

GHANA COLLEGE OF PHYSICIANS AND SURGEONS
FACULTY OF SURGERY

Epidemiology and treatment outcome in patients presenting with Plantar Fasciitis
at the Korle Bu Teaching Hospital

Submitted to the Faculty of Surgery, in partial fulfilment of the requirements for the conferment
of a Fellow of the Ghana College of Surgeons (FGCS)

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DECLARATION

I hereby certify that this work was carried out at the Trauma and Orthopaedic Unit of the Korle Bu Teaching Hospital, from September 2014 to August 2015.

It has not been submitted as a thesis or dissertation for the award of a fellowship in the past

Signed

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CERTIFICATION

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DEDICATION

This work is being dedicated to all the patients afflicted with Plantar Fasciitis; more especially to those who willingly took part in this study.

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ABBREVIATIONS

PF- Plantar Fasciitis

KBTH- Korle Bu Teaching Hospital

VAS- Visual Analogue Scale

FFI- Foot Function Index

OPD- Out Patient Department

IBM/SPSS- International Business Machines Corporation/Statistical Package for the Social Sciences

PI- Principal Investigator

NHIS –National Health Insurance Scheme

BMI- Body Mass Index

OPERATIONAL DEFINITION

The diagnosis of plantar fasciitis was made on clinical grounds; patients who are experiencing pain at the plantar part of the foot and specifically, in the inferior part of the heel which was usually more intense upon the first few steps in the morning or prolonged period of inactivity were considered to be having plantar fasciitis

ABSTRACT

ABSTRACT

Background

Plantar fasciitis (PF) is a common cause of heel pad pain. The pain associated with this clinical condition can result in impairment of activities of daily living. Although the diagnosis of this condition is easy to clinch, the aetiology remains unclear with numerous treatment options, because no single treatment has strong scientific evidence to support its use to improve outcome. For most patients presenting with this condition at the Orthopaedic unit of Korle-Bu Teaching Hospital (KBTH), the main treatments offered are plantar fascia stretching exercises and corticosteroid injection if the former fails. The rationale of this study was to describe the epidemiology of this clinical condition, identify some of the risk factors common in patients presenting to the Orthopaedic unit of the Korle Bu Teaching Hospital and to determine baseline outcome of KBTH treatment protocol for PF and compare it to those reported in the literature.

Methods

This was a longitudinal study on patients presenting with plantar fasciitis to the unit between September, 2014 and August, 2015. Those who met the inclusion criteria were recruited in this study. All newly diagnosed patients were offered plantar fascia stretching exercises; those who failed to respond to treatment based on the Visual Analogue Scale for pain and a modification of foot function index after a month or two were offered corticosteroid injection in addition to plantar fascia stretching exercise.

Results

Forty four patients met the inclusion criteria for this study with an incidence of 2.75% of all new cases reporting at the Orthopaedic OPD of the KBTH over the study period. At the end of the 12th week, thirty seven patients were available for follow up. Majority of the patients seen were females (thirty eight), leading to a female to male preponderance of 6.3:1. Twenty three patients representing 52.5% belonged to the age group of 41-50%. The mean age was 47.9 years with a standard deviation of 9.7 years. All the patients seen responded 'yes' to morning pain marked

after a few couple of steps and to pain after prolonged periods of inactivity. Twenty six patients (59.1%), admitted to be involved in occupations that involved prolonged weight bearing. No significant structural risk factors in terms of pes planus, pes cavus, and leg length discrepancy were detected. Ninety percent of the patients seen were either overweight, obese or morbidly obese. Thirty five patients (79.4%) had a heel spur on X-ray. At four weeks, out of the 42 patients available for follow up, only 5(11.9%) required steroid injection in addition to physiotherapy. At eight weeks, only one (2.56%) of the 39 patients available for follow up had steroid injection in addition to the physiotherapy. By the end of the 12 weeks, 37 patients were available for follow up. All the 37 patients had significant improvement in their VAS scores as well as their modified foot function index scores.

The means and (standard deviations) for VAS scores at baseline, 4th week, 8th week and 12th week were, 7.05 (2.2); 5.05 (2.5); 3.15 (1.6); 1.9 (1.2) respectively. The means for the modified FFI at baseline, 4th week, 8th week and 12th week were, 16.0, 11.4, 6.8, 3.7 respectively, with corresponding standard deviations of 4.0, 5.6, 4.6, and 3.0 respectively. These results shows a trend in improvement of symptoms with time.

Conclusions

Plantar Fasciitis was found to be common in females. Majority of the patients were middle aged 41 to 50 years with a mean age of 47.9 years and a standard deviation of 9.7 years. Early morning pain at the heel which is marked with few couple of steps is characteristic of plantar fasciitis. Not all patients with plantar fasciitis have a heel spur on X-ray. Structural risk factors in terms of pes cavus, pes planus, and leg length discrepancy were uncommon in this study. Elevated BMI, happened to be a major risk factor in this study; ninety percent of the patient were either overweight, obese or morbidly obese. Stretching exercises should be employed as the first line of treatment for patients presenting with plantar fasciitis

Keywords: Plantar Fasciitis, Epidemiology, Treatment outcomes, Korle Bu Teaching Hospital

CHAPTER 1

1.1 INTRODUCTION

Plantar fasciitis is a degenerative syndrome of the plantar fascia resulting from repeated trauma at its origin on the calcaneus¹. PF is reported to be the most common cause of inferior heel pain in adults². Other names for PF include painful heel syndrome, heel spur syndrome, runner's heel, subcalcaneal pain, calcaneodynia, and calcaneal periostitis³.

The pain and discomfort associated with this condition can have a dramatic impact on physical mobility. The aetiology of this condition is multi-factorial in nature and there are several treatment options available, with plantar fascia stretching exercises and steroid injection being the main stay of conservative treatment options offered in the unit.

