Global Scientific JOURNALS

GSJ: Volume 10, Issue 10, October 2022, Online: ISSN 2320-9186

www.globalscientificjournal.com

Title of Thesis

Prevalence of shin splints among hikers in Islamabad

Session: Fall 2017- 2022

Supervisor: Dr. Ishaq Ahmad, PT

Co-Supervisor: Dr. Sammar abbas, PT

Duration of Research Project: Six months.

Submission for the Partial Fulfillment of the Requirement of Doctor of Physical Therapy Degree

UNIVERSITY INSTITUTE OF PHYSICAL THERAPY

UNIVERSITY OF LAHORE, ISLAMABAD CAMPUS

Department

University Institute of Physical Therapy (UIPT) of University of Lahore, Islamabad Campus.

Name and Signature of Supervisor: Dr. Ishaq Ahmed_____.

Name and Signature of Co-Supervisor: Dr. Sammar Abbas 'PT**_____.**

Name and Signature of Head of Department: Dr. Ishaq Ahmed

_____.

FINAL APPROVAL CERTIFICATE

This thesis by Danish Aziz, Talha Bashir and Mateen Haider is accepted in its present form by the faculty of University Institute of Physical Therapy, University of Lahore Islamabad Campus, as satisfying thesis requirement for award of degree of Doctor of Physical Therapy.

Supervisor _____

Dr. Ishaq Ahmed PT

Co-Supervisor _____

Dr. Sammar Abbas

Head of Department _____

Dr. Ishaq Ahmed PT

DECLARATION

I hereby declare that this project, in its entirety or in part, has not been plagiarized from any source. It is also stated that I developed this project and accompanied the entire work based on my personal efforts made under the sincere supervision of my supervisor. If any portion of the work presented in this report was submitted in support of another degree or qualification, or to another University or Institute of learning, I will be held accountable.

_____ _____ _____

Danish Aziz Talha Bashir Mateen Haider

ACKNOWLEDGMENT

I owe ALLAH ALMIGHTY my heartfelt and humble gratitude. The compassionate, the Merciful, who knows all and the best and gave me complete initiative, health thoughts, and enabled me to complete this colossal task.

I would like to express my heartfelt gratitude to my loving supervisors, Dr. Ishaq Ahmed, Dr. Faryal Zaidi, and my co-supervisor, Dr. Sammar Abbas, who motivated me to pursue a master's degree in the future and created an educational environment. I would like to thank you for your kind guidance, constant assistance, moral support, and constant encouragement in completing this research work.

We would like to express our heartfelt gratitude to our parents for their unwavering moral support.

DEDICATION

First and foremost, we express our gratitude to Allah Almighty for his guidance and strength. We dedicate this dissertation to our parents, who have always been a constant source of inspiration and have always provided us with moral, emotional, and financial support, as well as to our respected supervisors Dr. Ishaq, and our co-supervisor Dr. Sammar Abbas, who worked hard and shared their words of advice and encouragement in helping us finish this study.

ABSTRACT

Background and objective

Medial Tibial Stress Syndrome (MTSS) or Shin-Splint Syndrome is a clinical pain condition defined as exercise-induced pain along the posteromedial tibial border (distal third) caused by repetitive loading stress during running and jumping and provoked on palpation over a length of ≥5consecutive centimeters. MTSS is mostly present in sportsmen, military personnel, runners and athletes. The aim of our study is to determine the prevalence and functional disability among hikers with shin splint in Islamabad

METHODS

Descriptive case study was conducted among Hikers of Islamabad. Patients' data was collected through interviewer administered questionnaire and the pain disability questionnaire including questions related to demographics, anthropometrics such as weight, height, BMI, and duration of hiking etc to determine the prevalence and associated risk factors of shin splints. Pain was measured through pain measurement scale, which has 11 points and Pain disability scale was made which has seven parameters, for each of the 7 categories of life activity listed and the number on the scale describes the level of disability subjects typically experience.

RESULTS

A total of 50 participants were taken for the study. Data was analyzed through SPSS version 26. All of the participants had shin splints syndrome. Among them, 43 (86%) were males and 7 (14%) were females.

CONCLUSION

Findings suggested that the shin splint is 26.88% prevalent and is seen in age groups of adults (26-30 year (52%)).Though this study found no significant association as risk factors of shin splints with socio-demographic characteristics and anthropometrical characteristics but found significant association with nature of activity and role of the pain while hiking and after hiking.

Table of Contents

List of Tables

List of Figures

LIST OF ABBERVIATION

AMA	American Medical Association
BMI	Body Mass Index
DXA	Dual Energy X-ray Absorption
ESWT	Extracorporeal Shock Wave Treatment
MTSS	Medial Tibial Stress Syndrome
MRI	Magnetic Resonance Imaging
PDI	Pain Disability Index

CHAPTER # 1

INTRODUCTION

1. Definition

Shin-Splint Syndrome, also known as Medial Tibial Stress Syndrome (MTSS), is a clinical pain syndrome. A condition in which the athletes encounter exercise induced pain in the distal posteromedial position of the tibia is known as Medial tibial stress syndrome [1]. It is the most common among all the condition leading to the exercise induced leg pain and is also denoted as true shin splints [1]. According to the two enormous epidemiological surveys, this syndrome is considered the most common in runners such as 13.1% of 1800 injuries while 22% of 385 injuries were observed in aerobic dancers [2, 3].

Medial tibial stress syndrome (MTSS) also known as “Shin splints” causes pain in the front part of the lower leg. The symptoms are inflammation in lower leg, tenderness, pain along the inner side of shinbone (posteromedial border of tibia) [4]. It often occur in athletes and on checkup found with diffuse area of tenderness. Moderate increase found in uptake of radionuclide in the diffuse area through bone scan images. These results useful in differentiation of tibial stress fractures from MTSS because large focal area of extreme tenderness besides high uptake of radionuclide found in MTSS on bone scan. Tibialis posterior muscle believed to be the origin causing pain tissue in MTSS while studies reported by Michael and Holder [32] informed medial soleus as a source of pain which is a tough layer. It is a key for static and dynamic controller of ankle plantar flexion and at its site traction generate periostitis verified by bone biopsy. It inverts calcaneus too [5]. It’s eccentric contraction while running limit pronation.

In this syndrome, the pain is mostly observed in the middle to distal third of the posteromedial margin of the tibia. The pain is noticed to be increase with exercise or any other physical activity and is present for few hours after the termination of exercise. Particularly, In case of severe conditions the discomfort continues the whole day in the posteromedial region of tibia [6,7].

The maximum common complaint of patients with MTSS is vague, diffuse pain of the lower extremity, along the middle-distal tibia associated with exertion [8]. In the early course of MTSS, the pain is worse at the start of exercise and gradually subsides during training and within minutes of cessation of exercise. However, as the injury progresses, pain occurs with less activity and may occur at rest [9].

Etiology:

The precise cause of shin splints syndrome is unknown. Acute and chronic conditions each have their own set of causes. Acute conditions include bone stress reaction, periostitis, fibrositis, bone strains, tenosynovitis, tendonitis of the tibialis anterior, tibialis posterior, soleus, and flexor halluces longus muscles, and tenosynovitis of the tibialis anterior, tibialis posterior, soleus, and flexor halluces longus muscles. Periosteal reaction, traction periostalgia, chronic tendonitis, fatigue tear of muscle-bone bridging collagen fibers, and chronic compartment syndrome are some of the chronic conditions [10].

When someone begins to exercise, their tibia undergoes certain metabolic changes. Increased osteoclastic activity on the compressed concave posteromedial border has resulted in increased initial bone porosity. Increased osteoblastic activity and new bone formation follow. On the posteromedial border, tibia becomes stronger than it was before the exercise. Long-term MTSS, on the other hand, causes the tibia to become 15% more porous than in the control group and 23% less porous than in the athletic control group [11].

Anatomy:

The pathophysiology of shin splints is better understood after studing the cross-sectional anatomy. In the leg, there are four muscular compartments. I. Anterior, II. Deep posterior, III. Superficial posterior, IV. Lateral. [12]

Anterior: this compartiment contains the tibialis anterior muscle, the extensor hallucis longus, the extensor digitorum longus and the peroneus tertius.

1. The tibialis anterior dorsiflexes the ankle and inverts the foot.
2. The extensor hallucis longus extends the great toe
3. The extensor digitorum longus extends the other toes and assists in eversion as does the peroneus tertius.

B) Deep posterior: this contains the flexor digitorum longus, the tibialis posterior and the flexor hallucis longus.

1. The tibialis posterior plantar flexes and inverts the foot.
2. The others are predominantly toe flexors.

C) Superficial posterior: this is the gastrocnemius and soleus group; predominatly plantar flexors of the ankle.

D) Lateral: this compartment contains the peroneus brevis and longus, mainly foot evertors [12].

The tibialis anterior and posterior muscles are frequently involved in dysfunction, and the region of attachment of these muscles might be the source of discomfort [13].MTSS is frequently associated with muscular imbalance and inflexibility, particularly tightening of the triceps surae [12]. Athletes with muscle weakness of the triceps surae are more prone to muscle fatigue, leading to altered running mechanics, and strain on the tibia. Clinicians should also examine for inflexibility and imbalance of the hamstring and quadriceps muscles. [13]

The excessive pronation is a major anatomical factor connected with MTSS. Runners at heel strike pronate more than without MTSS symptoms. Other problems like tight Achilles tendon, leg length discrepancy ends on pronation and should be assessed while non-anatomical factors supporting MTSS are footwear changes, running surface, training intensity and terrain [14].

Causes/Risk factors:

i) Intrinsic risk factors:

The combination of training errors and biomechanical abnormalities are important risk factors for the development of MTSS [8, 9-15, 16]. Physicians complete a detailed musculoskeletal examination of the patient, with a special focus on the lower extremity [17, 15, 18]. The medial ridge of the tibia (the origin of the posterior tibialis and soleus muscles) tends to be palpation, especially in the distal and medial tibial areas. The anterior tibia, however, usually does not.

Neurovascular symptoms are usually absent [9]. MTSS is associated with low biomechanical abnormalities [8, 19, 20]. Physicians should carefully evaluate the possibility of knee dislocation (especially genu varus or valgus), tibial torsion, femoral anteversion, abnormal foot arch, or variation in leg length [8, 9, 21]. Ankle movements and subtalar movements should also be considered. Hyperpronation of the subtalar joint is one of the most common and well-documented risk factors for MTSS [8, 13, 22, 19, 23, 24]. Muscle imbalance and flexibility, especially stiffness of the triceps surae (gastrocnemius, soleus, and plantaris muscle), are often associated with MTSS [8, 17, 15].

Athletes with weak muscle triceps surae tend to be more prone to muscle fatigue, leading to mechanical flexion, and stress on the tibia [8]. Physicians should also evaluate the flexibility and balance of the hamstring and quadriceps muscles. Weakness of the 'core muscles'' is an important factor in the risk of lower extremity injury [20, 25-26]. The strength of the hip and pelvis muscles is an important link in maintaining control and proper use between the ‘spine’ and the lower extremity.

According to various authors, there are several causes of Medial tibial stress syndrome including poor sports techniques, incorrect warmup methods, abruptly raising the level of training, extreme use of muscles, training on tough surfaces, skeletal malalignment, imbalance of muscles, and rigidity of calf muscles [27, 28, and 29]. Further, the most usual skeletal malalignment is extreme pronation of the foot region. On the basis of the anatomical studies, the rigidity of the soleus muscles are recognized as possible etiology which denoted that the origin of the pain is present at the distal-medial region of the soleus muscle and crural fascia [29, 30]. The most research studies recommend that this syndrome is basically occurs by the bone stress reaction [8, 31] whereas the particular cause of this disease condition is unidentified. The previous theories suggested that it contain inflammatory response of the periosteal traction reaction while the recent evidence proposes it is a painful stress reaction of the bone. In this case, the most important risk factors are hyperpronation of the foot, females’ sex and the clinical history of former MTSS [27-30].

ii) Extrinsic risk factors:

Type of sport, time of day, always jogging on the same side of the road, hard running surface, uneven terrain, shoes, in-shoe orthotics, climate, weather conditions, and so on are a few extrinsic or environmental risk factors for shin splints. [32]

Symptoms:

Dull pain at distal two third of the posteromedial tibial disorder is the said to be the main symptoms. The pain is non-central however reaches out finished "no less than 5 cm" [12] and is frequently two-sided [33]. At each movement of contact it become more worsen [7]. A gentle edema in this agonizing region may likewise be available and delicacy on palpation is normally present after the actuating movement for up to a few days [12].

During workout patient feel pain at early stages, the pain usually disappears during workout but after exercise when the muscles relax the pain return. The pain can remain during the workout when the shin splints got worsen and can be felt for several hours after the end of the persuading activity. [34]

Stress rupture is the major common snag of shin-splints and displayed itself by sensitivity of anterior tibia [35]. Neurovascular signs and manifestations are not regularly owing to MTSS and when present, diverse pathologies, for example, constant chronic compartment disorder (CECS) or vascular lacks ought to be considered as the cause of leg pain. [32] [36] [17].

An algorithmic methodology has been set up for additional distinguishing exercise-initiated leg pain substances [34]:

1. Ache at break with intense soreness specifies bone stress grievances (MTSS and stress fractures),
2. No pain at break with intense soreness suggests nerve set-up syndromes
3. No pain at break with no intense soreness made efficient popliteal artery entrapment syndrome and chronic exertional compartment syndrome likely.

Diagnosis:

A complete history should be obtained to evaluate the athlete's weekly exercise routine as well as the distance of running, strength, speed, geography, and footwear, with careful consideration of the latest changes in the type of training. Training errors appear to be the

most common factors involved in MTSS, especially as runners try to perform '' very, very quickly '' [9, 15, and 17].

