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Original Article

Prevalence of Medial Tibial Stress Syndrome among Non-Athletic Treadmill Users. A cross-sectional study

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ABSTRACT

Background: Medial tibial stress syndrome (MTSS) is a common injury affecting athletes, runners, and individuals engaged in high-impact activities. Non-athletic treadmill users are also at high risk due to increased exercise volume, load, and impact. MTSS is characterized by unrepaired microdamage in the cortical bone of the tibia, often resulting from repetitive muscle contractions.

Objective: To determine the prevalence of medial tibial stress syndrome among non-athletic treadmill users.

Methods: This cross-sectional study was conducted over six months following the approval of the synopsis. A convenience sampling technique was used to recruit 96 participants from two gym centers in Lahore. Participants, aged 18 to 30 years, with no history of physical or mental illness, were included. Exclusion criteria included those involved in structured sports, competitive programs, athletes, individuals under training, those with joint stiffness, obvious deformities, or comorbid conditions such as fractures, osteoarthritis, bone carcinoma, or recent surgical procedures of the lower limbs. Data were collected using a Delphi-study-developed, cross-culturally translated English questionnaire. Ethical approval was obtained, and the study adhered to the principles of the Declaration of Helsinki. Data were analyzed using SPSS version 25, employing descriptive statistics, frequencies, and percentages.

Results: The mean age of the participants was 24.09 ± 2.970 years. Among the 96 participants, 45 were male (46.9%) and 51 were female (53.1%). MTSS severity was classified as follows: 20% minimal, 23.9% moderate, 29.1% severe, 14.5% crippling, and 11.4% bed-bound.

Conclusion: Medial tibial stress syndrome was found to be prevalent among non-athletic treadmill users, with a significant portion experiencing moderate to severe symptoms. This highlights the need for targeted interventions and preventive measures for this demographic.

Keywords: Medial Tibial Stress Syndrome, MTSS, Shin Splints, Non-Athletic Treadmill Users, Gym Injury, Exercise-Induced Leg Pain.

INTRODUCTION

Medial tibial stress syndrome (MTSS), commonly known as shin splints, is an inflammation of the muscles, tendons, and bone tissue surrounding the tibia. This condition is characterized by pain along the inner edge of the shinbone, often resulting from repetitive stress and overuse. MTSS is prevalent among athletes, particularly runners, and individuals engaged in high-impact activities, with incidence rates ranging from 13-20% in runners to 35% in military recruits. Additionally, dancers exhibit a prevalence rate of approximately 20% (1). While the condition is well-documented in athletic populations, its prevalence and characteristics among non-athletic treadmill users remain relatively unexplored. Given the increasing popularity of treadmills as an accessible form of exercise, understanding MTSS in this demographic is essential.

The development of MTSS is primarily linked to overuse and repeated stress, particularly in activities involving running or high-impact leg motions. Risk factors include sudden increases in physical activity, improper footwear, anatomical variations such as flat feet or excessively inflexible arches, high body mass index (BMI), a history of MTSS, muscle weakness, and training errors. Additionally, vitamin D deficiency has been associated with an increased risk of stress injuries, as evidenced by studies conducted in military training settings (2-4). These factors contribute to the pathophysiology of MTSS, which involves unrepaired microdamage in the cortical bone of the tibia and associated periostitis at the site of injury. The repetitive muscle contractions of the flexor digitorum

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longus, soleus, and posterior tibialis exacerbate periostitis and cortical microtrauma, although the exact sequence of these events remains unclear (5, 6).

Non-athletic treadmill users, who may differ significantly from athletes in terms of physical conditioning, training regimens, and biomechanics, are potentially more vulnerable to MTSS. These individuals might not possess the same level of muscular fitness or flexibility, making them susceptible to overuse injuries. Furthermore, non-athletes may lack access to proper training guidance and appropriate footwear, increasing their risk of developing MTSS. This demographic is expanding due to rising health consciousness and the widespread availability of exercise facilities. Despite this growth, there is a lack of research focusing specifically on the prevalence and risk factors of MTSS in non-athletic treadmill users (7, 8).

