International Journal of Physical Education, Sports and Health 2022; 9(3): 235-239

P-ISSN: 2394-1685
E-ISSN: 2394-1693
Impact Factor (RJIF): 5.38
IJPESH 2022; 9(3): 235-239

www.kheljournal.com
Received: 22-03-2022
Accepted: 24-04-2022

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Prevalence of medial tibial stress syndrome [MTSS] in secondary high school sports players

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DOI: https://doi.org/10.22271/kheljournal.2022.v9.i3d.2543

Abstract
Background: Medial Tibial Stress Syndrome [MTSS] is a lower limb injury related to repetitive overuse of shin muscles. Some known assessment tools for diagnosis of MTSS are manual muscle testing for strength of soleus, tibialis posterior muscle and universal goniometer for ankle – range of motion. Previous studies have also concluded association of foot pronation with MTSS.
Objective: The objective of this study was to check prevalence of MTSS in group of secondary high school sports players, to compare if prevalence was more in males or females and check association between foot posture and MTSS.
Materials and Method: 60 participants of age group 12- 15 years were selected according to inclusion criteria of which 30 were males and 30 were females. The purpose of study and procedure to be done was explained to participants as well as guardian and informed consent was taken from both. The outcome measures i.e ankle- range of motion, manual muscle testing for soleus and tibialis posterior and Foot posture index were assessed bilaterally. The scores were recorded and hence analyzed.
Result: Out of 60 participants 31 were positively diagnosed for MTSS 24 were negative and 5 were excluded. Post assessment we found that prevalence of MTSS was more in males (59.2%) as compared to females (53.5%). Our records resulted that pronatory foot type is notably associated with MTSS. The p value for ankle ROM plantarflexion was 0.075 and for dorsiflexion was 0.58. The p value for soleus strength score was 0.0001 and we observed that strength for tibialis posterior was not significantly reduced.

Keywords: Medial tibial stress syndrome (MTSS), ankle-range of motion, (rom), pronation, soleus

Introduction
Medial tibial stress syndrome [MTSS] is one of the most common lower extremity overuse sports injuries with incidence of 4%-19% in athletes and 4%-35% in military population. MTSS causes periostitis at the posteromedial border of distal tibia. Periostitis is tearing away of muscle fibers at muscle bone interface causing inflammation. It can be a debilitating injury in long distance runners with incidence rate ranging from 13.6% to 20.2% and prevalence of 9.5%. The American Medical Association defined MTSS as 'pain and discomfort in the leg from repetitive running on hard surfaces or forcible, excessive use of foot flexors'. Bruckner and Kahn described it as 'A more descriptive term that explains the inflammatory traction event in the tibial aspect of the common leg in the runners is the medial periostitis of the tibial traction or simply the tibial periostitis medial'. As soleus muscle fibers insert 4 inches proximal to the medial malleolus and tibialis posterior origin 7.7 cm proximal to medial malleolus it participates in traction theory and hence causes MTSS pain [16]. Pronation of foot is one of the clinical features for diagnosis of MTSS. Pronation of foot is one of the clinical features for diagnosis of MTSS.

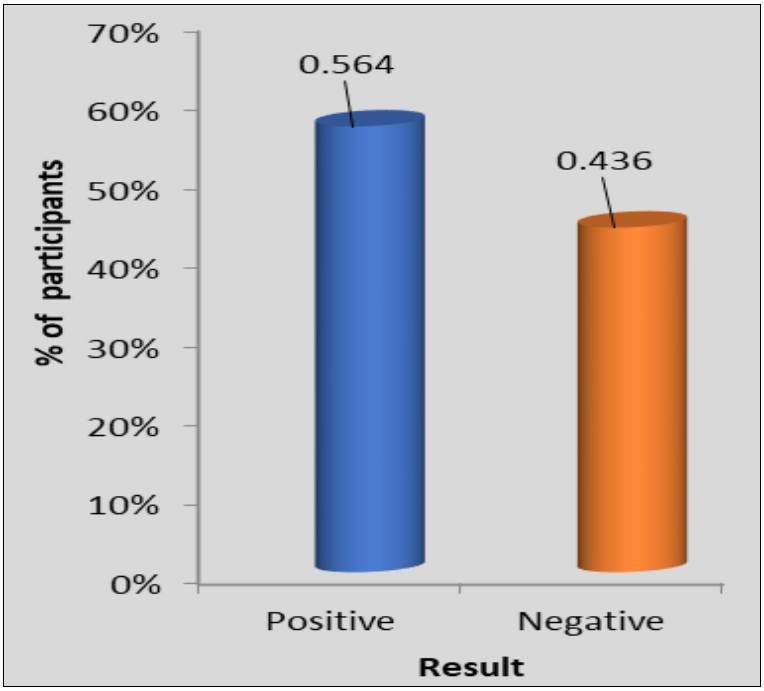
Materials and Methods
A cross sectional analytical study was conducted in in Dr. APJ Abdul Kalam College of Physiotherapy. Study duration was 6 months with sample size of 60 of which 30 were males and 30 were females. Study design was prepared and approval was taken from institutional ethical committee.