MTSS may additionally overlap with the diagnosis of deep posterior compartment syndrome however the important factor for differentiation is the longer lasting submit-workout ache when in comparison with deep posterior continual exertional compartment syndrome.

In comparison with stress breaks, the painful area spreads up to 5cm on the distal two thirds of the medial tibial border.

Testing demonstrates an extensive tenderness on palpation along the medial tibial border, the anterior tibia, however, is typically non tender. Neurovascular signs and symptoms are typically absent. Distinctive from pressure fracture, the ache is not centered to a particular factor however covers a variable distance of several centimeters within the distal medial and proximal distal third of the tibia [34]. In the pain site, there is no actual muscle source, however the deep crural fascia is hooked up to the medial tibial border. From clinical experience, a painful transverse band can often be palpated which most possibly corresponds to the solealaponeurosis. Therefore, MTSS is currently hypothesized to originate from tibial bone overload and not from adjoining smooth tissue stress [34].

This syndrome can be diagnosed primarily by the clinical history, the region of the pain and the tenderness of the medial tibial margin. When the clinical history and other findings are non-specified then the techniques utilized for the detection of this syndrome are Magnetic resonance imaging or bone scintigraphy [33, 37].

i) **Imaging:** Imaging is usually not necessary for the diagnosis of MTSS. However, if the patient fails to improve with conservative management, plain film radiography may be considered. X-rays are usually negative within the first 2–3 weeks after the onset of injury [38]. Long-term radiographic changes of those with chronic MTSS with periosteal involvement may show periosteal exostoses. Those that progress from MTSS to stress fracture may develop a dreaded black line on radiograph, which indicates a more ominous sign [16].

ii) **Bone Scan:** A triple-phase bone scan demonstrates evidence of a stress fracture with a diffuse, longitudinal uptake along the posterior tibia, seen only on the delayed

phase of the scan [9, 39]. Bone scans have been the gold standard for diagnosing stress fractures in the past, but now are often replaced by magnetic resonance imaging (MRI).

iii) **MRI:** MRI has many advantages over a bone scan and plane radiography. MRI is better able to identify other soft tissue injuries [34, 32, 39, 40]. MRI can show progression of injury in the tibia, starting with periosteal edema, progressive marrow involvement, and finally cortical stress fracture [34]. With better accuracy, MRI can grade tibial injuries according to extent of involvement. Grading tibial injuries may help clinicians make more accurate recommendations for rehabilitation, though no literature data exist about MRI findings and specific return-to-play guidelines [34].

Treatment:

Different types of treatments were suggested by various authors while some period of rest were referred by all of them. Some other conventional modalities included the use of ice in severe condition, cast arrest, ultrasound, taping, use of steroid injections, anti-inflammatory medicines, orthoses, stretching exercises, and a slow return to the sports activity [6, 7, 41, 42].

i) **Rest:**

In the acute period, rest is required, followed by a gradual return to athletic activity. The MRI grading system may be used to determine the duration of rest, which is typically 2–3 weeks for grade 1 tibial stress injuries, 4–6 weeks for grade 2 tibial stress injuries, and 6–9 weeks for grade 3 tibial stress injuries. Individuals with grade 4 injuries are cast-treated [34]. When the acute period has passed, the training regimen is changed by halving the weekly running distance, effort, and frequency [8–40]. It is best to avoid running on slopes or uneven terrain [15].

ii) **Use of Ice:**

Immediately after exercise, apply ice to the afflicted area for 15–20 minutes to give local anesthetic and reduce muscle tissue stiffness [43, 44].

iii) **Physiotherapeutic exercises:**

Stretching the plantar flexors and strengthening the dorsiflexes of the ankle are the main goals of the workout program. [43].

To improve core stability and running mechanics, strengthening core hip muscles is also recommended [44].

Cross exercise, such as running in the pool or using a floating device, is essential for maintaining aerobic conditioning.

A stationary bicycle, cross-country skiing machine, or stair climber can be used to supplement these activities [34]. Although local ultrasonography and extracorporeal shock wave treatment (ESWT) have been utilized as supportive conservative therapies, their usefulness has yet to be proven due to a lack of study.

If these conservative method of treatments is failed which is infrequently done by most authors, then surgical treatments are recommended in which the success range is between 29% to 86% [6, 28].

The purpose of this study is to find the prevalence of shin splints in hikers of Islamabad and to work on the limitations of previous research studies.

1.2. RATIONALE OF STUDY

In most of previous studies the limitation was that exact etiology and cause of shin splints syndrome was not known and not any study focused on functional disabilities due to shin splint [1, 10, 50]. This study was conduct specifically among young hikers (approx; 25 years age) of Islamabad which is neglected area of population. The aim of our study was to determine the prevalence and functional disability among hikers with shin splint in Islamabad. Evaluating this study will provide valuable insights into preventive measures of shin splints and will help the hikers to relieve the pain and starting their normal activities.

1.3. RESEARCH QUESTION

What is the Prevalence of Shin Splints among hikers in Islamabad?

1.4. OBJECTIVES

- To find out the prevalence of shin splints among hikers in Islamabad.
- To find out the functional disability among hikers due to shin splints.

1.5. HYPOTHESIS

- Null Hypothesis $H_{0;}$ Shin splints is not prevalent among hikers in Islamabad.
- Alternate Hypothesis $H_{A;}$ Shin splints is prevalent among hikers in Islamabad.

Testing of hypothesis do not need to be applicable because it is a descriptive study.

1.6. OPERATIONAL DEFINITION

Medial tibial stress syndrome (MTSS) or shin splints is one of several repetitive lower leg injuries that's comes under the term of exercise-induced leg discomfort. The three most prevalent types of exercise-induced leg discomfort are chronic compartment syndrome, stress fracture and MTSS, with MTSS having the highest frequency. MTSS was initially identified as "a symptom complex reported in sportsmen who suffer of exercise-induced stiffness along the posterior-medial region of the tibia." It is a highly prevalent injury among runners and military people. Recent research has supported that MTSS is a bone stress reaction that becomes painful rather than an inflammatory condition of the periosteum. The bone experiences metabolic alterations when an individual starts an activity routine. MTSS most typically manifests as diffuse, palpable discomfort at the posterior-medial tibial line. It can happen anywhere along the posterior-medial boundary, however it usually happens in the middle to distal thirds. The discomfort is typically described as a dull aching that occurs after exertion and might continue for several hours or days. In extreme situations, soreness may remain during routine activities.[22]

We are conducting descriptive case study among Hikers of Islamabad. Patients' data is collected through interviewer administered questionnaire and the pain disability questionnaire to determine the prevalence and associated risk factors of shin splints. The condition of patients is recorded through physical examination based on the specific criteria of signs and symptoms [5].

Pain is measured through pain measurement scale, which has 11 points, in which

- >3= positive shin splints syndrome
- ≥6= severe pain due to shin splints.

Pain disability scale was made which has also 11 scale points and seven parameters were made, for each of the 7 categories of life activity listed and the number on the scale describes the level of disability subjects typically experience.

Level of Disability Points

- none 0
- 1
- 2 mild
- 3
- 4
- 5 moderate
- 6
- 7

- 8 severe
- 9
- total 10

Pain disability index =SUM (points for all 7 parameters)

Interpretation:

• Minimal index: 0
• Maximal index: 70

The higher the index the greater the person's disability due to pain.

Socio-demographic variable:

Age and gender

Anthropometrical variables:

Height, weight and BMI.

1.7. Significance of Study

Significance of our study is that this study is conducting specifically among young hikers (approx; 25 years age) of Islamabad which is neglected area of population. The purpose of our study is to determine the prevalence and functional disability among hikers with shin splint in Islamabad. Evaluating this study will provide valuable insights into preventive measures of shin splints and will help the hikers to relieve the pain and starting their normal activities.

1.8. Summary

This chapter is divided into three sections: the first provides an overview of shin splints; the second covers the study's rationale, which explains why this research is necessary and what is its aim and significance. The third section looks into the important terms used in this study, as well as the hypothesis (if one exists) and the objectives of study, as well as the study's significance. The reader will be able to learn about previous studies conducted on the same topic in the next chapter, which is a literature review. The reader will also learn about the procedures that have been utilized in prior studies, as well as their outcomes, in the following chapter.

CHAPTER # 2.

LITERATURE REVIEW

Moen et al. 2009 critically review the literature on medial tibial stress syndrome and conclude that this is most commonly exercise-induced lower leg pain, the incidence of which ranges from 4% to 35% among military personnel. Medial tibial stress syndrome is mostly found among runners, athletes, and military personnel because they are involved in activities like jumping, playing, and gymnastics.

Various scientists use different definitions and terminologies for this condition. Various names used for this condition are "shin soreness", "medial tibial stress syndrome", "tibial stress syndrome", "shin splints syndrome" and "shin splints". In this review, they used the term "medial tibial stress syndrome" for this condition because this syndrome is best defined by this term. [45]

Story and Cymet 2006 described that shin splints cause a distinct type of pain. It's commonly described as a burning sensation, hurting, or a sense that something isn't quite right in the lower leg. Because the pain is diffused throughout the lower leg rather than simply in the knee or ankle, it may be distinguished from joint problems caused by overuse. Muscle cramps are also not spasmodic and incapacitating. Pain is usually associated with exercise and only rarely keeps patients up at night. The same sort of pain may typically be reproduced by palpating the area, however it will be less intense than the pain caused by activity.

Shin splints are characterized by discomfort in a characteristic place on the lower leg, although the cause of the pain might vary. It usually begins as a dull soreness that sharpens with each workout, but it may reduce for small periods during an activity. The pain, on the other hand, gradually grows in frequency and severity until it lasts the entire exercise and can even last for hours or days later.

Some sources try to distinguish between antero-lateral and postero-medial shin discomfort. Antero-lateral symptoms might occur from the ankle to the inferior area of the knee. Posterior posteromedial complaints, on the other hand, are usually restricted to the area between the ankle and the inferior border of the gastrocnemius. [46]

Exercise-induced discomfort on the posteromedial side of the mid-to distal tibia is characteristic of MTSS. The American Medical Association (AMA) defined the Shin splints in 1966. “Pain or soreness in the leg from repetitive running on rough surfaces or forceful elevated use of the foot flexors; prognosis should be restricted to muscles and tendons inflammations, with the exception of fracture or infarction disorder”. This is the only official definition found in literature but is not very popular among clinicians because on physical examination there are no well-described symptoms present. [13]

When the term "shin splints" is used in the (earlier) literature, it usually refers to "medial tibial stress syndrome." Yates and White 2004 have offered an updated and improved definition. According to these authors, MTSS is defined as "pain along the posteromedial line of the tibia that develops during activity, eliminating pain of ischemic origin or symptoms of stress fracture." They detected a diffuse painful region across a dimension of at least 5 cm on palpation with clinical examination. However, as there was no proper definition of MTSS present, many authors created their own. This makes it difficult to compare all the studies. [22]

2.1 Functional Anatomy

To analyze the relationship structures, different article study was carried out. These investigations evaluated the distal attachments of several leg muscles to the MTSS symptom location.

Micheal and Holder in 1985 did a study, in patients with shin splints, radionuclide bone scans showed linear uptake along the posterior medial border of the tibia. Anatomical dissection (14 cadavers), Electro myographic and muscle stimulation investigations (10 individuals), and open biopsies were all used to examine this area. Anatomically and biomechanically, the soleus muscle and its investing fascia are involved in the creation of these stress changes, especially when the heel is in a pronated position. The fibes of soleus muscle and fascia are found crucial in patients who need surgery to compress. [29]

The distal attachment of the tibialis posterior muscle was discovered to be 7.5 cm proximal to the malleolus by Sexena et al. in 1990 after dissecting ten cadavers. From this, the author deduced that MTSS was induced by the tibialis posterior muscle. [47]

Beck et al. in 1994 dissected 50 legs and determined that the soleus muscle and the flexor digitorum longus muscle, rather than the tibialis posterior muscle, could be involved in MTSS.

On the distal half of the posteromedial line of the tibia, no tibialis posterior muscle fibers were discovered during dissection. Fibers of the soleus muscle and flexor digitorum longus muscle were numerous on the medial border of the distal tibia in the upper half. While intervention symptoms are frequently felt in the distal portion of the tibia, there were few muscle fibers of the soleus muscle or any other muscle detected at this location. [30]

After conducting a case-control study on 17 athletes, Garth and Miller (1989) concluded that the flexor digitorum muscle was to cause the complaints. He discovered a decreased flexion range of motion of the second meta-tarsophalyngeal joint and toe flexor weakness in the symptomatic group. He hypothesized that this was due to the constant increased activity of flexor digitorum longus muscle. [48]

Recently the traction explanations has been studied by Bronche and Johnson in 2007. The traction on the periosteum during soleus, flexor digitorum longus and posterior tibial activity was examined by using three cadaver specimens. Strain in the tibial fascia, which we believe pertains to the periosteum, increased in a linear way when tension on the tendons of the abovementioned muscles was enhanced. According to their findings, facial tension may play a role in the patho-mechanics of medial tibial stress syndrome. Muscle contraction causes the soleus tendons, posterior tibial, and flexor digitorum longus to tent, exerting a stress on the distal tibial fascia, which is directed to its tibial crest insertion. The tension directed to the medial tibial crest was not dampened by circumferential straps. [49]

Fred and Delacerda in 1980 identified the anatomical components that have a role in shin splints. The study focused on identifying anatomical characteristics that are frequent in females who develop shin splints. The incidence of shin splints was linked to the height of the longitudinal arch of the foot, pronation, and the body weight-to-height ratio. Within the study's parameters, only foot pronation was shown to be associated with the occurrence of shin splints. Volunteer subjects for the study were 81 female students in body mechanics physical education. [50]

2.2 Histopathology

Periostitis has little histological evidence. Two individuals with inflammation or vasculitis identified in the fascia following biopsy are described in two reports from the 1980s. [1,29]

Michael and Holder [29] observed a thickened periosteum, which they called "periostitis." Mubarak et al. [1] studied two individuals who had microscopic periosteal inflammation and vasculitis. In major studies, inflammatory cells were rarely found in the periosteum.[51,52] Biopsy revealed inflammatory modifications in the crural fascia in 13 out of 33 athletes. [52] One biopsy sample revealed signs of plasma cell infiltration around broad lymphatics in the periosteum, as well as a thicker periosteum and enhanced osteoblast activity in the same specimens. This was also observed by Bhatt et al.,[51], who discovered less osteocytes in normal bone, however their findings were not statistically significant. [51] Their patient population's activities were not described.