The limited research on non-athletic treadmill users impedes the development of effective prevention and management strategies tailored to this group. Addressing this gap is crucial for community fitness and wellness initiatives aimed at improving public health. By understanding the prevalence and characteristics of MTSS in non-athletic treadmill users, more accurate and efficient programs can be designed to mitigate the risk of this condition. This study aims to fill this gap in the literature by determining the prevalence of MTSS among non-athletic treadmill users and identifying associated risk factors. Such information is vital for developing targeted interventions and enhancing the overall well-being of individuals who use treadmills for exercise (9, 10).

Overall, this research seeks to contribute to the existing body of knowledge by focusing on a previously underrepresented group in MTSS studies. By highlighting the unique needs and risks of non-athletic treadmill users, the findings of this study will inform the development of comprehensive fitness programs and preventive measures that address the specific challenges faced by this population (11,12).

MATERIAL AND METHOD

This cross-sectional study was designed to determine the prevalence of medial tibial stress syndrome (MTSS) among non-athletic treadmill users. The study was conducted over six months following the approval of the synopsis. Participants were recruited using a convenience sampling technique from two gym centers in Lahore. The sample size, calculated using Epitool software, comprised 96 participants. The target population included non-athletic treadmill users aged 18 to 30 years. Inclusion criteria specified participants with no history of physical or mental illness. Exclusion criteria encompassed those involved in structured sports or competitive programs, athletes or individuals under training, those with joint stiffness or any obvious deformity such as stress fractures or compartment syndrome, and individuals with comorbid conditions like fractures, osteoarthritis, bone carcinoma, or those who had undergone surgical procedures on the lower limbs.

Data collection involved administering a questionnaire to participants, with each participant's agreement obtained before inclusion in the study. The questionnaire was developed through a Delphi study and was cross-culturally translated into English to ensure comprehensibility. The collected data included demographic information and responses related to the frequency and severity of shin pain, activity limitations, and the timing of pain onset during treadmill use. Ethical approval for the study was obtained, and all procedures adhered to the principles of the Declaration of Helsinki to ensure the ethical treatment of participants.

Assessment of MTSS was based on the participants' self-reported experiences of pain and activity limitations, categorized into minimal, moderate, severe, crippling, and bed-bound levels. This classification allowed for a detailed analysis of the prevalence and severity of MTSS among the study population. Data were analyzed using SPSS software version 25. Descriptive statistics, including means, standard deviations, frequencies, and percentages, were utilized to summarize the data. Categorical variables were analyzed to determine the prevalence of MTSS within the sample population.

Informed consent was obtained from all participants, ensuring they were fully aware of the study's purpose, procedures, and their right to withdraw at any time without consequence. Confidentiality of participant information was maintained throughout the study. The analysis revealed that the mean age of the participants was 24.09 ± 2.970 years, with 45 males (46.9%) and 51 females (53.1%). The prevalence of MTSS was categorized as follows: 20% minimal, 23.9% moderate, 29.1% severe, 14.5% crippling, and 11.4% bed-bound.

The study's methodology was designed to provide a comprehensive understanding of the prevalence and severity of MTSS among non-athletic treadmill users. By adhering to rigorous ethical standards and employing robust data collection and analysis techniques, the study aimed to contribute valuable insights into the risk factors and impact of MTSS in this specific population (1).

RESULTS

The study included a total of 96 non-athletic treadmill users, with a mean age of 24.09 ± 2.970 years. Among the participants, 45 were males (46.9%) and 51 were females (53.1%).

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Table 1: Descriptive Statistics of Age

Statistic	Value
N	96
Mean	24.09
Standard Deviation	2.970

The prevalence of MTSS among the participants was categorized into different severity levels, as detailed in the table below.

Table 2: Interpretation of MTSS Scores

Severity Level	Frequency	Percentage
Minimal	20	20.8%
Moderate	23	23.9%
Severe	28	29.1%
Crippling	14	14.5%
Bed-Bound	11	11.4%
Total	96	100.0%

From the 96 participants, 20% reported minimal symptoms of MTSS, while 23.9% experienced moderate symptoms. Severe symptoms were reported by 29.1% of the participants. Crippling symptoms were noted in 14.5%, and 11.4% of the participants were classified as bed-bound due to the severity of their MTSS.