Outcome of treatment just like many other studies was assessed using the visual analogue score as well as a modified foot function index score. The FFI was developed to measure the impact of foot pathology on function in terms of pain, disability and activity restriction. The FFI is a self-administered index consisting of 23 items with three subscales. The FFI has been found to be valid and reliable¹

1.2 PROBLEM STATEMENT

Plantar Fasciitis is a relatively common but least discussed condition in the West African Sub-region. It is one of the commonest causes of heel pad pain presenting at the Orthopaedic clinic of the KBTH. The prevalence of this condition at KBTH is unknown; the sociodemographic characteristics, risk factors as well as treatment outcome in the Unit has not been clearly documented.

1.3 RATIONAL FOR STUDY

To establish baseline data on the epidemiology of Plantar Fasciitis and its treatment outcome at the Korle Bu Teaching hospital. To identify some of the risk factors common in patients presenting at the Orthopaedic Unit of KBTH. This knowledge will provide a medical audit of our current management of Plantar Fasciitis and help to make recommendations and draw algorithms on the management of Plantar Fasciitis in the Korle-Bu Teaching Hospital.

1.4 RESEARCH QUESTIONS

- i. What is the incidence of plantar fasciitis at Korle Bu Teaching hospital
- ii. What are some of the common risk factors in patients presenting at the Korle Bu Teaching hospital
- iii. Does KBTH PF treatment protocol match with that reported in the literature?

1.5 AIMS AND OBJECTIVES

1.5.1 Aim

To describe the epidemiology of plantar fasciitis in patient's presenting at the Korle-Bu Teaching Hospital and assess the response to treatment offered in this institution

1.5.2 Primary objectives

1. To determine the incidence of plantar fasciitis in patients presenting at the Orthopaedic unit of the hospital

2. To assess outcome of treatment offered to patients presenting with plantar fasciitis at the unit (i.e., plantar fascia stretching exercises and corticosteroid injections if the former fails).

1.5.3 Secondary objective

1. To identify some of the common risk factors in patient's presenting at the unit

CHAPTER 2
Literature Review

2.0 LITERATURE REVIEW

2.1 Aetiology and pathophysiology

The plantar fascia is a thickened fibrous sheet of connective tissue that originates from the medial tubercle on the under surface of the calcaneus and fans out, attaching to the plantar plates of the metatarsophalangeal joints⁴.

In general, the purpose of the plantar fascia is to act like a windlass mechanism to provide support of the longitudinal arch and to serve as a dynamic shock absorber for the foot and entire leg⁵.

Although the exact aetiology of plantar fasciitis remains unclear⁶, it is theorized that overloading the plantar foot muscles originating at the volar calcaneus can lead to micro trauma, inflammation and consequent pain in the plantar fascia⁷. The peculiar anatomy of the plantar fascia gives it little elasticity⁸.

During the weight-bearing phase of gait, the sole of the foot is compressed and a traction force is generated along the fascia. When these forces are applied successively, with increased frequency and intensity, progressive degeneration may occur at the origin of the plantar fascia, at the medial portion of the calcaneal tuberosity. The repetitive microtraumas at the origin of the plantar fascia correlate with the development of periostitis due to traction and microtears of the fascia itself, which result in inflammation and chronic pain⁹.

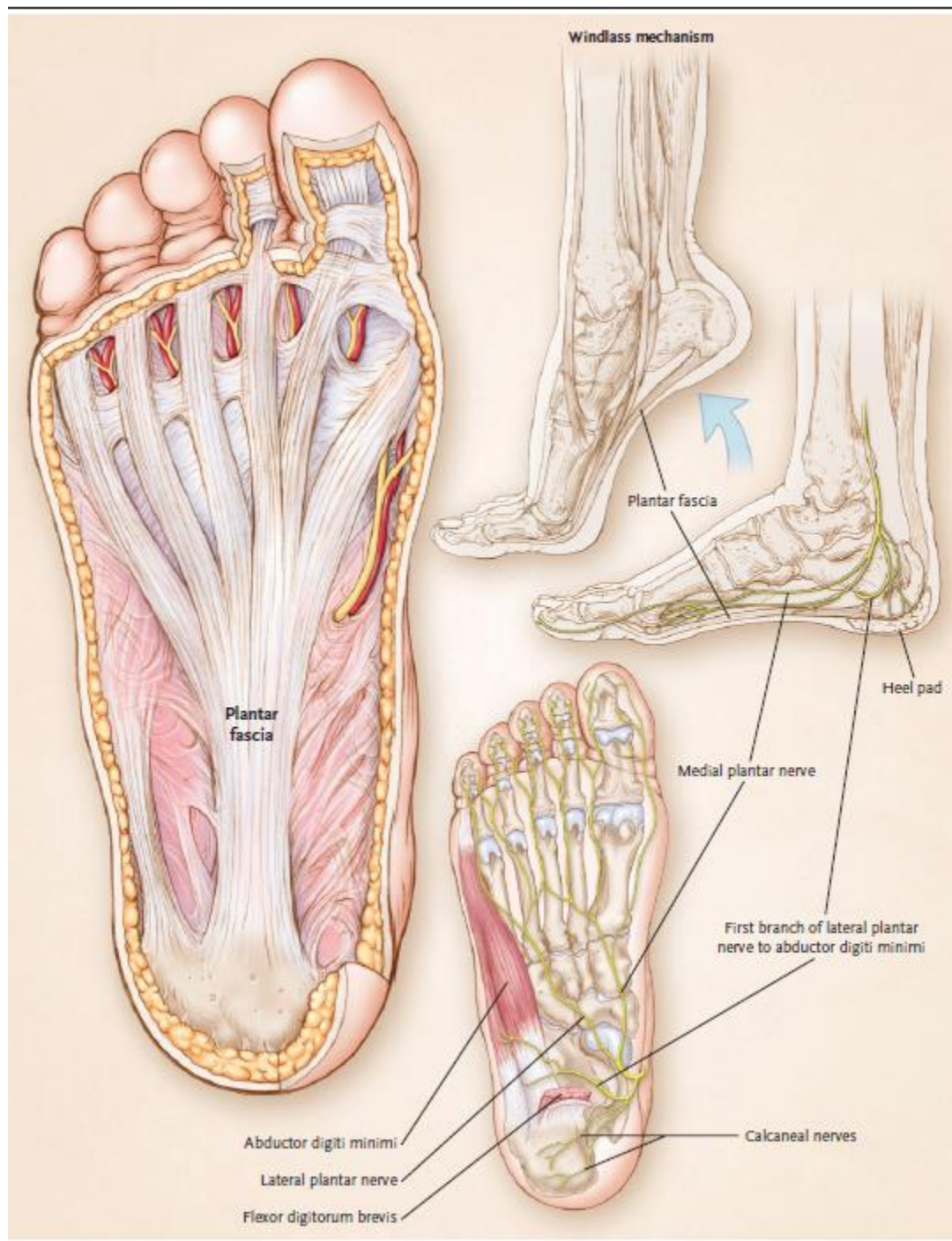
This inflammatory process may be confined to the origin of the plantar fascia and in the medial tubercle of the calcaneus, or it may involve other structures such as the medial nerve of the calcaneus and the nerve of the abductor muscle of the fifth toe¹⁰.