Recent evidence suggests that osteocytes play a key part in mechano-transduction, the process by which bone detects mechanical impulses. [53, 54] In response to direct mechanical stimulation or bone micro damage, osteoclasts are thought to stimulate bone remodeling. [55] Apoptosis of osteocytes is observed during bone remodeling, and this apoptosis may impact osteoclast development and/or function. [56]

In comparison to healthy athletes, individuals with MTSS had lower regional tibial bone density.

[11] Patients with MTSS had lower bone density (23%-8% (mean S.D)) in the mid-to distal tibia, as evaluated by dual energy x-ray absorption (DXA). After a mean of 5.7 years (range: 4–8 years), the athletes' bone density returned to normal. [57]

2.3 Medical Examination

Winters [58] presented a study about the diagnosis and treatment of shin splints in athletes. Winters investigated the history and physical examination of shin splints as foundations of the diagnostic procedure in clinical pain situations. X-rays, ultrasound, magnetic resonance imaging, computed tomography, and bone scans have all been demonstrated in trials to be ineffective in distinguishing between athletes with and without clinically diagnosed MTSS. Imaging in the diagnosis of MTSS does not appear reasonable as long as the pathogenesis of MTSS is not completely understood. Clinicians who provide accurate diagnoses provide a solid platform for discussing expectations and treatment options with patients. A 7-step standardized history and physical examination technique can be used to diagnose MTSS. History can be noted by following these steps and asking different questions about pain in

specific area of lower limb. If MTSS is reported after history then patient is physically examined. The palpation of posteromedial border should be done by clinicians.

During palpation, the athletes were asked whether they had any recognized discomfort (i.e., from unpleasant activities). The diagnosis of MTSS was verified when identifiable pain was evident on probing of the posteromedial tibial border across 5 cm or greater. During the physical examination, the athlete should be asked whether they have any aches in nearby structures, and if so, these structures should be palpated to ensure there are no concurrent injuries. Once the MTSS diagnosis has been confirmed, a care approach for the patient must be established. A variety of therapeutic techniques for athletes with MTSS have been suggested to be useful. Some of the treatments include rest, ice massage, shockwave therapy, stretching and strengthening exercises, gait retraining, graded running programs, lower leg braces, and injectable therapies.

Prior to beginning therapy, it is critical to clarify expectations with the patient. Many athletes are overconfident about how long it will take them to improve. For athletes with MTSS, patient education is critical. An explanation of the nature of MTSS should be included in education. [58]

According to recent research of Gabett in 2016, loading should not vary by more than 10% week to week to minimize injury [59]. When progressively exposing the athlete to increasing weights, this appears to be a suitable guideline. Running or activity applications can assist athletes in monitoring their loads and avoiding training spikes.

The diagnosis of MTSS should be made based on the patient's medical history and physical examination.

Imaging for shin discomfort is only necessary when a disease, such as a tibial stress fracture or osteosarcoma, is suspected.

When taken as a whole, making an MTSS diagnosis based on history and physical examination is both trustworthy and simple. Effectively managing MTSS, on the other hand, might be difficult. In the management of MTSS, balancing load and loading capacity while exposing the athlete to greater amounts of loading appears to be the most essential factor.

2.3.1 Clinical history

Kortebein et al. 2000 and Andrish 2003 studied that exercise-induced leg discomfort is common in patients with MTSS. Discomfort is commonly felt in the middle or distal thirds of the tibia's posteromedial border. Initially, symptoms appear when you begin an activity and lessen as you continue to exercise, but later on, discomfort persists during activity. If the symptoms intensify, the discomfort may persist long after the activity has stopped. [60,61] This symptom has also been reported in stress fractures, so the physician should be careful when diagnosing it. Even completing ordinary chores might trigger symptoms in extreme instances.

2.3.2 Physical Examination

Physical examination and MTSS were only mentioned in a few papers. V. Ugalde conducted an unpublished study (personal communication, 2006). The goal of this study was to figure out the sensitivity and specificity of physical examination tests. Athletes with symptoms and athletes who did not have any symptoms were included in the study. Bone scintigraphy was used as the gold standard in this investigation. The researchers looked at three different tests: diffuse posteromedial pain on palpation, jumping pain, and percussion pain. The most sensitive test was the palpation of diffuse posteromedial discomfort.

According to Kortebein et al. 2000, Andrish 2003 and Edwards et al. 2005 on palpating the distal two-thirds of the posteromedial tibial border during a physical examination, discomfort is apparent. Mild tibial edoema is not uncommon [60-62]. During a clinical assessment, MTSS risk factors should be examined. Medial tibial stress syndrome, exertional compartment syndrome, tibial stress fracture, and, to a lesser extent, popliteal artery entrapment and nerve entrapment, are among the potential diagnoses for exercise-induced leg discomfort. Study of Edwards et al. 2005 showed that intra-compartmental pressure measurements can confirm the diagnosis. [62]

MTSS, tibial stress fracture, and exertional compartment syndrome may typically be distinguished without further imaging, according to Moen et al. Cramping, burning, or throbbing pain, and tightness in the leg are common symptoms of exertional compartment syndrome. Muscle tightness is common, as are neurological signs such as sensory abnormalities. In most cases, palpation is not uncomfortable when performed at rest. The leg hurts while exercising, but it goes away fast when you stop.

In the 1970s and 1980s, elevated leg compartment pressures were thought to be the aetiology of MTSS. In 1981, Puranen and Alavaikko [63] examined it by measuring the pressure in 22 people who had medial leg pain. According to the study, patients had a substantially higher rise in pressure during effort than controls. When they were exerted, patients and controls exhibited pressure ranges of 70–150 mmHg and 15–30 mmHg, respectively.

Other researchers were unable to detect an increase in pressure. [1, 64, 65] Fourteen track runners with MTSS were studied by D'Ambrosia in 1977, and no increased pressure was seen in any compartment. [65] In research by Mubarak et al. in 1982, compartment pressures were measured and compared with identified chronic compartment syndromes in a group of 12 individuals with MTSS. During exercise, pressures in the MTSS group were lower than in the confirmed compartment syndrome group (84 mmHg [mean value] vs. 112 mmHg, respectively) [1]. In a publication by Wallensten and Eklund in 1984, the pressures during exercise in 12 individuals with MTSS were compared to pressures in the compartment syndrome. The compartment syndrome group had higher values (28 mmHg and 70 mmHg, respectively). [64] All four studies that looked at compartmental pressure in MTSS looked at a small number of patients and had weak methodological quality.Some people believe that medial tibial stress syndrome and compartment syndrome can coexist, but there is no proof for this other than a single study by Puranen and Alavaikko [63] in 1981.

According to Greaney et al. (1983) and Kiuru et al. (2002), differentiating between stress fracture and MTSS can be difficult, especially because stress fracture radiographs can be false negative with sensitivities as low as 26–56 percent [66,67]. The pain in stress fractures is generally more specific, whereas the pain in MTSS is more widespread. In addition, MTSS patients seldom have night discomfort or percussion pain.

CHAPTER # 3.

MATERIALS AND METHODS

A) Study Design: Descriptive cross-sectional study

B) Study Setting: On various trails of Islamabad (Trail 1-6)

C) Study duration: 6 Months

D) Sample Size: For sample size Slovin's formula will be used.

Confident Interval CI: 95% margin of error: 0.05

$$n = \frac{N}{(1 + Ne^2)}$$

The Slovins Formula is given as follows:
n = N/(1+Ne2),
n = 351/(1+351(0.052),
n = 186
136 were excluded on the basis of exclusion criteria.
52 included that were meeting the inclusion criteria.
Where n is the sample size,
N is the population size

E) Sampling technique: Non-probability Convenience sampling.

3.1 MEASURABLE OUTCOME VARIABLES

- For measuring the pain 11 points visual analog scale was used where 0 score was for no pain and the 10 score was for severe pain.
- Functional activity limitations was measured by Pain Disability Index.

3.2 SAMPLING PROCEDURE

A) Inclusion criteria

- Both gender were included
- Age of participant was kept between 20 and 40 years [25].
- Duration of hiking was more than 2 hours per day, 3 days a week.
- Duration of hiking ≥ 3 months [99].

B) Exclusion criteria

- Stress fracture in last 6months

- Lumbar Radiculopathy
- Patients with history of lower leg surgery in last 4 months.
- Participants with deep vein thrombosis.
- Infections in lower leg.[5]

3.3 DATA COLLECTION PROCEDURE

- For data collection the permission was taken from the Head of Department of University Institute of Physical Therapy, University of Lahore, and Institutional review Committee (IRC) / Ethical Review Board (ERB), University of Lahore. The permission was also taken from the Head of Department, University of Lahore of Islamabad Campus. Each participant consent was must.
- Participants who agreed to take part in the study signed a permission form. The patients were given a questionnaire that includes questions concerning functional limits and tool-related pain.

3.4 DATA ANALYSIS

- The data was statistically analyzed by using SPSS version 26.
- For qualitative variables and other numerical variables such as Age, Pain measurement scoring i.e. equal and greater than 3 point and pain disability index (PDI) score i.e. equal and greater than 30% were analyzed through frequency charts and graphs.

3.5. SUMMARY

The purpose of this chapter was to go over the procedures and methods that were used during the research process. In addition, the topics of IRB Questionnaire Approval, Permissions from Study Settings, Survey Forms, and Instrumentation used for Variable Measurement, and Statistical Analysis are covered. The above methodology's results are further discussed in the following chapter with an analysis of IBM SPSS Version 26.

CHAPTER#4

RESULTS

In the present study, the prevalence of shin splints in hikers was studied, for which 500 hikers were selected. Out of 500 only 50 were according to our inclusion criteria and the rest were excluded. In these 50 subjects shin splint syndrome was present and their basic characteristics were statistically analyzed by using SPSS.

4.1 Socio-demographic Characteristics

4.1a. Age: These 50 subjects were categorized age wise into 4 groups, 20-25 year, 25-30 year, 30-35 year and 35-40 year. Majority of subjects belong to age group 26-30year (52%) followed by 20-25yr (28%), 31-35yr (16%) and 36-40yr (4%), which shows that risk of prevalence of shin splint is more in 26-30 year of age as shown in table and figure 1.

Table 1 Age as associative factor of shin splint in hikers

Age Category	Frequency	Percent
20-25	14	28.0
26-30	26	52.0
31-35	8	16.0
36-40	2	4.0
Total	50	100.0

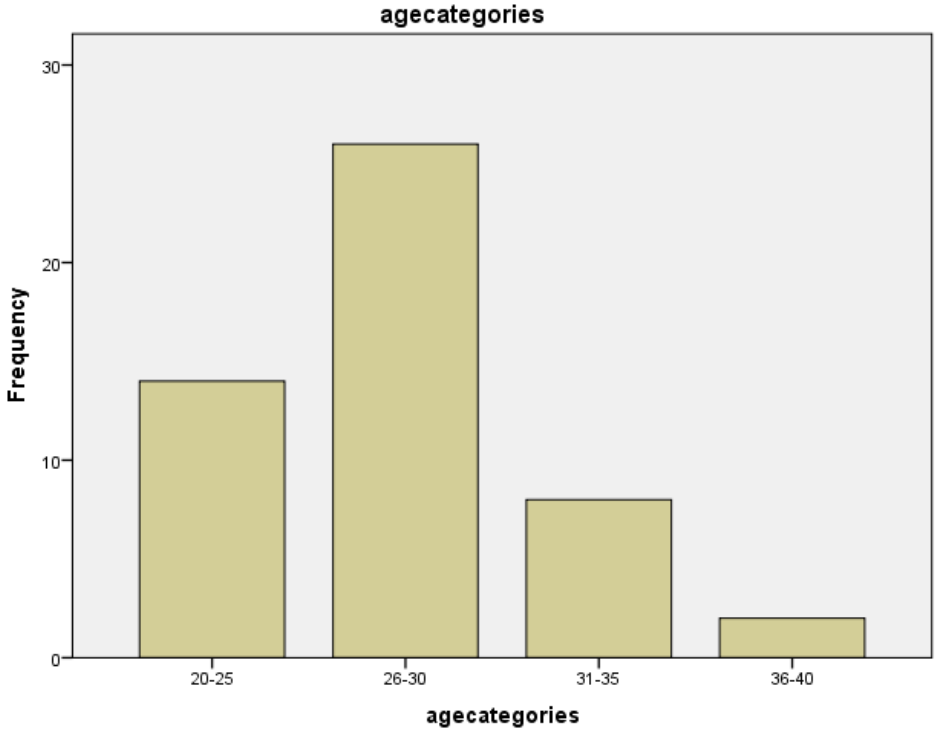

Figure 1 Age as associative factor of shin splint in hikers

4.1b. Gender

In this study male and female individuals were included, the following table and figure 2 shows the prevalence of shin splints in male and female hikers, majority subjects were male participants (86%) because very limited female (14%) participate in hiking activity.