Selection was done by simple random sampling. After screening with inclusion and exclusion criteria participants and their guardian were educated with purpose and procedure of the present study and informed consent was taken from both. Detailed history taking and demographic data was noted on a sheet. Students were later physically examined for tenderness and swelling. Strength of soleus muscle as well as tibialis posterior was assessed bilaterally using manual muscle testing. Range of motion of bilateral ankle was further assessed using universal goniometer. 'Foot Posture Index' scale was used to assess foot type.

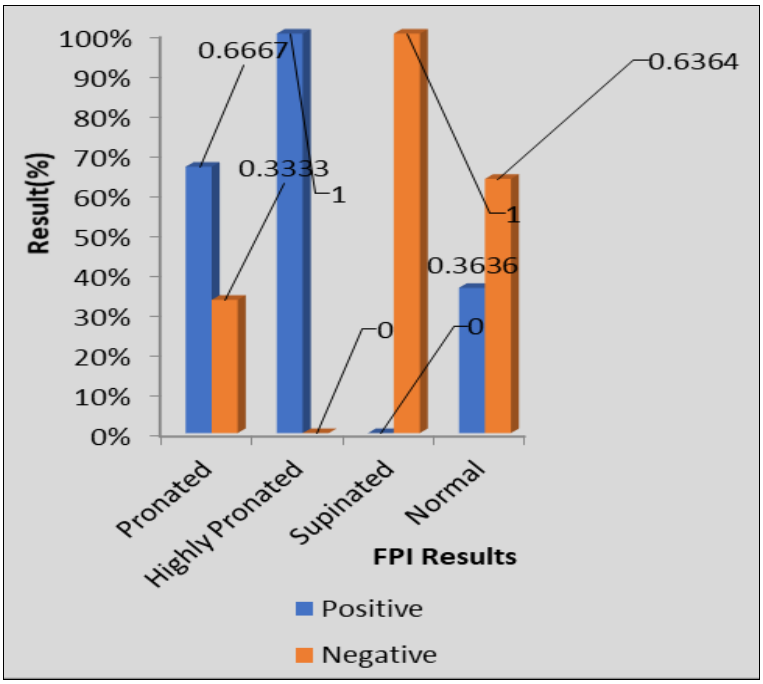
Selection Criteria

Participants were included if they had been playing sports for more than one year and are between age of 12 to 15 years. Students of either gender were included whose guardian as well as participant were willing to give informed consent. Participants with any recent lower limb injury, neuromuscular disorders, use of supportive devices or splints, cognitive impairments or received any treatment for lower limb from any medical practitioner within previous month were excluded.