On the contrary, histological findings of plantar fasciitis include myxoid degeneration, micro-tears in the fascia, collagen necrosis, and angiofibroblastic hyperplasia consistent with a degenerative process without inflammation³.

Histological evaluation of 50 surgical cases support the contention that this is a degenerative, not an inflammatory condition¹¹.

Plantar fasciitis may be linked with various seronegative spondyloarthropathies, but in approximately 85% of cases there are no known systemic factors¹².

Figure 1 medial and planter views of plantar fascia (by Buchbinder.NEJM)²



Plantar and medial views of the foot demonstrating the origin and insertion of the plantar fascia and the location of nerves in proximity to the heel. The windlass mechanism, or bowstring effect, of the plantar fascia refers to its function in raising the arch of the foot during the push-off phase of walking

2.2 Risk factors

The presence of a heel spur is considered by many clinicians as a finding secondary to the abnormal stresses along the plantar fascia rather than a cause of plantar fasciitis. Reports have it that, 50% of symptomatic patients and 20% of asymptomatic patients have heel spurs^{13 14}.

In another study only 5.2% of the patients with heel spur reported having symptoms relating to pain in the calcaneus¹⁵.

Other frequently sighted risk factors include obesity, occupations requiring prolonged standing and weight-bearing, sudden weight gain, reduced ankle dorsiflexion, and pes planus^{7, 8, 9}.

In general, risk factors can be classified as extrinsic or intrinsic.

Extrinsic factors include, occupational prolonged weight bearing, inappropriate shoe wear, and rapid increases in activity level¹⁶. These factors combine to create a pathologic overload of the plantar fascia at the calcaneal insertion, causing microtears in the fascia that subsequently lead to perifascial oedema and increasing heel pad thickness¹⁶. Also, each heel strike during running causes compression of the heel pad up to 200% of body weight¹⁷. Therefore, in individuals who may not have adequate muscle strength or flexibility, and therefore have decreased shock-absorbing capabilities, the initiation of a new training program can exacerbate overloading of the plantar fascia¹⁷. Additionally, plantar fasciitis has also been associated with young individuals who engage in sporting activities that involve repetitive jumping¹⁸

Intrinsic factors can be structural, functional or degenerative in nature.

Structural risk factors include pes planus, pes cavus, leg-length discrepancy, excessive lateral tibia torsion, and excessive femoral anteversion¹⁹. Tightness in the gastrocnemius and soleus muscles and Achilles tendon are considered as functional risk factors. Restricted dorsiflexion of the foot has also been found to be a significant functional risk factor²⁰.

Degenerative risk factors include, increasing age and heel fat pad atrophy. As one ages, degenerative alterations associated with gradual reduction of collagen and fluid lead to reduction of the elasticity of the fatty pad. After approximately 40 years, the plantar fatty pad begins to deteriorate, with loss of collagen, elastic tissue and water, which gives rise to diminished pad thickness and height. These changes result in softening and thinning of the plantar fatty pad, thereby reducing its capacity to absorb impacts and its ability to protect the plantar tuberosity of the calcaneus²¹

2.3 Epidemiology

In the United States of America it is estimated that 10% of the population experience the pain of PF, leading to about a million visits to healthcare professionals for treatment in a year²².

In the United Kingdom it accounts for 5-10% of running related injuries²³. It has also been reported to be common among military personnel²⁴.

For a country like South Africa, it is estimated that 200,000 of the population are afflicted with this condition, representing 0.4% of the total population²⁵. A search from the Latin American and Caribbean Center on Health Sciences Information (LILACS) between 1982 to October 2011 showed an incidence of 4.5-10%.²⁶ An Australian population based study yielded a prevalence of 3.6%²⁷.

The incidence reportedly peaks in people between the ages of 40 and 60 years in the general population².

A study carried out in Asia, Nepal, by Chakraborty MK et al²⁸ yielded a mean age of 46.12 years with a standard deviation of 7.11 years; and majority of the patients being females, 72%.

A prospective study on Plantar fasciitis in Central Africa, Harare by Chigwanda et al²⁹ showed a female preponderance of 90% with a mean age 48.5 years.

Data in the West African sub-region is very sparse, Oguntona and Ogunsemi reported seeing 20 patients over three and a half years, spanning between July 2009 and December 2012 at the Olabisi Onabanjo Teaching Hospital in the Ogun state of Nigeria³⁰. There was a female preponderance of 60% with a mean age of 36 years.