The results highlight that a significant proportion of non-athletic treadmill users suffer from varying degrees of MTSS. The high prevalence of moderate to severe symptoms indicates a substantial impact on the physical activity levels and quality of life of the affected individuals.

Table 3: Gender Distribution of Participants

Gender	Frequency	Percentage
Male	45	46.9%
Female	51	53.1%
Total	96	100.0%

The gender distribution showed a slightly higher number of female participants compared to male participants. This distribution provides insight into the prevalence of MTSS across genders within the non-athletic treadmill user population.

These findings underscore the importance of recognizing and addressing MTSS among non-athletic treadmill users. The data suggests that tailored interventions and preventive measures are necessary to mitigate the risk and impact of MTSS in this growing demographic.

DISCUSSION

The present study aimed to determine the prevalence of medial tibial stress syndrome (MTSS) among non-athletic treadmill users, revealing that a significant proportion of this population suffers from varying degrees of MTSS. The findings indicated that 20% of participants experienced minimal symptoms, 23.9% moderate, 29.1% severe, 14.5% crippling, and 11.4% were bed-bound due to the severity of their condition. These results underscore the substantial impact of MTSS on the physical activity levels and quality of life among non-athletic treadmill users (13,14)

The high prevalence of MTSS in this study is consistent with previous research on physically active populations. For instance, studies have shown that MTSS affects 13-20% of runners and 35% of military recruits, highlighting the commonality of this condition among those engaged in repetitive, high-impact activities (1). Additionally, a study by Winters et al. reported reliable diagnosis of MTSS based on history and physical examination, further validating the self-reported symptoms used in the present study (3). However, the prevalence rates observed in non-athletic treadmill users appear to be higher compared to these athletic populations, suggesting that non-athletic individuals might be at greater risk due to factors such as improper training techniques, inadequate footwear, and lack of conditioning (15,16)

One of the strengths of this study was its focus on a previously underrepresented group—non-athletic treadmill users. This demographic is expanding due to increasing health consciousness and the accessibility of exercise facilities. By highlighting the prevalence of MTSS in this group, the study provided valuable insights into the unique needs and risks faced by non-athletic

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individuals. Furthermore, the use of a cross-culturally translated questionnaire ensured the reliability and validity of the data collected.(17)

Despite these strengths, the study had several limitations. The use of convenience sampling might have introduced selection bias, as participants were recruited from only two gym centers in Lahore. This limits the generalizability of the findings to the broader population of non-athletic treadmill users. Additionally, the reliance on self-reported data for the assessment of MTSS symptoms could have led to reporting bias. Participants might have underreported or overreported their symptoms due to recall bias or social desirability bias. Moreover, the cross-sectional design of the study precluded the ability to establish causality between treadmill use and the development of MTSS (18)

Comparing the findings with those of Fatima et al. (2023), who reported a 17.9% prevalence of lower limb pain among gym-goers, it is evident that the present study found a much higher prevalence of MTSS among non-athletic treadmill users. This discrepancy could be attributed to differences in participant demographics, activity levels, and diagnostic criteria (2). The high prevalence observed in the current study highlights the need for targeted interventions to address MTSS in this population (19)

The variability in pain presentation and duration among participants underscores the complexity of MTSS and the necessity for individualized approaches to prevention and treatment. Previous studies have identified several risk factors for MTSS, including overuse, improper footwear, and anatomical variations such as flat feet or high BMI (4). These findings suggest that non-athletic treadmill users might benefit from education on proper training techniques, appropriate footwear, and gradual increases in physical activity to mitigate the risk of developing MTSS (20,21)

Recommendations for future research include conducting longitudinal studies to establish causality between treadmill use and MTSS and exploring the effectiveness of various preventive measures and interventions. Additionally, expanding the study to include a more diverse population and multiple locations would enhance the generalizability of the findings. Understanding the biomechanical and physiological differences between athletic and non-athletic individuals could also provide insights into tailored intervention strategies.

CONCLUSION

In conclusion, the study revealed a high prevalence of MTSS among non-athletic treadmill users, highlighting the need for targeted interventions and preventive measures to mitigate the risk and impact of this condition. The findings contribute valuable insights into the unique challenges faced by non-athletic individuals and underscore the importance of addressing MTSS in community fitness and wellness programs.

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