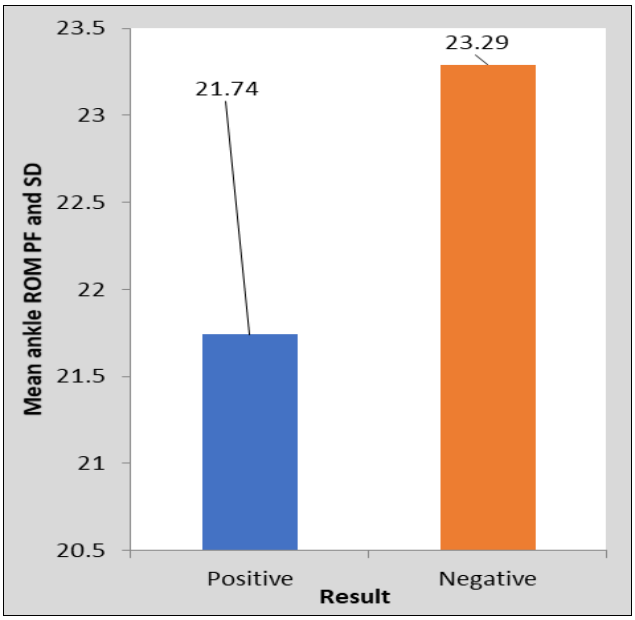
Results



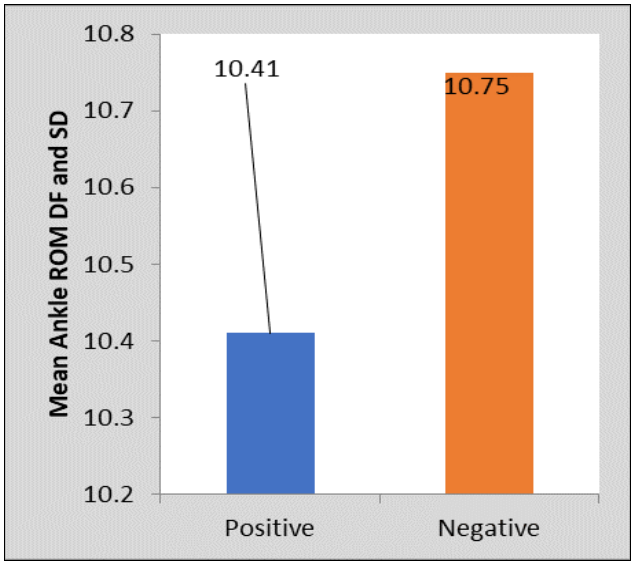
Graph 1: Distribution of participants according to result.



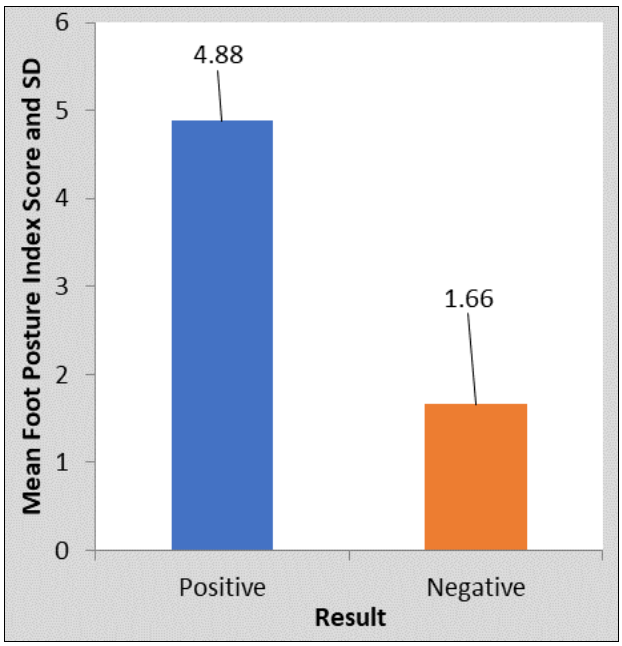
Graph 2: Correlation of FPI with result.



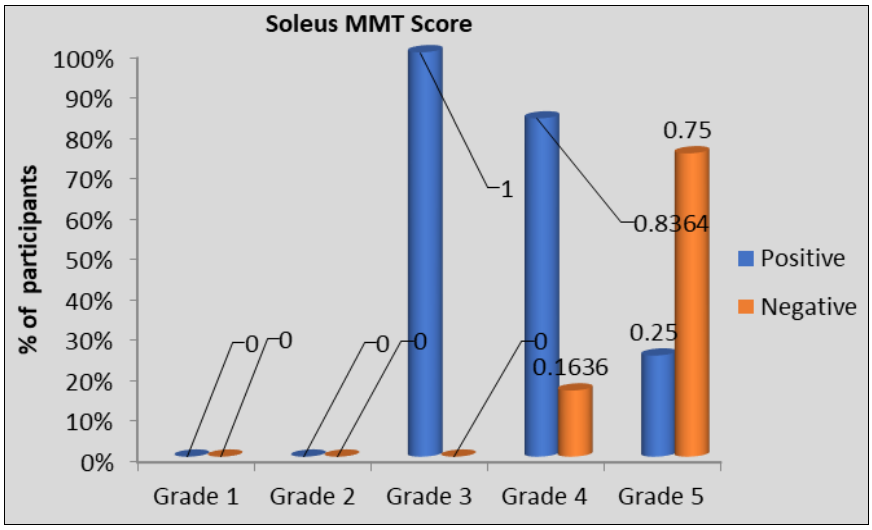
Graph 3: Comparison of ankle ROM plantar flexion with result



Graph 4: Comparison of ankle ROM dorsiflexion with result.



Graph 5: Comparison of Foot Posture Index with result.



Graph 6: Correlation of Soleus MMT score with result.