Table 2 shows gender as factor of shin splint syndrome

Gender	Frequency	Percent
Male	43	86.0
Female	7	14.0
Total	50	100.0

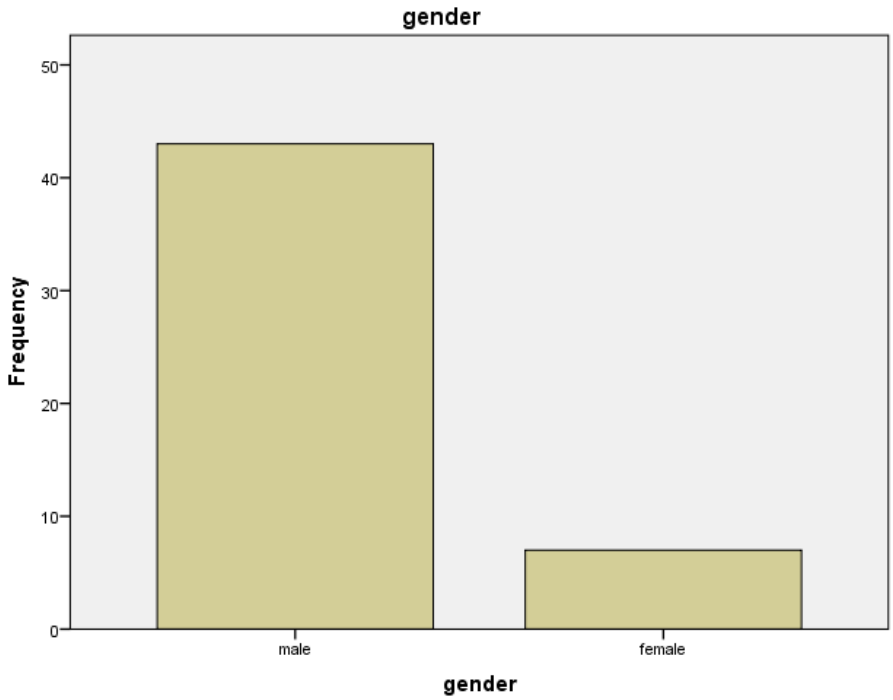

Figure 2 shows gender as factor of shin splint syndrome

4.2 Anthropometrical Characteristics

BMI: In this study the selected 50 subjects were categorized into 3 groups according to their BMI, Out of 50 participants, 2 (4%) were lying in the underweighted category of BMI, 32 (64%) were lying in the normal category and 16 (32%) were lying in the overweight category. **As the table and figure 3 shows, more participants (64%) were lying in the normal category.**

Table 3 shows association of BMI with Shin splint syndrome.

BMI	Frequency	Percent
below 18.5 underweight	2	4.0
18.5 to 24.9 normal weight	32	64.0
25.0 to 29.9 overweight	16	32.0
Total	50	100.0

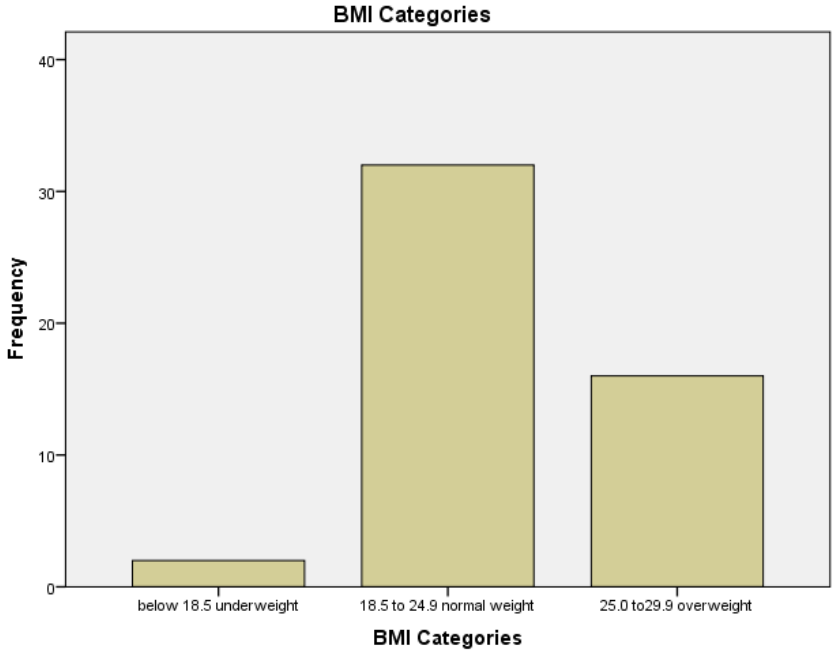

Figure 3 shows association of BMI with Shin splint syndrome.

4.1. Affected side

Physiology of subjects were analyzed by examining their affected side of leg. Most of the participants (52%) had affected both sides of their leg followed by the individuals (26%) who had right side affected and 11 (22%) individuals had left side of leg affected as shown in table and figure 4.

Table 4 shows the affected side of lower leg in shin splint patients.

Affected Side	Frequency	Percent
right	13	26.0
left	11	22.0
both	26	52.0
Total	50	100.0

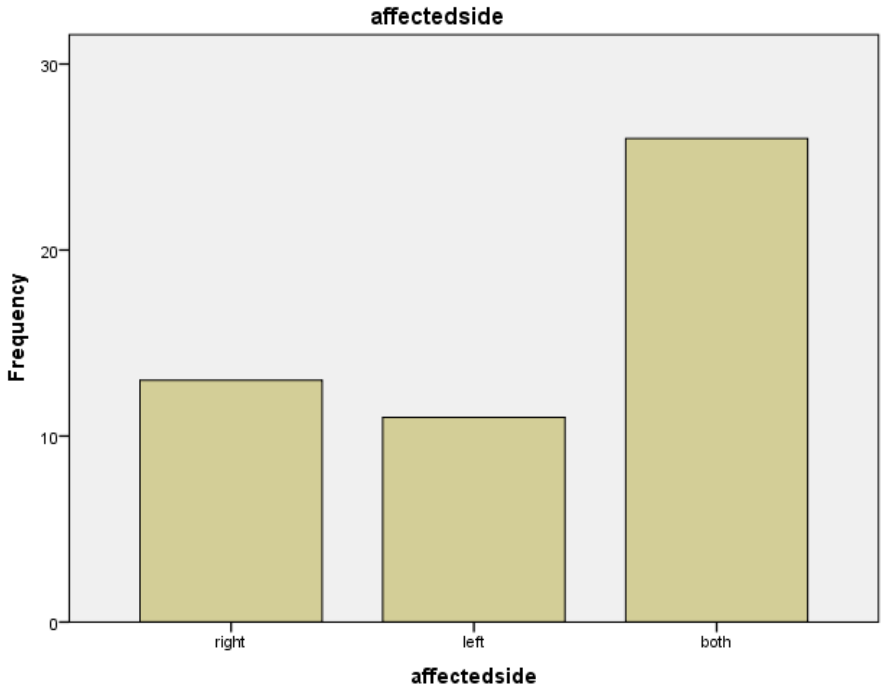

Figure 4 shows the affected side of lower leg in shin splint patients.

4.2.Duration of Hiking

According to the duration of hiking per day, 3 categories of these 50 participant were made, group I hike for 2-3 hours, group II hike for 3-4 hours and group III hike for more than 4 hours. In which high frequency (68%) was of those hikers who hike for 2-3 hours as shown in the table and figure 5.

Table 5 shows association of duration of hiking and shin splints in selected hikers.

Duration	Frequency	Percent
2-3 hours	34	68.0
3-4 hours	10	20.0
More than 4 hours	6	12.0
Total	50	100.0

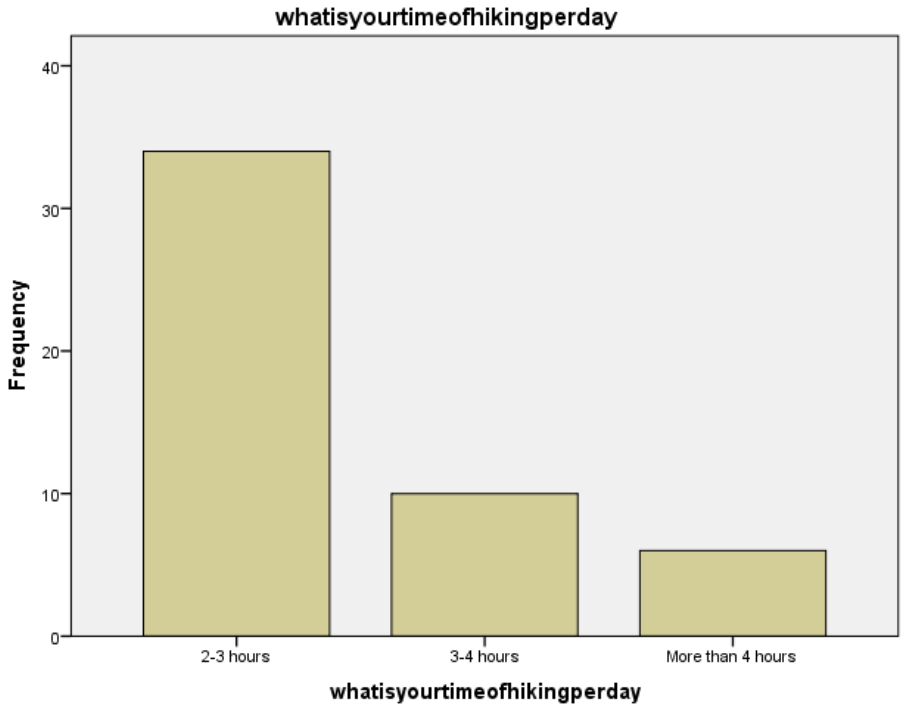

Figure 5 shows association of duration of hiking and shin splints in selected hikers

4.3 Duration of hiking per week

According to the duration of hiking per week, these 50 participant were categorized, in which majority (48%) was of those hikers who hike 4 days in a week followed by 14 (28%) participants who hike 3 days in a week and 12 (24%) participants hike more than 4 days per week, **As shown in the table and figure 6 high frequency of subjects hike 4 days in a week.**

Table 6 shows duration of hiking per week in selected subjects.

Per week duration	Frequency	Percent
3 days per week	14	28.0
4 days per week	24	48.0
more than 4 days	12	24.0
Total	50	100.0

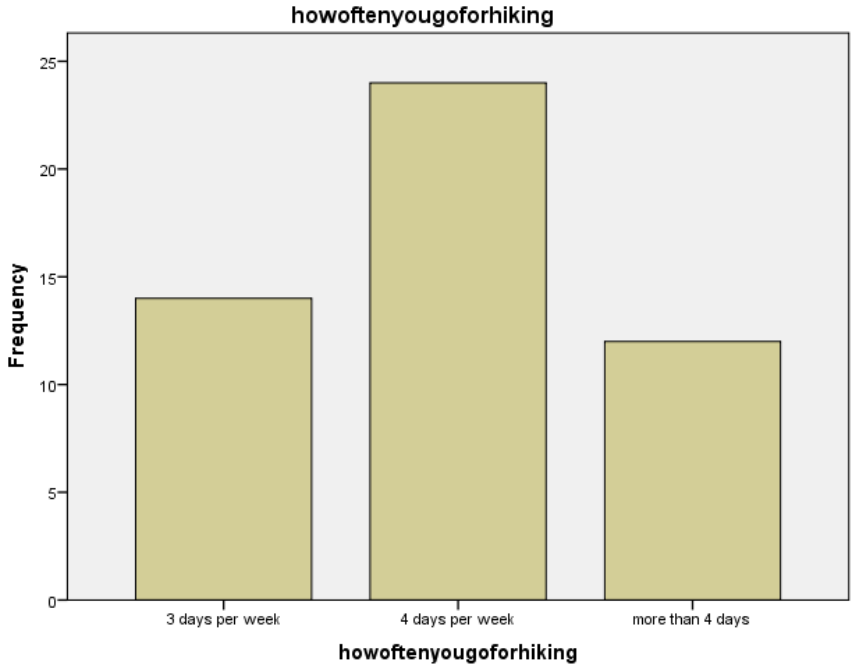

Figure 6 shows duration of hiking per week in selected subjects

4.3. Out of 50 participants most of the hikers (60%) were those who were hiking from last 3-4 months and 20 (40%) participants were hiking from more than 4 months as shown in the table and figure 7.

Table 7 shows from how long these hikers are doing this activity.

	Frequency	Percent
3-4 months	30	60.0
above 4 months	20	40.0
Total	50	100.0

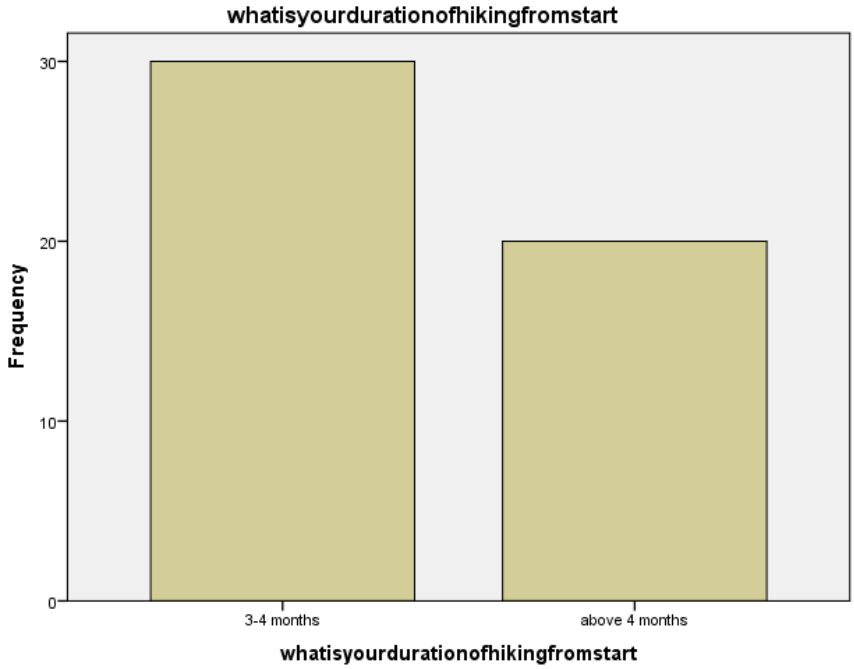

Figure 7 shows from how long these hikers are doing this activity.