In Ghana the situation is not that different, a review of theatre records book from August 2012 to July 2013 at the Orthopaedic unit of the Korle Bu teaching hospital revealed a total of 25 patients who had corticosteroid injection on account of plantar fasciitis. The age range was 21-70 years, with a high female to male preponderance, 7:1. Current literature however shows inconsistencies

with regard to the association between sex and plantar fasciitis. Some studies show an increased prevalence in men^{31, 32} while others show an increased prevalence in women^{33, 34}

In this study, 1598 new cases were seen at the OPD of the Orthopaedic Unit of the KBTH over the study period. The incidence of Plantar Fasciitis amongst all new cases was 2.75%. Out of the 69 patients presenting with heel pain, 44 met the inclusion criteria.

2.4 Clinical presentation and imaging studies

The hallmark of plantar fasciitis is a history of intense sharp heel pain with the first couple of steps in the morning or after other long periods without weight-bearing⁷. Pain is typically relieved by taking the load off the affected foot (via sitting, elevation, or other means). Aggravating factors include walking with the bare foot on hard surfaces, climbing up the stairs, and sprinting especially in athletes. Patients who stand a lot may also admit that the pain is marked at the end of the day.

Physical examination normally reveals local point tenderness along the medial tuberosity of the os calcis; and pain on weight bearing and/or pain upon the first step. Plantar fascia pain is especially evident upon dorsiflexion of the patient's pedal phalanges, which further stretches the plantar fascia or windlass mechanism. This manoeuvre increases the sensitivity of this test from 13.6 to 31.8%.³⁵

Lateral radiograph of the ankle should be the first imaging study. It is a good modality for assessment of heel spur, thickness of plantar fascia, and the quality of fat pad. Stress fractures, unicameral bone cysts, and giant cell tumors are usually identified with plain radiography³⁶

Ultrasound examination is operator-dependent, but it proves to be significant when the diagnosis is uncertain³⁷. In the literature, normal thickness of the plantar fascia when measured with ultrasound varies in range (mean 2–3 mm). People with chronic heel pain are likely to have a thickened plantar fascia with associated fluid collection, and that thickness values >4.0 mm are diagnostic of plantar fasciitis³⁸. Plantar fascia thickness values have also been used to measure

the effect of treatments and there is a significant correlation between decreased plantar fascia thickness and improvement in symptoms³⁹

MRI can be used in uncertain cases, which fail conservative management or are suspected of other causes of heel pain, such as tarsal tunnel syndrome, soft tissue and bone tumors, osteomyelitis, subtalar arthritis, and stress fracture⁴⁰

Figure 2 lateral view of the calcaneus showing a heel spur



2.5 Differential diagnoses

Plantar fasciitis manifesting as pain and tenderness over the medial aspect of the calcaneum should be distinguished from Achilles tendinopathies which are characterised by pain and tenderness over the posterior aspect of the calcaneus.

Tarsal tunnel syndrome, a compressive neuropathy of the posterior tibial nerve manifesting as pain, numbness and tingling sensation felt on the inside of the ankle just behind the medial malleolus and/or on the bottom of the foot should also be distinguished from Plantar Fasciitis.

Fat-pad atrophy should also be distinguished from PF; it occurs in elderly patients with pain in the central heel. These patients usually do not complain of pain upon first weight bearing in the morning².

A calcaneal stress fracture should also be distinguished from PF; it is confirmed on examination with use of the squeeze test, tenderness on mediolateral compression of the calcaneus.

Other differentials of heel pain are displayed in table 1⁴¹, below.

Table 1 Differential diagnosis of heel pain (by Department of Family and Community Medicine at the Medical College of Wisconsin, Milwaukee)

Differential Diagnosis of Heel Pain	
<i>Disease or injury</i>	<i>Differentiating clinical features</i>
Neurologic causes (entrapment syndromes)	Radiating burning pain, numbness and tingling, especially at night
Tarsal tunnel syndrome	Diffuse symptoms over plantar surface
Medial calcaneal branch of the posterior tibial nerve entrapment	Medial and plantar heel symptoms
Abductor digiti quinti nerve entrapment	Burning pain in heel pad area
Skeletal causes	Bony point tenderness
Calcaneal stress fracture activity	Pain with weight-bearing; worsens with prolonged weight-bearing
Paget's disease	Bowed tibias, kyphosis, headaches
Tumor	Deep bone pain; constitutional symptoms late in the course
Calcaneal apophysitis (Sever's disease)	Posterior heel pain in adolescents
Soft tissue causes	
Fat pad syndrome	Atrophy of heel pad
Heel bruise	History of acute impact injury
Bursitis	Usually retrocalcaneal; swelling and erythema of posterior heel
Plantar fascia rupture	Sudden acute, knife-like pain, ecchymosis
Tendonitis	Pain with resisted motions

2.6 Treatment options

Plantar fasciitis is considered a self-limiting condition with a typical resolution period of 6-18 months, sometimes longer. Protracted symptoms lead to frustration on the part of the clinician as well as the patient. Experienced clinicians agree that early recognition and treatment of plantar fasciitis leads to a shorter course of treatment and greater probability of success with conservative therapies⁴²

Treatment options available can be grouped as non-surgical and surgical.

Non-surgical interventions include, orthoses, stretching of the plantar fascia, splinting, taping, topical medications with or without iontophoresis, oral nonsteroidal anti-inflammatory medications, extracorporeal shockwave therapy, laser, and percutaneous injections with steroid, botulinum toxin type A or autologous blood.

Surgical options include open or endoscopic fasciotomy of the plantar fascia.

An evidence-based review of treatments of plantar fasciitis suggests that clinicians must first recommend the use of conservative measures, easy to perform and of low cost, such as plantar soft insoles, plus specific stretching plantar fascia exercises⁴³.

Conservative management provides satisfactory results in approximately 80–90% of cases in clinical practice⁴⁴. Evidence based review has shown that steroid injections are useful in reducing plantar pain, but only in the short-term (one month)⁴⁵. A number of studies have also shown that when several conservative management options are unsuccessful, steroid injection is a preferred option^{46 47 48}

2.6.1 Stretching Exercises

Stretching exercises can be confined to the Achilles tendon or the Plantar Fascia, also known as Plantar Fascia specific Exercises. Plantar fascia stretching exercises have been shown to provide short term benefits over Achilles Tendon stretching exercise; however the long term outcome (over a two year period) for these two stretching modalities are the same⁴⁹.

