue mobilization. The increased flexibility is possibly due to the mechanical impact of IASTM on the fascial and muscular tissues of the foot, which may help in aligning collagen fibers and decreasing fascial tension and is similar to that in the study reported by Koumantakis *et al.* [5]

Further analysis of Graph 1 interprets a significant reduction in the time taken to complete the TUG test, with pre-test (mean-10.45 seconds) and post-test (mean-9.23 seconds). Additionally, the greater flexibility and mobility of the foot following IASTM therapy could have enabled improved activation of the muscles responsible for maintaining balance and restoration of optimal movement patterns could have contributed to greater stability during dynamic and static balance tasks. Our findings were in agreement with the study done by Christine *et al.* [6]

IASTM is a specialized therapeutic technique that employs specific instruments to engage the skin, myofascia, muscles, and tendons through various direct compressive stroke methods. This approach activates the A-beta sensory fibers, which in turn inhibit the transmission of pain signals carried by

the A-delta and C-fibers. According to the pain gate control theory, when these sensory fibers are activated, the pathway for pain transmission is effectively closed. This mechanism prevents the release of substance P from pain receptors through presynaptic inhibition at the dorsal horn. This is similar to the study by Page *et al.* [7]

IASTM exerts a neurophysiological influence by activating mechanosensitive neurons via skin deformation induced by the instrument. These mechanosensitive neurons encompass mechanoreceptors, which facilitate two-point discrimination, and mechano-nociceptors, which are integral to pain perception. The application of IASTM alters the neural activity of larger mechanoreceptor neurons, thereby impacting two-point discrimination capabilities. This process enhances local tactile sensitivity through the stimulation of mechanoreceptors and results in a reduction of the pain pressure threshold, indicating that gentle IASTM modulates the activity of nociceptors, which are smaller pain fibers. A similar finding has been reported by Ge W *et al.* [8]

The primary objective of Instrument Assisted Soft Tissue Mobilization (IASTM) is to eliminate scar tissue and facilitate a return to normal function after soft tissue healing. The application of appropriate pressure and shear forces during IASTM can lead to microvascular and capillary hemorrhage, as well as localized inflammation. This inflammatory response initiates the healing process by breaking down scar tissue and releasing adhesions, while simultaneously enhancing blood flow and nutrient delivery to the affected area, promoting fibroblast migration. IASTM enhances the flexibility of soft tissues by addressing restrictions, and the friction generated by the instrument reduces tissue viscosity, resulting in a softer texture. From a physiological standpoint, this reduction in viscosity contributes to improved range of motion (ROM). Additionally, when mechanical stress is applied to the muscle fascia, it stimulates intrafascial mechanoreceptors, which modifies the proprioceptive feedback to the central nervous system, subsequently adjusting the tension in the associated motor units. Kim J *et al.* and Tang S *et al.* showed a similar result. [9,10]

The primary constraint of this study was its reliance on a limited sample size, focusing solely on the immediate impacts on pain, range of motion, and functional ability, without addressing the long-term effects. Future research should explore the prolonged effects of IASTM and include a diverse range of age groups from similar professions.

CONCLUSION

These preliminary findings suggest that Instrument assisted soft tissue mobilization does produce an immediate effect in alleviating pain, enhancing flexibility and aiding balance in housewives experiencing foot pain.

Limitations

The primary constraint of this study was its reliance on a limited sample size, focusing solely on the immediate impacts on pain, range of motion, and functional ability, without addressing the long-term effects. Future research should explore the prolonged effects of IASTM and include a diverse range of age groups from similar professions.

Future Studies

A state-level survey can be conducted to assess the immediate effects of IASTM on pain, flexibility and balance in housewives having foot pain on a large scale.

Abbreviations

IASTM – Instrument Assisted Soft Tissue Mobilization
NPRS – Numeric Pain Rating Scale
ROM – Range of Motion
DF – Dorsiflexion
PF – Plantarflexion
TUG – Timed-Up and Go Test

Declaration by Authors

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