4.4.Severity of pain

In our study we grouped these 50 participants into mild, moderate and severe pain intensity. Out of 50 subjects, half of the subjects (50%) had mild pain, 22 (44%) had moderate pain and 3 (6%) had severe pain by lifting their foot up. **As shown in the table and figure 8, more subjects (50%) had a mild pain.**

Table 8 shows pain intensity in selected subjects

Pain intensity	Frequency	Percent
mild pain	25	50.0
moderate pain	22	44.0
severe pain	3	6.0
Total	50	100.0

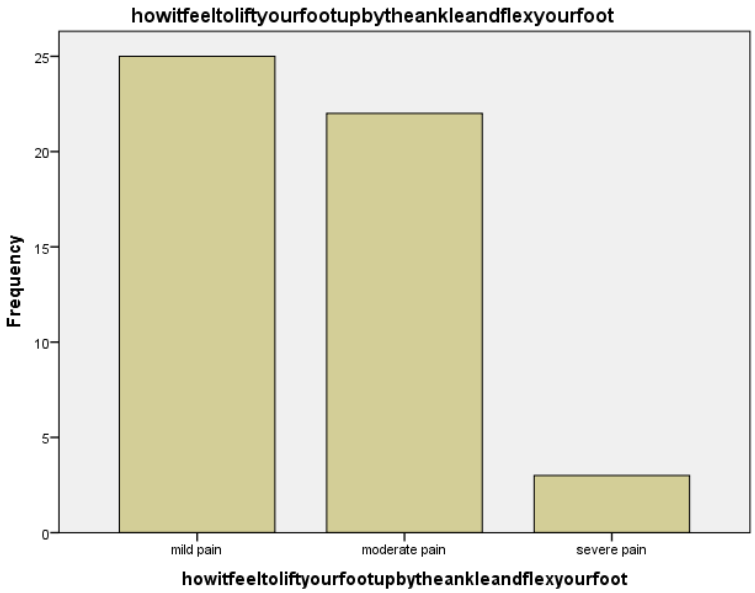

Figure 8 shows pain intensity in selected subjects

4.5.Pain Intensity during Hiking

Out of 50 subjects, 29 (58%) subjects often feel the pain during hiking, 16 (32%) subjects feel this pain every time when they hike and 5 (10%) of subjects feel the pain at rest. **As shown in the table and figure 9, more subjects (58%) had pain during hiking.**

Table 9 shows how often pain occur during hiking in selected subjects.

	Frequency	Percent
every time during hiking	16	32.0
often during hiking	29	58.0
at rest	5	10.0
Total	50	100.0

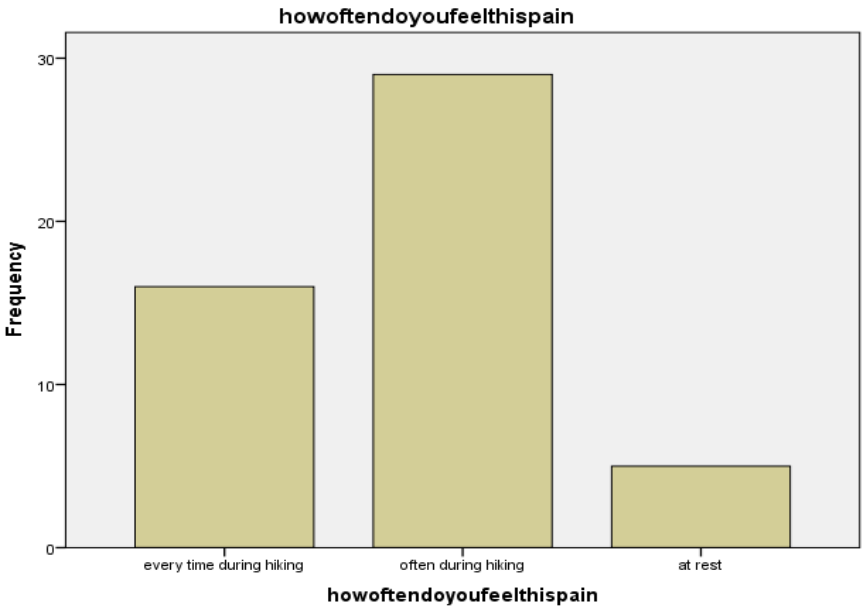

Figure 9 shows how often pain occur during hiking in selected subjects.

4.6. Pain intensity after hiking

It was also noted that 34 (68%) have typically shin splint pain during hiking and the rest of individuals (32%) feel the pain after hiking. **As shown in table and figure 10 most of subjects feel pain during hiking.**

Table 10 shows pain occurrence during and after hiking in selected subjects.

	Frequency	Percent
during hiking	34	68.0
after hiking	16	32.0
Total	50	100.0

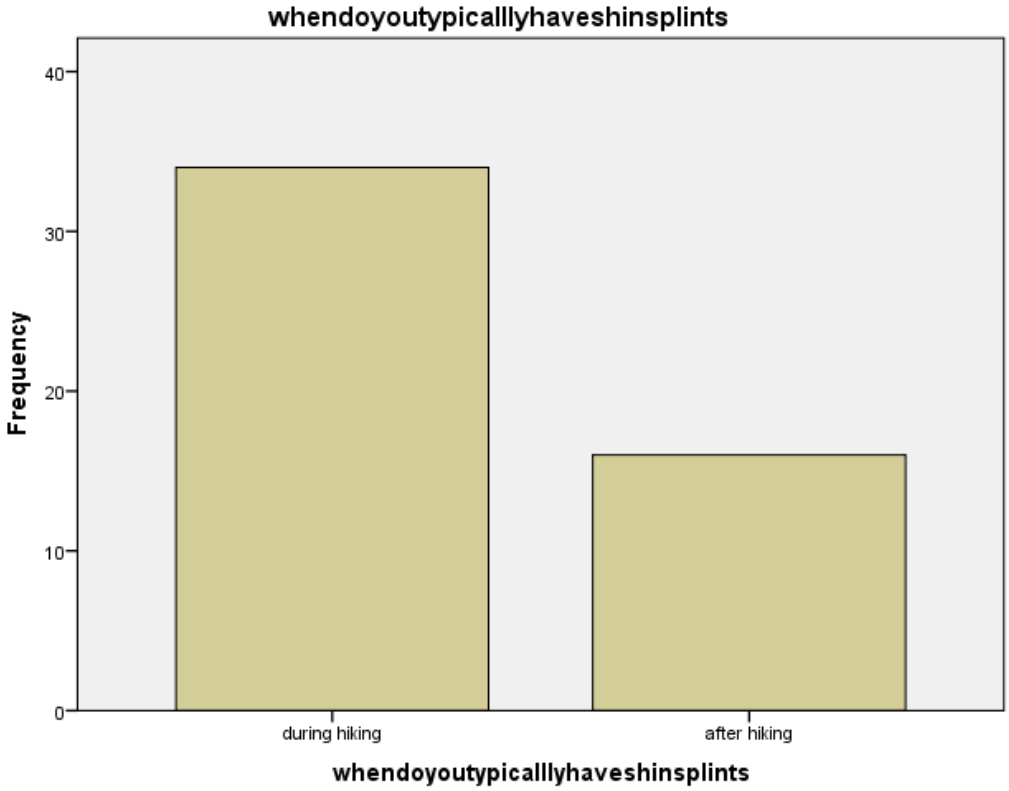

Figure 10 shows pain occurrence during and after hiking in selected subjects

4.7.Treatment of shin splint

Out of 50 participants, 42 (84%) subjects relax their pain by rest, 6 (12%) subjects relax their pain by compression and only 2 (4%) use ice for relaxation. **These results shows that rest is the most used treatment for relaxation, as shown in table and figure 11.**

Table 11 shows treatment of shin splints used by selected subject.

		Frequency	Percent
Valid	by ice	2	4.0
	by rest	42	84.0
	by compression	6	12.0
	Total	50	100.0

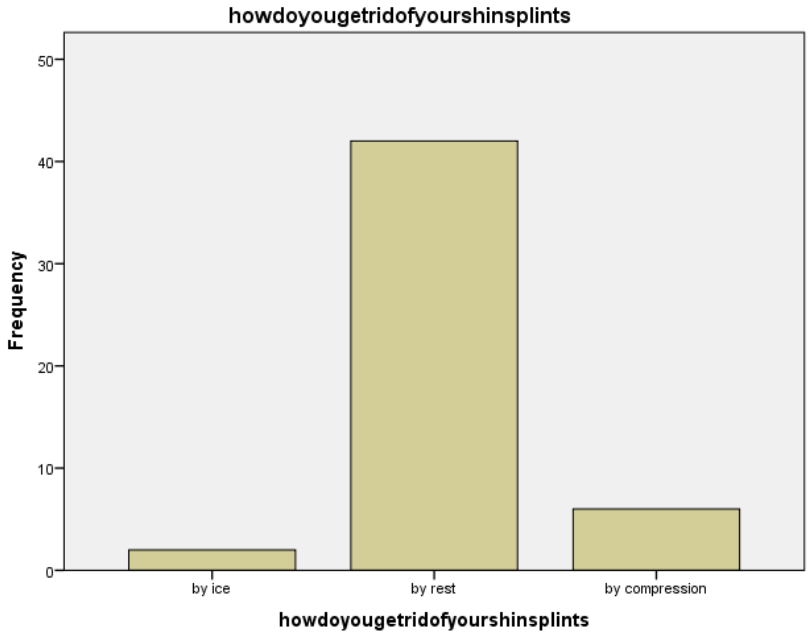

Figure 11 shows treatment of shin splints used by selected subject.

4.8.Effects of shin splints

Only 10 (20%) out of 50 subjects cannot hike because of shin splint pain. **This shows that most of individuals have mild pain and very less have severe pain as shown in table and figure 12.**

Table 12 shows effects of shin splint in selected subjects.

Shin splint effect hiking activity	Frequency	Percent
yes	10	20.0
no	40	80.0
Total	50	100.0

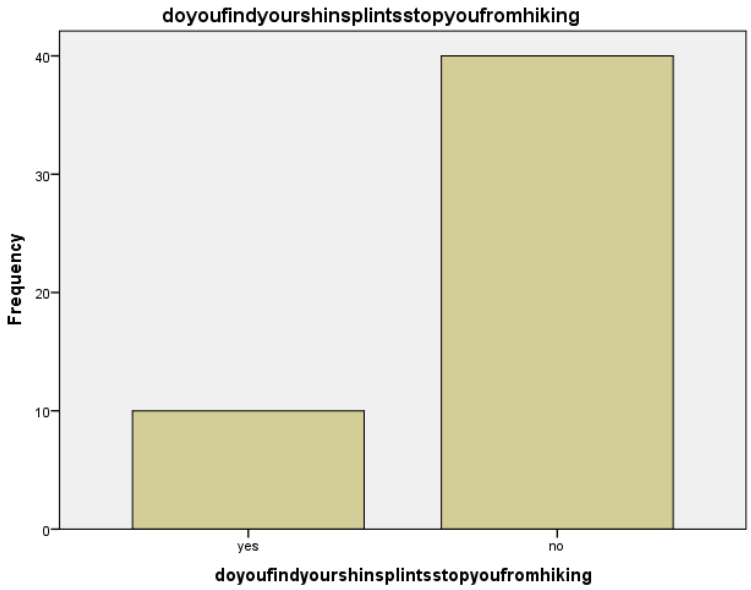

Figure 12 shows effects of shin splint in selected subjects.

4.9. Pain Intensity Scale

Pain intensity was measured according to the pain intensity scale, 28 (56%) had pain score 3 which is followed by (36%) subjects who had pain intensity score 4, 3 (6%) had pain score 5 and 1 (2%) had pain score 6. **Which shows that most of individuals has pain score 3 which is pain cutoff value and confirm that these subjects have shin splint shown in table and figure 13.**

Table 13 shows pain intensity in selected subjects.

Pain intensity score	Frequency	Percent
1	9	18.0
2	6	12.0
3	28	56.0
4	18	36.0
5	3	6.0
6	1	2.0
Total	50	100.0

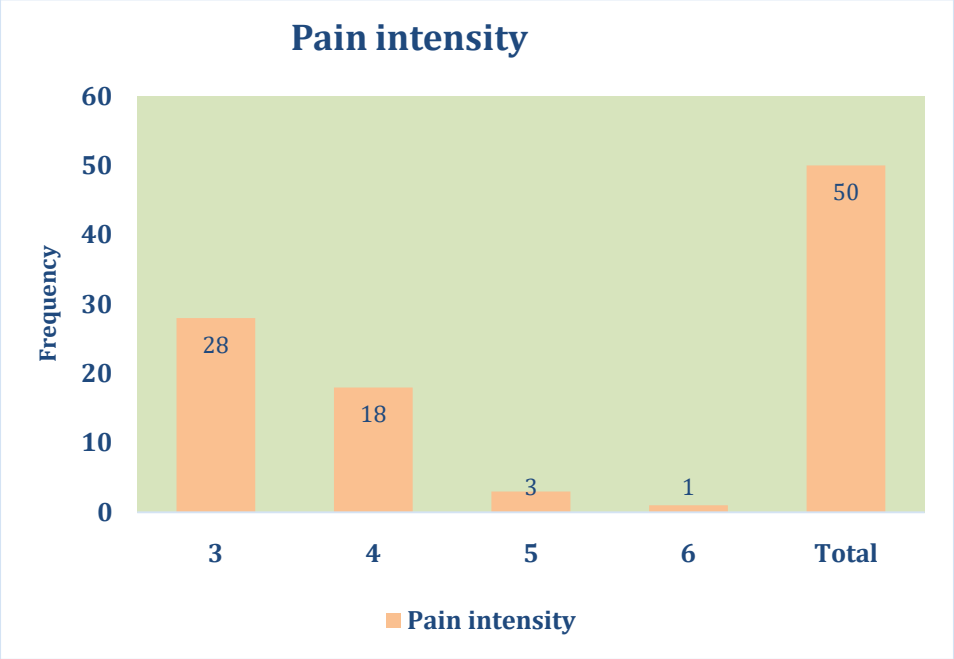

Figure 13 shows pain intensity in selected subjects.