Statistical analysis was done by using descriptive and inferential statistics using chi square test and z-test for difference between two means and software used in the analysis were SPSS 27.0 version and Graph Pad Prism 7.0 version and $p < 0.05$ is considered as level of significance.

Discussion

The present study was aimed towards surveying prevalence of Medial Tibial Stress Syndrome in students playing sports from secondary high school. Numerous studies have previously conducted on MTSS of which majorly reported notable amount of incidence as well as prevalence. MTSS is a frequently diagnosed lower limb condition especially in runners as injury occurs due to monotonous repetitive actions as well as overuse. Repetitive actions or overuse leads to tearing away of muscle fibers at muscle-bone interface which causes inflammation at periosteum. Periosteum is a layer that surrounds the surfaces of your bone; it is a membranous tissue. MTSS presents inflammation of periosteum [Periostitis] at the posterior medial border of distal tibia.

Some known diagnostic parameters for MTSS are tenderness at posteromedial border of distal tibia, patient complains dull aching to intense pain quality, reduced gastrocnemius length leading to reduced ankle range of motion- plantarflexion and dorsiflexion, decreased strength of soleus and tibialis posterior muscle. Extensive studies have also reported association of pronatory foot type in MTSS. Primary risk factors for development of MTSS are previous history of MTSS and increased BMI.

Jason E. Bennett, *et al*. in 2001 conducted study with objectives of identifying incidence of MTSS in group of high-school cross country runners and also to determine if any relationship exists between lower extremity structural measures and incidence of MTSS. They measured tibiofibular varum, resting calcaneal position, gastrocnemius length and navicular drop. Their study supported the hypothesis that pronatory foot type is related to MTSS.

Tricia J. Hubbard, *et al*. in 2008 did prospective investigation on Contributing factors to Medial Tibial Stress Syndrome with purpose of conducting a prospective, multisite, cohort study investigating the possible risk factors for medial tibial stress syndrome (MTSS) in college athletes; where 29 out of 146 samples developed MTSS This study concluded that the factors most influencing MTSS development were previous history of MTSS and stress fracture, years of running experience, and orthotic use. They also demonstrated the importance of establishing a thorough history before the start of the season so that athletes who might be at risk for MTSS development can be identified.

Soleus muscle fibers inserts 4 cm proximal to medial malleolus and Tibialis posterior muscle origins 7.7 cm proximal to medial malleolus [16]. Both soleus and tibialis posterior muscle highly contribute in running. While walking; whole body weight is alternately supported by each foot and leg. But, when one starts walking faster or running lower extremity muscles contract with much more force to pitch the body weight [14]. These added forces on the muscular components or its overuse leads to tearing away of muscle fibers at muscle- bone interface and hence causing periostitis. It also contributes to reduced strength of these muscles. Thereby connecting reduced strength of soleus and tibialis posterior muscle to MTSS. Saxena, *et al* performed study to investigate involvement of Tibialis posterior muscle where they observed tibialis posterior muscle arises from distal third of tibia and hence is a contributor to MTSS.

Some amount of foot pronation is considered to be physiological but over pronation could lead to various injuries. Excessive pronation of foot is associated with occurrence of overuse injuries during gait. It has been observed that in one's with injury foot pronation is 2 to 4° more than those with no injury [13]. Ben Yates, et.al. in their study on 'The Incidence and Risk Factors in the Development of Medial Tibial Stress Syndrome Among Naval Recruits' conducted in 2004 resulted 32.2% incidence of MTSS they also concluded that earlier identification of pronated foot type may reduce further occurrence of MTSS.

About the present study; when participants were enquired about type of sports, majority of them were runners and run on uneven terrain. In 2015, Alexandra S. Voloshina conducted study on biomechanics and energetics of running on uneven terrain where they resulted that running on uneven terrain leaded to more energy expenditure and force on muscles and joints. They also mentioned that the ankle joint showed a significant decrease in joint power [17].

During this study, it was also observed that participants did not present with enough knowledge about MTSS. They had misunderstood their condition for regular soreness. Such opinion of them could potentially worsen their situation. Hence, earlier detection of MTSS would prevent further progression of MTSS.

Above mentioned factors could be potential contributors to such high percentage of prevalence of MTSS in secondary high schools of Ahmednagar district.

Conclusion

The present study reported that prevalence of Medial Tibial Stress Syndrome in secondary high school sports player of Ahmednagar district was 56.3%. Prevalence was found more in males than in females. Pronatory foot type was notably associated with presence of Medial Tibial Stress Syndrome [MTSS].

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