Plantar fascia stretching exercise are normally carried out by the physiotherapist, and entails both active and passive stretching.

For the passive stretch test, with the patient seated or lying down, the physiotherapist applies one hand to the heel then the other hand to the region of the head of the metatarsals; a stretch is then applied.

With the active stretch the participant assumes the same sitting position and is taught to pull back on the toes until they feel a stretch in the arch of their foot.

Participants are instructed to repeat the stretch 10 times, with each stretch lasting for 10 seconds. Subjects are asked to complete the stretching program three times per day and to record their stretching frequency down.

Other commonly used techniques of stretching are leaning wall stretches and curb or stair stretches, which focus on stretching the Gastrosoleus muscle complex. Rolling the foot over a 15-oz can or tennis ball, helps stretch the plantar fascia. Cross-friction massage above the plantar fascia can be beneficial on waking to help stretch and warm up the fascia before the first steps of the day. Strengthening exercises are focused on the intrinsic muscles of the foot and include towel curls, toe taps, and picking up marbles with the toes⁵⁰

2.6.2Corticosteroid injection

Limited evidence supports the use of corticosteroid injections to manage plantar fasciitis. Results of a Cochrane review⁴⁵ showed that corticosteroid injections improved plantar fasciitis symptoms at one month but not at six months when compared with control⁴⁵. Injection can be administered under ultrasound guidance or not. A study has shown that there is no clear advantage of using an ultrasound over palpation guided injection⁵¹. Injections are usually administered via a plantar approach but occasionally by a medial approach, usually in conjunction with a local anesthetic.

Corticosteroid injections have a success rate of 70% or better⁴⁷ but it may not go without complications.

The general complications include skin atrophy, skin hypopigmentation, soft-tissue atrophy, infection, bleeding, and failure to work. A steroid flare-up, which consists of increased pain for up to several days, may occur in up to 2% of individuals who use corticosteroids⁵²

Specific complications include plantar fascia rupture, which was found in almost 10% of patients after plantar fascia injection in one case series⁵³ and fat pad atrophy⁴⁹. Long-term sequelae were found in approximately 50% of patients with plantar fascia rupture⁵⁴.

As to the choice of a particular steroid over the other, there is little systematic evidence to that effect for therapeutic injections⁵⁵. Most recommendations are based on a combination of clinical experience and personal preference.

Commonly used steroids include Methylprednisolone acetate (Depo-Medrol), and Bethamethasone dipropionate /sodium phosphate (Diprofos). Depo-Medrol is given with a local anaesthetic as adjunct, to provide immediate pain relief; however Diprofos has a prompt therapeutic activity which is achieved by the soluble ester, betamethasone sodium phosphate, which is absorbed quickly after injection. Sustained activity is provided by betamethasone dipropionate, which is only slightly soluble and becomes a repository for slow absorption, thereby controlling symptoms over a prolonged period⁵⁶. Diprofos can thus be given without adding a local anaesthetic agent.

Many patients presenting at the Orthopaedic clinic of the Korle Bu Teaching Hospital would have been referred from a lower facility where some form of treatment would have been initiated (mainly the use of oral NSAIDs). The main treatment modality offered for such patients is plantar fascia stretching exercises with corticosteroid injections being roped in if the stretching exercises fail. With limited scientific evidence backing the use of steroids amidst its complications (fascia weakness and rupture, as well as atrophy of the fat pad cushioning the heel^{57 58}), it became prudent to assess the outcome of treatment in these patients, using the visual analogue scale as well as a modified foot function index score at various times.

2.6.3 Other treatment

Other non-surgical interventions include, use of orthoses, splinting, taping, topical medications with or without iontophoresis, oral nonsteroidal anti-inflammatory medications, extracorporeal shockwave therapy, laser, and percutaneous injections with steroid, botulinum toxin type A or autologous blood.

Surgical options as mentioned earlier on, include open or endoscopic fasciotomy of the plantar fascia. Table 2, shows the weight of evidence for some of these treatment options as reported by Lafuente Guijosa A et al⁵⁹

Table 2: Plantar Fasciitis: Evidenced-based review of treatment

Intervention	Evidence
Steroid infiltration	Limited (short-term)
Steroid Iontophoresis	Limited (short-term)
Nocturnal orthosis	Limited
Soft heel pads	Limited
Plantar fascia stretching exercises	Limited
Laser	No evidence
Ultrasound	No evidence
Extracorporeal shock waves	No evidence
Electromagnetic-plated insoles	No evidence
Surgery	No evidence

CHAPTER 3

Methodology

3.0 METHODOLOGY

3.1 Study type

Hospital based longitudinal study

3.2 Study site

The Orthopaedic and Trauma Unit / Korle Bu Teaching Hospital

The Korle Bu Teaching Hospital is the premier and largest tertiary health care facility in Ghana, with over 2000 beds. The hospital is located in the Accra Metropolis district, at the southern part of the country. The Orthopaedic and Trauma unit is under the Department of Surgery, one of the seventeen departments in the hospital. The Orthopaedic section of this unit sees an average of 840 new cases and 11,000 follow up cases in a year⁶⁰. The participants of this study would be recruited from the new cases that are seen in the unit.

3.3 Study Period

September 2014 to August 2015

3.4 Sampling

Recruitment of participants was done from patients reporting with plantar fasciitis at the Orthopaedic clinic who have met the inclusion criteria. This was done consecutively till the sample size was attained.

3.4.1 Inclusion criteria

All patients who had been clinically diagnosed for plantar fasciitis and were willing to partake in this study were recruited

3.4.2 Exclusion criteria

1. Any patient with a history of previous trauma/fracture to the foot/ankle
2. Arthritis of the ankle joint
3. Patients with known Rheumatoid Arthritis, Ankylosing Spondylitis or Crystalline arthritis
4. Patients who have had prior physiotherapy or received corticosteroid injection on account of plantar fasciitis.
5. Any patient with referred pain of neurological origin

3.5 Sample Size

For this longitudinal study in patients with plantar fasciitis, the minimum sample size was determined based on the prevalence of plantar fasciitis in the general population. The minimum sample size so determined constitute the number of patients that were followed up in this study.