4.10. Severity of pain

By evaluating pain severity in selected 50 individuals, 34 (68%) subjects had mild pain (1-3) and 16 (32%) had moderate pain (4-6) as shown in table and figure 14.

Table 14 shows severity of pain in selected subjects.

Pain severity	Frequency	Percent
1-3= mild pain	34	68.0
4-6=Moderate pain	16	32.0
Total	50	100.0

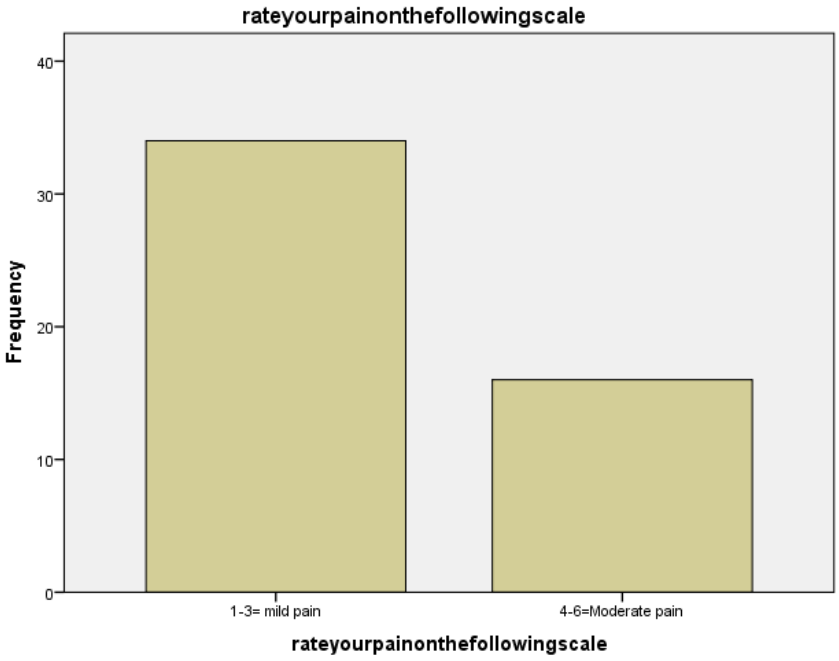

Figure 14 shows severity of pain in selected subjects.

4.11. Pain Disability Index

Pain disability index was measured in 50 individuals to analyze functional disabilities due to shin splints, in this study maximum index score was 36 in only 1 (2%) individual followed by pain disability index score 28, 23, 22, 21, 19, and 18 in 1 (2%), 1 (2%), 3 (6%), 5 (10%), 2 (4%) and 4 (8%) individuals respectively. Which shows that very less individuals are functionally disable to maintain their quality of daily life. As shown in table and figure 15.

Table 15 shows pain disability index score and functional disabilities due to shin splints.

Pain disability Index score	Frequency	Percent
3	1	2.0
4	2	4.0
5	1	2.0
6	1	2.0
8	3	6.0
9	3	6.0
10	2	4.0
11	4	8.0
12	3	6.0
13	2	4.0
14	5	10.0
16	2	4.0
17	4	8.0
18	4	8.0
19	2	4.0
21	5	10.0
22	3	6.0
23	1	2.0
28	1	2.0
36	1	2.0
Total	50	100.0

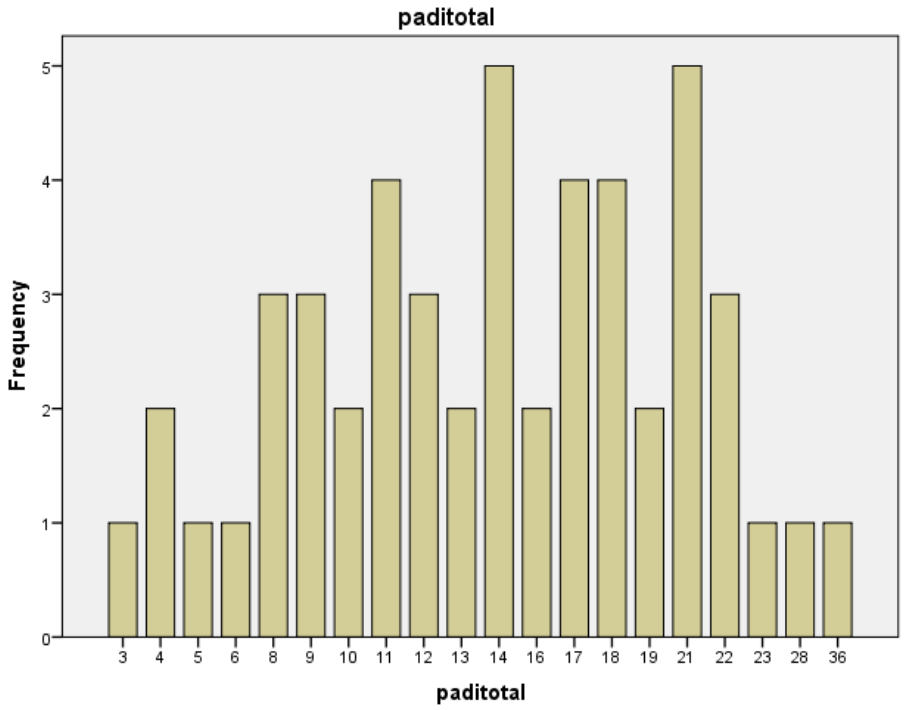

Figure 15 shows pain disability index score and functional disabilities due to shin splints.

CHAPTER#5

DISCUSSION

In current study of shin splint syndrome among hikers, the prevalence was more at age of 26-30 year (52%) followed by 20-25year (22%) and the majority of subjects were male while in previous study of Sultana et al. (2016) on shin splints syndrome among sports persons, the prevalence was more at age of 26-50 (32.4%), followed by 18-25 year (23.2%) where the majority of respondents were male [99].

In our study prevalence peaked in the normal category of BMI which is 18.5-24.9 likewise in the previous study (72.4%) of the studied population were normal weight (BMI 18.5-24.9) and had shin splint syndrome. This study did not found any significant association with socio-demographic characteristics of this study such as gender, age etc., and anthropometrical factors such as height, weight, BMI etc. whereas others study found association with gender [22, 82] and body mass index [82, 100].

In this study physiology of subjects were analyzed by examining their affected side of leg. Most of the participants (52%) had affected both sides of their leg followed by the individuals (26%)

who had right side affected and 11 (22%) individuals had left side of leg affected similar to the study of Jackson and Bailey (1975) who studied 26 athletes out of which 16 said they had pain in both shins, the right shin was involved in four of the athletes and the left in six [101].

By comparing our study with previous related study of Patel and Patil 2020, we found that the occurrence of shin splint was not dependent on the duration of hiking or any sports activity. In our study 34 (68%) subjects have typically shin splint pain during hiking and the rest of individuals (32%) feel the pain after hiking. While recent study maximum people have pain during running 114(86.4%), and many people have pain after running 111(84.1%), and minimum people have present with no pain 21(15.9%). We found that pain during hiking plays a significant role in shin splint Regarding the risk factors of shin splint, the present study found a significant role of the pain while hiking and after hiking, findings were comparable with research done by Patel and Patil 2020 [102]. By comparing this study with previous studies it is evaluated that pain severity can be varied depending on the type of activity, sport and training period [101].

Due to the significant occurrence of shin splints and the pain that this population experiences, it is critical to take action on hikers by educating them about the risks and consequences of renewal. It may help in the reduction of overuse injuries and the development of injury prevention methods. Future research should, however, confirm this hypothesis.

CONCLUSION

It was concluded from the present study that there is a prevalence of shin splint in hikers. This study has stated that the shin splint is seen in age groups of adults. Though this study found no significant association as risk factors of shin splints with socio-demographic characteristics and anthropometrical characteristics but found significant association with nature of activity and role of the pain while hiking and after hiking. We also concluded from the present study that no functional disability affect quality of daily life.

LIMITATION

Limitations of the study included the small sample size and lack of female participants. Further studies are needed to more precise determination of prevalence, incidence and the factors associated with Shin splints among hikers.

References

1. Mubarak SJ, Gould RN, Lee YF, Schmidt DA, Hargens AR. The medial tibial stress syndrome: a cause of shin splints. The American journal of sports medicine. 1982 Jul;10(4):201-5.
2. Kvist M. Achilles tendon injuries in athletes. Sports Medicine. 1994 Sep;18(3):173-201.
3. Taunton JE, McKenzie DC, Clement DB. The role of biomechanics in the epidemiology of injuries. Sports medicine. 1988 Aug;6(2):107-20.
4. Churches AE, Howlett CR. Functional adaptation of bone in response to sinusoidally varying controlled compressive loading of the ovine metacarpus. Clinical orthopaedics and related research. 1982 Aug 1(168):265-80.
5. Churches AE, Howlett CR, Waldron KJ, Ward GW. The response of living bone to controlled time-varying loading: method and preliminary results. Journal of biomechanics. 1979 Jan 1;12(1):35-45. 34.
6. Abramowitz AJ, Schepsis A, McArthur C. The medial tibial syndrome. The role of surgery. Orthopaedic review. 1994 Nov 1;23(11):875-81.
7. Holen KJ, Engebretsen L, Grøntvedt T, Rossvoll I, Hammer S, Stoltz V. Surgical treatment of medial tibial stress syndrome (shin splint) by fasciotomy of the superficial posterior compartment of the leg. Scandinavian journal of medicine & science in sports. 1995 Feb;5(1):40-3.
8. Beck BR. Tibial stress injuries. Sports Medicine. 1998 Oct;26(4):265-79.
9. Kortebein PM, Kaufman KR, Basford JR, Stuart MJ. Medial tibial stress syndrome. Medicine and science in sports and exercise. 2000 Mar 1;32(3 Suppl):S27-33.
10. Patil SS. Shin splints. InFoot and ankle sports orthopaedics 2016 (pp. 181-186). Springer, Cham.
11. Magnusson HI, Westlin NE, Nyqvist F, Gärdsell P, Seeman E, Karlsson MK. Abnormally decreased regional bone density in athletes with medial beck Btibial stress syndrome. The American journal of sports medicine. 2001 Nov;29(6):712-5.
12. Galbraith RM, Lavallee ME. Medial tibial stress syndrome: conservative treatment options. Current reviews in musculoskeletal medicine. 2009 Sep;2(3):127-33.

13. Thacker SB, Gilchrist J, Stroup DF, Kimsey CD. The prevention of shin splints in sports: a systematic review of literature. Medicine & Science in Sports & Exercise. 2002 Jan 1;34(1):32-40.
14. Goodship AE, Lanyon LE, McFie H. Functional adaptation of bone to increased stress. An experimental study. The Journal of bone and joint surgery. American volume. 1979 Jun 1;61(4):539-46.
15. Wilder RP, Sethi S. Overuse injuries: tendinopathies, stress fractures, compartment syndrome, and shin splints. Clinics in sports medicine. 2004 Jan 1;23(1):55-81
16. Couture CJ, Karlson KA. Tibial stress injuries: decisive diagnosis and treatment of 'shin splints'. The Physician and sportsmedicine. 2002 Jun 1;30(6):29-36.
17. Fredericson M. Common injuries in runners. Sports Medicine. 1996 Jan;21(1):49-72.
18. Plastaras CT, Rittenberg JD, Rittenberg KE, Press J, Akuthota V. Comprehensive functional evaluation of the injured runner. Physical Medicine and Rehabilitation Clinics. 2005 Aug 1;16(3):623-49.
19. Sommer HM, Vallentyne SW. Effect of foot posture on the incidence of medial tibial stress syndrome. Medicine and science in sports and exercise. 1995 Jun 1;27(6):800-4.
20. Niemuth PE, Johnson RJ, Myers MJ, Thieman TJ. Hip muscle weakness and overuse injuries in recreational runners. Clinical Journal of Sport Medicine. 2005 Jan 1;15(1):14-21.
21. Strakowski JA, Jamil T. Management of common running injuries. Physical Medicine and Rehabilitation Clinics. 2006 Aug 1;17(3):537-52.
22. Yates B, White S. The incidence and risk factors in the development of medial tibial stress syndrome among naval recruits. The American journal of sports medicine. 2004 Apr;32(3):772-80.
23. Messier SP, Pittala KA. Etiologic factors associated with selected running injuries. Medicine and Science in Sports and Exercise. 1988 Oct 1;20(5):501-5.
24. Ravin TH, Cantieri MS, Pasquarello GJ. Principles of prolotherapy. Denver, CO: American Academy of Musculoskeletal Medicine; 2008.