The prevalence of plantar fasciitis was set at 10%⁶¹

Using the prevalence sample size relation: where

$$N = [z^2 \times (p) \times (1-p)] / C^2$$

N= sample size

Z= Z-value A (e.g., 1.96 for a 95% confidence interval)

P= prevalence of plantar fasciitis=10%

C= margin of error (precision) of 5%

By substituting the values $(1.96^2 \times 0.1 \times 0.9) / 0.1^2 = 34.574$ a minimum of 35 subjects were to be recruited. Accounting for losses to follow up, a total of 44 patients were recruited

From the historical records at the Orthopaedic clinic and theatre records, over 45 patients with the outcome of interest (plantar fasciitis) were seen over a one year period

3.6 Details of treatment to be offered

3.6.1 Plantar fascia stretching exercises

Plantar fascia stretching exercise was carried out by the physiotherapist, and entailed both active and passive stretching. **For the passive stretch test, with the patient seated or lying down, the physiotherapist then applied one hand to the heel then the other hand to the region of the head of the metatarsals; a stretch was then applied.** With the active stretch the participant assumed the same sitting position and was taught to pull back on the toes until they feel a stretch in the arch of their foot. Participants were instructed to repeat the stretch 10 times, with each stretch lasting for 10 seconds. Subjects were asked to complete the stretching program three times per day and to record their stretching frequency in a diary.

3.6.2 Corticosteroid Injection

Subjects were positioned prone on a treatment table with their knees extended. Point of maximal tenderness at the medial aspect of the heel pad was marked. The foot was prepped in sterile

fashion. The injection was performed at this point with 2mls of betamethasone and 4mls of plain xylocaine, delivered with a 20 gauge needle.

3.7 Data collection technique and tools

Data was collected **by the principal investigator** using a questionnaire; follow up was assessed at four, eight and twelve weeks, using a modification of the foot function index score which seeks to assess pain, disability and activity restriction. The sum of the average for each subscale gives a total, maximum score of 30; the higher the score, the greater the disability with associated decreased function. Participants treated for bilateral plantar fasciitis were asked to indicate the magnitude of symptoms without specific reference to an individual foot (i.e. bilateral pain was evaluated as one independent sample).

3.8 Plan for data processing and analysis

Data was entered as and when the patients report at the OPD. Statistical analysis was done using IBM SPSS version 20. Demographic characteristics of the patients was analysed using descriptive statistics such as mean, mode, median and standard deviation. Changes from baseline to one, two and three months for outcome was measured using continuous and categorical scale (Visual analogue scale and the foot function index). Outcome measures of interest was compared with other studies.

3.9 Ethical and legal consideration

3.9.1 Ethical clearance

Ethical clearance for this study was obtained from the Ethics Review Committee of University of Ghana Medical School (Reference Number: MS-AA/C.2/Vol 17^A).

Permission to undertake this study at the Orthopaedic unit was sought from the authorities of Korle Bu Teaching Hospital.

3.9.2 Informed Consent and Confidentiality

Written informed consent was obtained from each person before enrolment into this study. **This was counter signed by the principal investigator.**

Every aspect of this study was explained explicitly to all those who took part. Where necessary local dialects were used to explain every concern raised by subjects.

Subjects were also made to understand that they could withdraw at any point during the study if they so wish, as such actions would not affect their treatment.

Subjects were also informed that the information gathered shall be kept strictly confidential.

3.10 Study Limitations

- i. Relatively small sample size
- ii. Short term follow up

- iii. Loss to follow up
- iv. Patients not reporting on the exact day for review
- v. Incomplete data entry

3.11 Dissemination

The analysed results of this study will be submitted to the faculty of surgery division of the Ghana College of Surgeons and Physicians in partial fulfilment for the award of a fellowship in Trauma and Orthopaedics. Also, a copy each will be made available to the Trauma and Orthopaedic unit of the Korle Bu Teaching Hospital and the College of Health Science Research Forum

CHAPTER 4

Results

4.0 RESULTS

4.1 Sociodemographic characteristics

A total of 1598 new cases were seen over the study period at the Orthopaedic OPD of the Korle Bu Teaching Hospital. Forty four patients out of 69 patients presenting with heel pain meet the inclusion criteria for the study. The incidence of new cases of Plantar Fasciitis amongst patients presenting at the OPD was 2.75/100 cases.

37 out of the 44 patients were available for follow up at the end of the three months period. A total of seven patients were lost to follow up at different times (two at one month, three at two months and two at three months)

Total number of females was 38; resulting in a female to male preponderance of 6.3:1.

The mean age was 47.9 years with a standard deviation of 7.9 years. Majority of the patients fell between 41-50 years representing 52.2% of the total.

35 patients were married, 7 were single and 2 were widowed.

36 patients representing 83.6% assessed healthcare services using National Health Insurance Scheme

Various occupations were captured. The top 5 in descending order were, Trader 13; Seamstress 4; Teacher 3; Banker 3; and unemployed 5.

The Educational level for the patients were as follows; tertiary 13, Secondary 23, primary 4; No formal education -4.