25. Nadler SF, Malanga GA, DePrince M, Stitik TP, Feinberg JH. The relationship between lower extremity injury, low back pain, and hip muscle strength in male and female collegiate athletes. Clinical Journal of Sport Medicine. 2000 Apr 1;10(2):89-97.
26. Leetun DT, Ireland ML, Willson JD, Ballantyne BT, Davis IM. Core stability measures as risk factors for lower extremity injury in athletes. Medicine & science in sports & exercise. 2004 Jun 1;36(6):926-34.
27. Slocum DB. The shin splint syndrome: medical aspects and differential diagnosis. The American Journal of Surgery. 1967 Dec 1;114(6):875-81.
28. Gehlsen GM, Seger A. Selected measures of angular displacement, strength, and flexibility in subjects with and without shin splints. Research quarterly for exercise and sport. 1980 Oct 1;51(3):478-85.
29. Michael RH, Holder LE. The soleus syndrome: a cause of medial tibial stress (shin splints). The American journal of sports medicine. 1985 Mar;13(2):87-94.
30. Beck BR, Osternig LR. Medial tibial stress syndrome. The location of muscles in the leg in relation to symptoms. JBJS. 1994 Jul 1;76(7):1057-61.
31. Nielsen MB, Hansen K, Hølmer P, Dyrbye M. Tibial periosteal reactions in soldiers: a scintigraphic study of 29 cases of lower leg pain. Actaorthopaedica Scandinavica. 1991 Jan 1;62(6):531-4.
32. Dugan SA, Weber KM. Stress fractures and rehabilitation. Physical medicine and rehabilitation clinics of North America. 2007 Aug 1;18(3):401-16.
33. Anderson MW, Ugalde V, Batt M, Gacayan J. Shin splints: MR appearance in a preliminary study. Radiology. 1997 Jul;204(1):177-80.
34. Fredericson M, Bergman AG, Hoffman KL, Dillingham MS. Tibial stress reaction in runners: correlation of clinical symptoms and scintigraphy with a new magnetic resonance imaging grading system. The American journal of sports medicine. 1995 Jul;23(4):472-81.
35. Detmer DE. Chronic shin splints. Sports Medicine. 1986 Nov;3(6):436-46.
36. Brunet ME, Cook SD, Brinker MR, Dickinson JA. A survey of running injuries in 1505 competitive and recreational runners. The Journal of sports medicine and physical fitness. 1990 Sep 1;30(3):307-15.

37. Drez D. Orthopaedic sports medicine: principles and practice. DeLee JC, Stanitski CL, editors. Saunders; 1994.
38. Mellion M, Walsh W, Madden C, Putukian M, Shelton G. The team physician's handbook. 3rd ed. Philadelphia, PA: Hanley & Belfus; 2002. p. 517, 583.
39. Young AJ, McAllister DR. Evaluation and treatment of tibial stress fractures. Clinics in sports medicine. 2006 Jan 1;25(1):117-28.
40. DeLee J, Drez D, Miller M. DeLee and Drez's orthopaedic sports medicine principles and practice. Philadelphia, PA: Saunders; 2003. p. 2155–9.
41. Clanton TO, Solcher BW. Chronic leg pain in the athlete. Clinics in sports medicine. 1994 Oct 1;13(4):743-59.
42. ANDRISH JT, BERGFELD JA, Walheim JO. A prospective study on the management of shin splints. JBJS. 1974 Dec 1;56(8):1697-700.
43. Wayne Rasmussen, Rpt. Shin Splints: definition and treatment.J Sports Med. 1974;2(2):111–7.
44. Michael Galbraith R, Lavallee ME. Medial tibial stress syndrome: conservative treatment options. Curr Rev Musculoskelet Med.2009;2:127–33.
45. Moen MH, Tol JL, Weir A, Steunebrink M, De Winter TC. Medial tibial stress syndrome. Sports medicine. 2009 Jul;39(7):523-46.
46. Story J, Cymet TC. Shin splints Painful to have and to treat. Comprehensive therapy. 2006 Sep 1;32(3):192-5.
47. Saxena A, O'Brien T, Bunce D. Anatomic dissection of the tibialis posterior muscle and its correlation to medial tibial stress syndrome. The Journal of foot surgery. 1990 Mar 1;29(2):105-8.
48. Garth JR WP, Miller ST. Evaluation of claw toe deformity, weakness of the foot intrinsics, and posteromedial shin pain. The American journal of sports medicine. 1989 Nov;17(6):821-7.
49. Bouché RT, Johnson CH. Medial tibial stress syndrome (Tibial fasciitis) A proposed pathomechanical model involving fascial traction. Journal of the American Podiatric Medical Association. 2007 Jan;97(1):31-6.
50. Fred and DeLacerda FG. A study of anatomical factors involved in shinsplints. Journal of Orthopaedic & Sports Physical Therapy. 1980 Oct 1;2(2):55-9.

51. Bhatt R, Lauder I, Finlay DB, Allen MJ, Belton IP. Correlation of bone scintigraphy and histological findings in medial tibial syndrome. British journal of sports medicine. 2000 Feb 1;34(1):49-53.
52. Johnell O, Rausing A, Wendeberg B, Westlin N. Morphological bone changes in shin splints. Clinical Orthopaedics and Related Research®. 1982 Jul 1;167:180-4.
53. Bonewald LF. Mechanosensation and transduction in osteocytes. BoneKEy osteovision. 2006 Oct;3(10):7.
54. Han Y, Cowin SC, Schaffler MB, Weinbaum S. Mechanotransduction and strain amplification in osteocyte cell processes. Proceedings of the National Academy of Sciences. 2004 Nov 23;101(47):16689-94.
55. Nicolella DP, Moravits DE, Gale AM, Bonewald LF, Lankford J. Osteocyte lacunae tissue strain in cortical bone. Journal of biomechanics. 2006 Jan 1;39(9):1735-43.
56. Noble B. Microdamage and apoptosis. European journal of morphology. 2005 Feb 1;42(1-2):91-8.
57. Magnusson HI, Ahlborg HG, Karlsson C, Nyquist F, Karlsson MK. Low regional tibial bone density in athletes with medial tibial stress syndrome normalizes after recovery from symptoms. The American journal of sports medicine. 2003 Jul;31(4):596-600.
58. Winters M. The diagnosis & management of medial tibial stress syndrome (shin splints): an evidence-update. Dansk Sportsmedicin. 2017;21(4):8-13.
59. Gabbett T. Infographic: The training–injury prevention paradox: should athletes be training smarter and harder?. British Journal of Sports Medicine. 2017 Jan 12.
60. Kortebein PM, Kaufman KR, Basford JR, et al. Medial tibial stress syndrome. Medicine & Science in Sports & Exercise. 2000 Mar:32 (3): 27-33
61. Andrish JT. The shin splint syndrome. In: DeLee JC, Drez D, editors. Orthopaedic sports medicine. 2nd ed. Amsterdam: Elsevier, 2003: chapter 29, 2155-8.
62. Edwards Jr PH, Wright ML, Hartman JF. A practical approach for the differential diagnosis of chronic leg pain in the athlete. The American Journal of Sports Medicine. 2005 Aug;33(8):1241-9.
63. Puranen JA, Alavaikko A. Intracompartmental pressure increase on exertion in patients with chronic compartment syndrome in the leg. The Journal of bone and joint surgery. American volume. 1981 Oct 1;63(8):1304-9.

64. Wallensten R, Eriksson E. Intramuscular pressures in exercise-induced lower leg pain. International journal of sports medicine. 1984 Feb;5(01):31-5.
65. . D'Ambrosia RD, Zelis RF, Chuinard RG, Wilmore J. Interstitial pressure measurements in the anterior and posterior compartments in athletes with shin splints. The American journal of sports medicine. 1977 May;5(3):127-31.
66. Greaney RB, Gerber FH, Laughlin RL, Kmet JP, Metz CD, Kilcheski TS, Rao BR, Silverman ED. Distribution and natural history of stress fractures in US Marine recruits. Radiology. 1983 Feb;146(2):339-46.
67. . Kiuru MJ, Pihlajamaki HK, Hietanen HJ, Ahovuo JA. MR imaging, bone scintigraphy, and radiography in bone stress injuries of the pelvis and the lower extremity. Acta Radiologica. 2002 Jan 1;43(2):207-12.
68. Batt ME, Ugalde VI, Anderson MW, Shelton DK. A prospective controlled study of diagnostic imaging for acute shin splints. Medicine and science in sports and exercise. 1998 Nov 1;30(11):1564-71.
69. Gaeta M, Minutoli F, Scribano E, Ascenti G, Vinci S, Bruschetta D, Magaudda L, Blandino A. CT and MR imaging findings in athletes with early tibial stress injuries: comparison with bone scintigraphy findings and emphasis on cortical abnormalities. Radiology. 2005 May;235(2):553-61.
70. Gaeta M, Minutoli F, Vinci S, Salamone I, D'Andrea L, Bitto L, Magaudda L, Blandino A. High-resolution CT grading of tibial stress reactions in distance runners. American Journal of Roentgenology. 2006 Sep;187(3):789-93.
71. Aoki Y, Yasuda K, Tohyama H, Ito H, Minami A. Magnetic resonance imaging in stress fractures and shin splints. Clinical Orthopaedics and Related Research (1976-2007). 2004 Apr 1;421:260-7.
72. Brukner PE. Exercise-related lower leg pain: bone. Medicine and science in sports and exercise. 2000 Mar 1;32(3 Suppl):S15-26.
73. Holder LE, Michael RH. The specific scintigraphic pattern of “shin splints in the lower leg”: concise communication. Journal of nuclear medicine. 1984 Aug 1;25(8):865-9.
74. Chisin R, Milgrom C, Giladi M, Stein M, Margulies J, Kashtan H. Clinical significance of nonfocal scintigraphic findings in suspected tibial stress fractures. Clinical orthopaedics and related research. 1987 Jul 1(220):200-5.

75. Zwas ST, Elkanovitch R, Frank G. Interpretation and classification of bone scintigraphic findings in stress fractures. Journal of Nuclear Medicine. 1987 Apr 1;28(4):452-7.
76. Matin P. Basic principles of nuclear medicine techniques for detection and evaluation of trauma and sports medicine injuries. InSeminars in nuclear medicine 1988 Apr 1 (Vol. 18, No. 2, pp. 90-112). WB Saunders.
77. Drubach LA, Connolly LP, D'hemecourt PA, Treves ST. Assessment of the clinical significance of asymptomatic lower extremity uptake abnormality in young athletes. Journal of Nuclear Medicine. 2001 Feb 1;42(2):209-12.
78. Mattila KT, Komu ME, Dahlström S, Koskinen SK, Heikkilä J. Medial tibial pain: a dynamic contrast-enhanced MRI study. Magnetic resonance imaging. 1999 Sep 1;17(7):947-54.
79. Vtasalo JT, Kvist M. Some biomechanical aspects of the foot and ankle in athletes with and without shin splints. The American Journal of Sports Medicine. 1983 May;11(3):125-30.
80. Bennett JE, Reinking MF, Pluemer B, Pentel A, Seaton M, Killian C. Factors contributing to the development of medial tibial stress syndrome in high school runners. Journal of Orthopaedic & Sports Physical Therapy. 2001 Sep;31(9):504-10.
81. DeLacerda FG. A study of anatomical factors involved in shinsplints. Journal of Orthopaedic & Sports Physical Therapy. 1980 Oct 1;2(2):55-9.
82. Plisky MS, Rauh MJ, Heiderscheit B, Underwood FB, Tank RT. Medial tibial stress syndrome in high school cross-country runners: incidence and risk factors. journal of orthopaedic & sports physical therapy. 2007 Feb;37(2):40-7.
83. Hubbard TJ, Carpenter EM, Cordova ML. Contributing factors to medial tibial stress syndrome: a prospective investigation. Medicine and science in sports and exercise. 2009 Mar 1;41(3):490-6.
84. Redmond AC, Crosbie J, Ouvrier RA. Development and validation of a novel rating system for scoring standing foot posture: the Foot Posture Index. Clinical biomechanics. 2006 Jan 1;21(1):89-98.
85. Keenan AM, Redmond AC, Horton M, Conaghan PG, Tennant A. The Foot Posture Index: Rasch analysis of a novel, foot-specific outcome measure. Archives of physical medicine and rehabilitation. 2007 Jan 1;88(1):88-93.

86. Burne SG, Khan KM, Boudville PB, Mallet RJ, Newman PM, Steinman LJ, Thornton E. Risk factors associated with exertional medial tibial pain: a 12 month prospective clinical study. British journal of sports medicine. 2004 Aug 1;38(4):441-5.
87. Bamman MM, Newcomer BR, Larson-Meyer DE, Weinsier RL, Hunter GR. Evaluation of the strength-size relationship in vivo using various muscle size indices. Medicine and science in sports and exercise. 2000 Jul 1;32(7):1307-13.
88. Taunton JE, Ryan MB, Clement DB, McKenzie DC, Lloyd-Smith DR, Zumbo BD. A retrospective case-control analysis of 2002 running injuries. British journal of sports medicine. 2002 Apr 1;36(2):95-101.
89. Nissen LR, Astvad K, Madsen L. Low-energy laser therapy in medial tibial stress syndrome. Ugeskrift for laeger. 1994 Dec 1;156(49):7329-31.
90. Johnston E, Flynn T, Bean M, Breton M, Scherer M, Dreitzler G, Thomas D. A randomized controlled trial of a leg orthosis versus traditional treatment for soldiers with shin splints: a pilot study. Military medicine. 2006 Jan 1;171(1):40-4.
91. Järvinnen M, Aho H, Niittymäki S. Results of the surgical treatment of the medial tibial syndrome in athletes. International journal of sports medicine. 1989 Feb;10(01):55-7.
92. Wallensten RI. Results of fasciotomy in patients with medial tibial syndrome or chronic anterior-compartment syndrome. The Journal of bone and joint surgery. American volume. 1983 Dec 1;65(9):1252-5.
93. Yates B, Allen MJ, Barnes MR. Outcome of surgical treatment of medial tibial stress syndrome. JBJS. 2003 Oct 1;85(10):1974-80.
94. Bensel CK, Kish RN. Lower extremity disorders among men and women in Army basic training and effects of two types of boots. ARMY NATICK RESEARCH AND DEVELOPMENT LABS MA INDIVIDUAL PROTECTION LAB; 1983 Jan 1.
95. Schwellnus MP, Jordaan G, Noakes TD. Prevention of common overuse injuries by the use of shock absorbing insoles: a prospective study. The American journal of sports medicine. 1990 Nov;18(6):636-41.
96. Larsen K, Weidich F, Leboeuf-Yde C. Can custom-made biomechanic shoe orthoses prevent problems in the back and lower extremities? A randomized, controlled intervention trial of 146 military conscripts. Journal of manipulative and physiological therapeutics. 2002 Jun 1;25(5):326-31.

97. Schwellnus MP, Jordaan G. Does calcium supplementation prevent bone stress injuries? A clinical trial. International Journal of Sport Nutrition and Exercise Metabolism. 1992 Jun 1;2(2):165-74.
98. Brushøj C, Larsen K, Albrecht-Beste E, Nielsen MB, Løye F, Hölmich P. Prevention of overuse injuries by a concurrent exercise program in subjects exposed to an increase in training load: a randomized controlled trial of 1020 army recruits. The American journal of sports medicine. 2008 Apr;36(4):663-70.
99. Sultana S, Mondal R, Sarker RC, Kamrujjaman M, Khalil MI, Banik PC. Shin splints among sports persons of different reputed clubs in Dhaka city. SMU Medical Journal. 2016 Jul 1;3(2):111-22.
100. Hamstra-Wright KL, Bliven KC, Bay C. Risk factors for medial tibial stress syndrome in physically active individuals such as runners and military personnel: a systematic review and meta-analysis. British journal of sports medicine. 2015 Mar 1;49(6):362-9.
101. Jackson DW, Bailey D. Shin splints in the young athlete: a nonspecific diagnosis. The Physician and Sportsmedicine. 1975 Mar 1;3(3):44-51.
102. Patel P, Patil N. Prevalence Of Shin Splint In Recreational Marathon Runner.

Appendices

Annexure I: Questionnaire

Consent form

Prevalence of shin splints among hikers in Islamabad

QUESTIONNAIRE

Consent form

There is no risk of harm to participants in the following study. All data obtained from you will be secured to protect your privacy and will not be shared with anybody. Following the survey, there will be no way to link your name to your data. Any further information regarding the survey's result will be provided to you upon at the completion of the study. You consent of participate means that you have read and comprehended the purpose of this study, and that all of your questions about the activities have been satisfactorily addressed.

Signature of Participant……

Name_____ Age_____

Gender_____ Marital Status_____

Height_____ Weight_____ Affected side_____

Address_____

Contact#_____ Profession_____

Q1. Are you a hiker?
- **YES**
- **NO**

Q2. What is your time of hiking per day?
- **Less than 1 hour**
- **1-2 hours**
- **2-3 hours**
- **3-4 hours**
- **More than 4 hours**

Q3. How often do you go for hiking?
- **Once per week**
- **Twice per week**
- **3 Days per week**
- **4 days per week**
- **More than 4 days**

Q4. What is your duration of hiking from start?
- **1-2 Months**
- **2-3 Months**
- **3-4 Months**
- **Above 4 Months**

Q5. Have you meet any type of fracture linked to Knee or ankle joint in last three months?
- **Yes**
- **No**

Q6. Do you have any infection in your leg at present?
- **Yes**
- **No**

Q7. Are you suffering from deep vein thrombosis?
- **Yes**
- **No**

Q8. Do you feel pain in shin or in tibia borders?
- **YES**
- **NO**

Q9. Does your pain radiate from your hip towards your foot?
- **YES**
- **NO**

Q10. How it feel to lift your foot up by the ankle and flex your foot?

- **Not any pain**
- **Mild pain**
- **Moderate pain**
- **Severe pain**

Q11. How often do you feel this pain?

- **Every time during hiking.**
- **Often during hiking**
- **At rest**

Q12. When do you typically have shin splints?

- **Before hiking**
- **During hiking**
- **After hiking**

Q13. How do you get rid of your Shin Splints?

- **By Ice**
- **By rest**
- **By elevation**
- **By compression**

Q14. Do you find that your shin splints stop you from hiking?

- **YES**
- **NO**

Q15. Rate your pain on the following scale.

0 1 2 3 4 5 6 7 8 9 10

No pain↓ ↓mild pain↓ ↓severe pain ↓

Q16. The following questions are designed to get information that how shin splints disorder has affected your daily life activities. Please circle the number on the following scale to describe your level of disability.

a) Family responsibilities: includes the home chores and all the duties which are performed around the house.

No disability 0 1 2 3 4 5 6 7 8 9 10 severe disability

b) Recreational activities includes the running, hiking, and other sports.

No disability 0 1 2 3 4 5 6 7 8 9 10 severe disability

c) Social activities involve the parties, weddings and other gatherings.

No disability 0 1 2 3 4 5 6 7 8 9 10 severe disability

d) Sex life includes the frequency of individual's sex life.

No disability 0 1 2 3 4 5 6 7 8 9 10 severe disability

e) Professional life includes the individual's job.

No disability 0 1 2 3 4 5 6 7 8 9 10 severe disability

f) Self-maintenance contains the activities of dressing, wearing shoes, and taking shower etc.

No disability 0____1____2____3____4____5____6____7____8____9____10 severe disability

g) Life supported activities include sleeping and eating etc.

No disability 0____1____2____3____4____5____6____7____8____9____10 severe disability

INTERPRETATION

For the above seven parameters pain disability index will be interpreted.

PDI= Sum (points for above 7 parameters)

Minimum index= 0

Maximum index=70

As the index increases the patient's disability due to pain will also increases

ANNEXURE II

GANTT CHART

	September	October	November	December	January	February
ASRB/ Ethical clearance						
Sampling Time						
Data Collection						
Data Analysis						
Thesis Writing						

Appendices III

RESEARCH PROPOSAL

1. TITLE

Prevalence of shin splints among hikers in Islamabad

2. INTRODUCTION

Shin-Splint Syndrome, also known as Medial Tibial Stress Syndrome (MTSS), is a clinical pain syndrome. A condition in which the athletes encounter exercise induced pain in the distal posteromedial position of the tibia is known as Medial tibial stress syndrome [1]. It is the most common among all the condition leading to the exercise induced leg pain and is also denoted as true shin splints [1]. According to the two enormous epidemiological surveys, this syndrome is considered the most common in runners such as 13.1% of 1800 injuries while 22% of 385 injuries were observed in aerobic dancers [2, 3].

The pathophysiology of shin splints is better understood after reviewing the cross-sectional anatomy. In the leg, there are four muscular compartments. I. Anterior, II. Deep posterior, III. Superficial posterior, IV. Lateral. [4]The tibialis anterior and posterior muscles are frequently involved in dysfunction, and the region of attachment of these muscles might be the source of discomfort[5].MTSS is frequently associated with muscular imbalance and inflexibility, particularly tightening of the triceps surae[4].

In this syndrome, the pain is mostly observed in the middle to distal third of the posteromedial margin of the tibia. The pain is noticed to be increase with exercise or any other physical activity and is present for few hours after the termination of exercise. Particularly,In case of severe conditions the discomfort continues the whole day in the posteromedial region of tibia [6,7].

This syndrome can be diagnosed primarily by the clinical history, the region of the pain and the tenderness of the medial tibial margin. When the clinical history and other findings are non-specified then the techniques utilized for the detection of this syndrome are Magnetic resonance imaging or bone scintigraphy [8,9].

According to various authors, there are several causes of Medial tibial stress syndrome including poor sports techniques, incorrect warmup methods, abruptly raising the level of training, extreme use of muscles, training on tough surfaces, skeletal malalignment, imbalance of muscles, and

rigidity of calf muscles [10, 11, and 12]. Further, the most usual skeletal malalignment is extreme pronation of the foot region. On the basis of the anatomical studies, the rigidity of the soleus muscles are recognized as possible etiology which denoted that the origin of the pain is present at the distal-medial region of the soleus muscle and crural fascia [12, 13]. The most research studies recommend that this syndrome is basically occurs by the bone stress reaction [14, 15] whereas the particular cause of this disease condition is unidentified. The previous theories suggested that it contain inflammatory response of the periosteal traction reaction while the recent evidence proposes it is a painful stress reaction of the bone. In this case, the most important risk factors are hyperpronation of the foot, females' sex and the clinical history of former MTSS[10-13].

Different types of treatments were suggested by various authors while some period of rest were referred by all of them. Some other conventional modalities included the use of ice in severe condition, cast arrest, ultrasound, taping, use of steroid injections, anti-inflammatory medicines, orthoses, stretching exercises, and a slow return to the sports activity [6, 7, 16,17]. If these conservative method of treatments is failed which is infrequently done by most authors [6, 18, 16,19] , then surgical treatments are recommended in which the success range is between 29% to 86% [6,11]. The purpose of this study is to find the prevalence of shin splints in hikers of Islamabad and to work on the limitations of previous research studies.

3. RATIONALE OF STUDY

In most of previous studies the limitation was that exact etiology and cause of shin splints syndrome was not known and not any study focused on functional disabilities due to shin splint [1, 10, 50]. This study was conduct specifically among young hikers (approx; 25 years age) of Islamabad which is neglected area of population. The aim of our study was to determine the prevalence and functional disability among hikers with shin splint in Islamabad. Evaluating this study will provide valuable insights into preventive measures of shin splints and will help the hikers to relieve the pain and starting their normal activities.

4. RESEARCH QUESTION

What is the Prevalence of Shin Splints among hikers in Islamabad?

5. OBJECTIVES

- To find out the prevalence of shin splints among hikers in Islamabad.
- To find out the functional disability among hikers due to shin splints.

6. HYPOTHESIS

- Null Hypothesis $H_{0;}$ Shin splints is not prevalent among hikers in Islamabad.
- Alternate Hypothesis $H_{A;}$ Shin splints is prevalent among hikers in Islamabad.

Testing of hypothesis do not need to be applicable because it is a descriptive study.

7. OPERATIONAL DEFINITION

Medial tibial stress syndrome (MTSS) or shin splints is one of several repetitive lower leg injuries that's comes under the term of exercise-induced leg discomfort. The three most prevalent types of exercise-induced leg discomfort are chronic compartment syndrome, stress fracture and MTSS, with MTSS having the highest frequency. MTSS was initially identified as "a symptom complex reported in sportsmen who suffer of exercise-induced stiffness along the posterior-medial region of the tibia." It is a highly prevalent injury among runners and military people. Recent research has supported that MTSS is a bone stress reaction that becomes painful rather than an inflammatory condition of the periosteum. The bone experiences metabolic alterations when an individual starts an activity routine. MTSS most typically manifests as diffuse, palpable discomfort at the posterior-medial tibial line. It can happen anywhere along the posterior-medial boundary, however it usually happens in the middle to distal thirds. The discomfort is typically described as a dull aching that occurs after exertion and might continue for several hours or days. In extreme situations, soreness may remain during routine activities.[22]

We are conducting descriptive case study among Hikers of Islamabad. Patients' data is collected through interviewer administered questionnaire and the pain disability questionnaire to determine the prevalence and associated risk factors of shin splints. The condition of patients is recorded through physical examination based on the specific criteria of signs and symptoms [5].

Pain is measured through pain measurement scale, which has 11 points, in which

- >3= positive shin splints syndrome
- ≥6= severe pain due to shin splints.

Pain disability scale was made which has also 11 scale points and seven parameters were made, for each of the 7 categories of life activity listed and the number on the scale describes the level of disability subjects typically experience.

Level of Disability Points

- none 0
- 1
- 2 mild
- 3
- 4
- 5 moderate
- 6
- 7
- 8 severe
- 9
- total 10

Pain disability index =SUM (points for all 7 parameters)

Interpretation:

• Minimal index: 0
• Maximal index: 70

The higher the index the greater the person's disability due to pain.

Socio-demographic variable:

Age and gender

Anthropometrical variables:

Height, weight and BMI.

8. MATERIALS AND METHODS

8.1. Study Design: Descriptive case study

8.2. Study Setting: On various trails of Islamabad (Trail 1-6)

8.3. Study duration: 6 Months after accepting proposal

8.4. Sample Size: For sample size Slovin's formula will be used.

Confident Interval CI: 95% margin of error: 0.05

$$n = \frac{N}{(1 + Ne^2)}$$

8.5. Sampling technique: Non-probability Convenience sampling.

9. SAMPLING PROCEDURE

9.1. Inclusion criteria

- Both gender are included

- Age of participant will be between 20 and 40 years. [25]
- Duration of hiking more than 2 hours per day, 3 days a week.
- Duration of hiking ≥ 3 months.

9.2.Exclusion criteria

- Stress fracture in last 6months
- Lumbar Radiculopathy
- Patients with history of lower leg surgery in last 4 months.
- Participants with deep vein thrombosis.
- Infections in lower leg.[5]

10. DATA COLLECTION PROCEDURE

- For data collection the permission will be taken from the Head of Department of University Institute of Physical Therapy, University of Lahore, and Institutional review Committee (IRC) / Ethical Review Board (ERB), University of Lahore. The permission will be also taken from the Head of Department, University of Lahore of Islamabad Campus. Each participant consent will be must.
- Participants who agree to take part in the study will sign a permission form. The patient will be given a questionnaire that includes questions concerning functional limits and tool-related pain.

11. DATA ANALYSIS

- The data was statistically analyzed by using SPSS version 26.
- For qualitative variables and other numerical variables such as Age, Pain measurement scoring i.e. equal and greater than 3 point and pain disability index (PDI) score i.e. equal and greater than 30% were analyzed through frequency charts and graphs.

GANTT CHART

	September	**October**	**November**	**December**	**January**	**February**
ASRB/ Ethical clearance						

Sampling Time						
Data Collection						
Data Analysis						
Thesis Writing						