Table 3 Age group Distribution

Age group (years)	Frequency	Percentage (%)
31 – 40	8	18.2
41 – 50	23	52.2
51 – 60	8	18.2
>60	5	11.4
Total	44	100

Table 4 Mean and Standard Deviation

Mean age	47.9 years
Standard deviation	9.7 years

Table 5 Sex Distribution

Gender	Frequency	Percentage (%)
Male	6	13.6
Female	38	86.4
Total	44	100

Table 6 Marital Status

Marital Status	Frequency	Percentage (%)
Married	35	79.5
Single	7	15.9
Widowed	2	4.6
Total	44	100

Table 7 NHIS Users

NHIS Status	Frequency	Percentage (%)
Yes	38	86.4
No	6	13.6
Total	44	100

Table 8 Educational Level

Educational level	Frequency	Percentage (%)
Secondary Education	23	52.3
Tertiary education	13	29.5
Primary education	4	9.1
No formal education	4	9.1
Total	44	100

Table 9: Top 5 Occupations

Occupation (Top 5)	Frequency	Percentage (%)
Trader	13	46.4
Seamstress	4	14.3
Banker	3	10.7
Teacher	3	10.7
Unemployed	5	17.9
Total	28	100.0

Figure 3 Age groups of patients

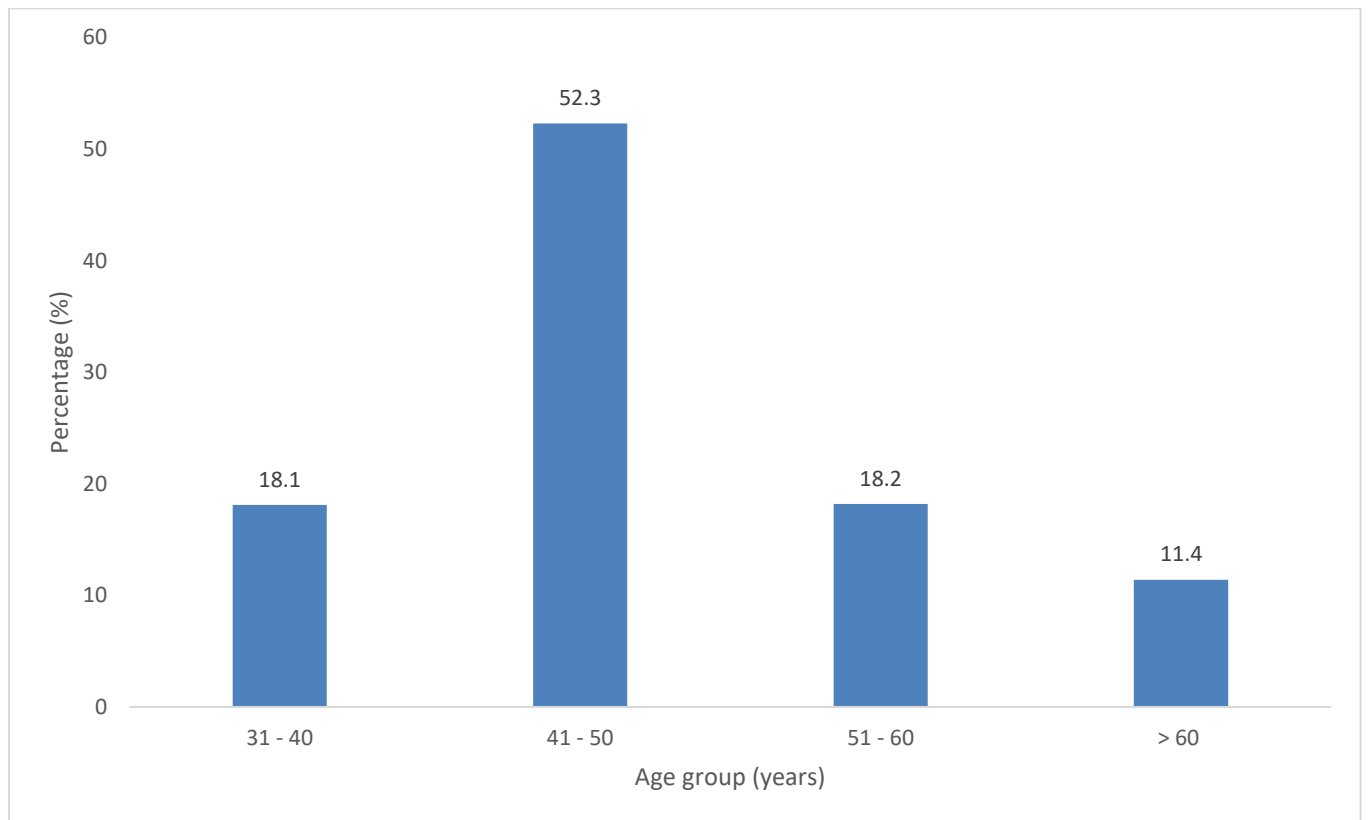


Figure 4 Sex of Patients

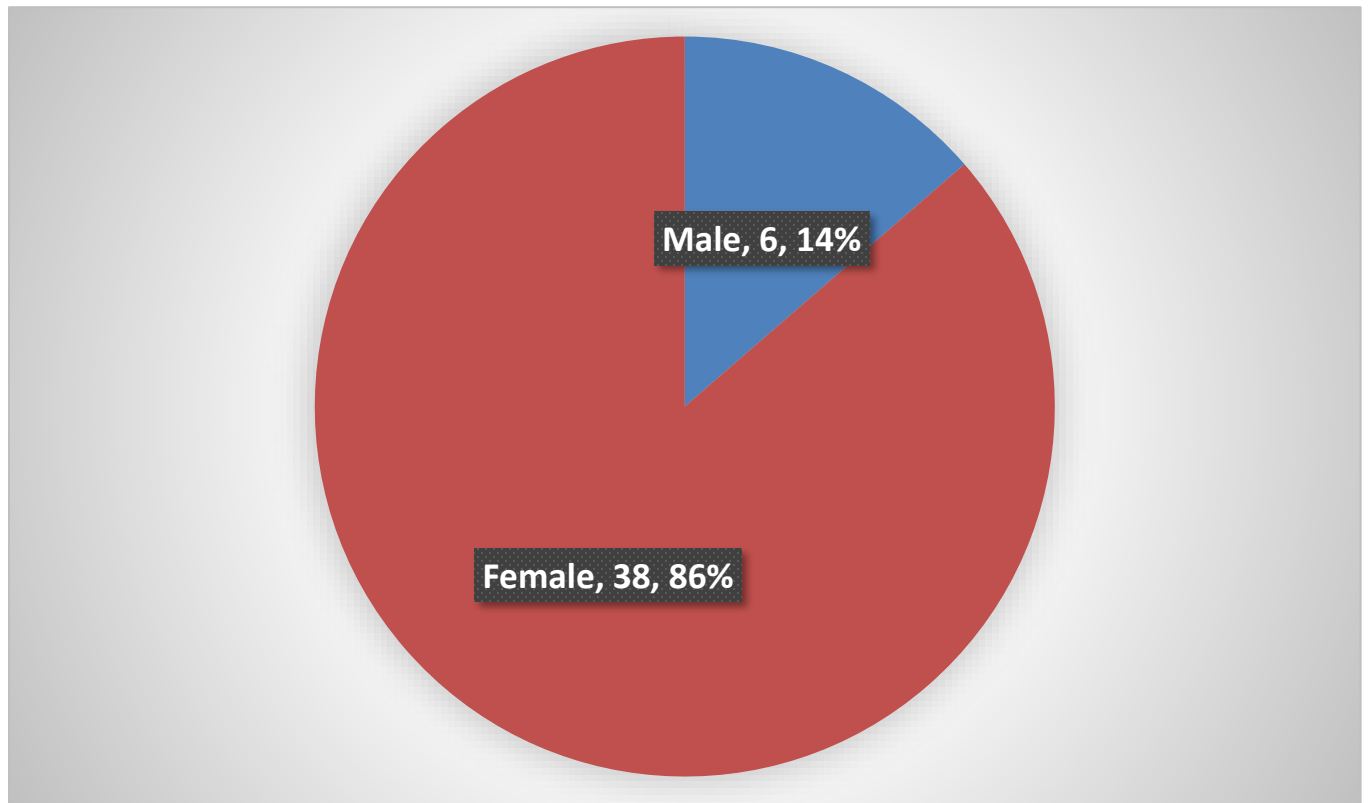


Figure 5 Marital Status of the Patients

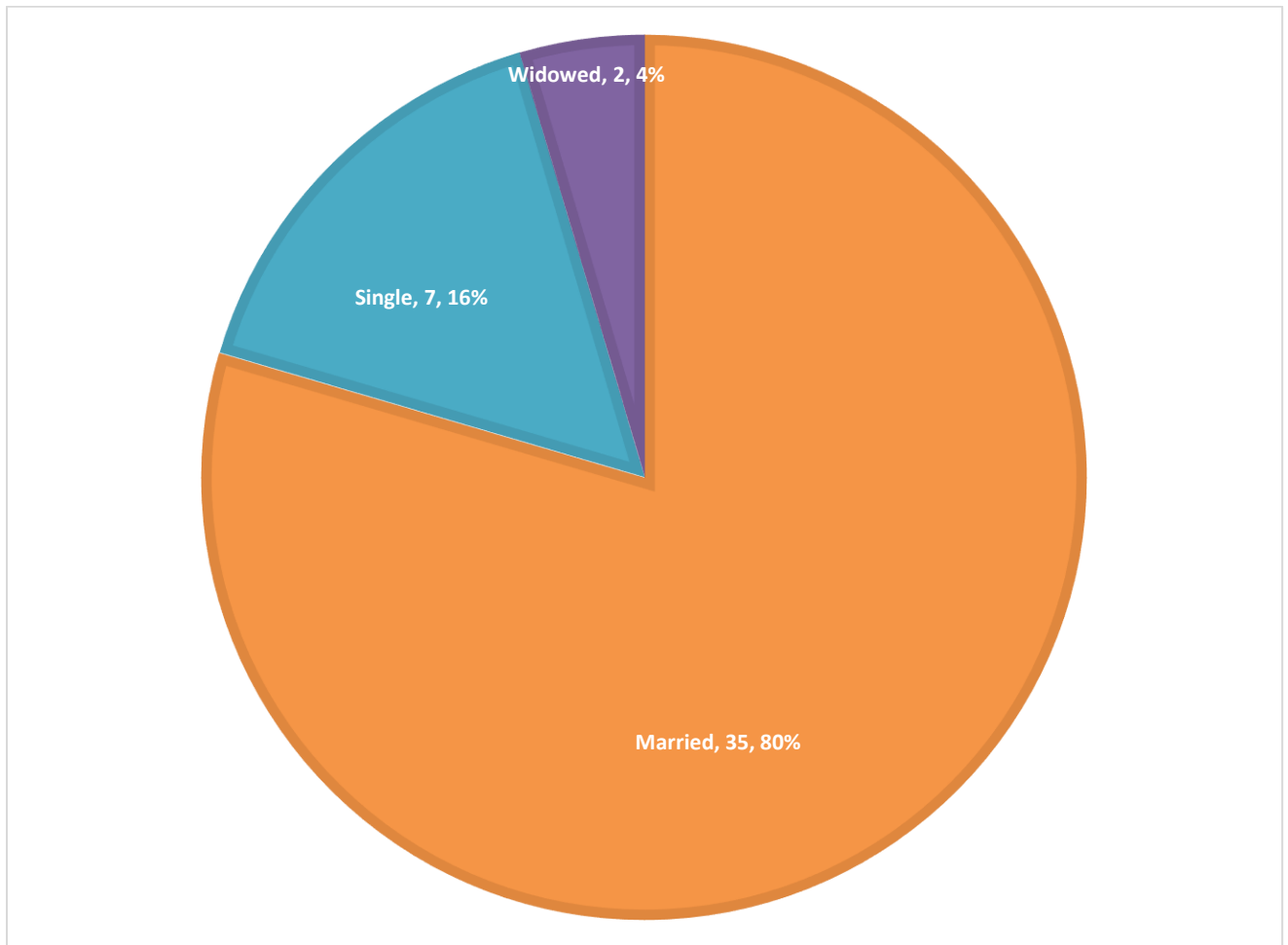


Figure 6:NHIS Users

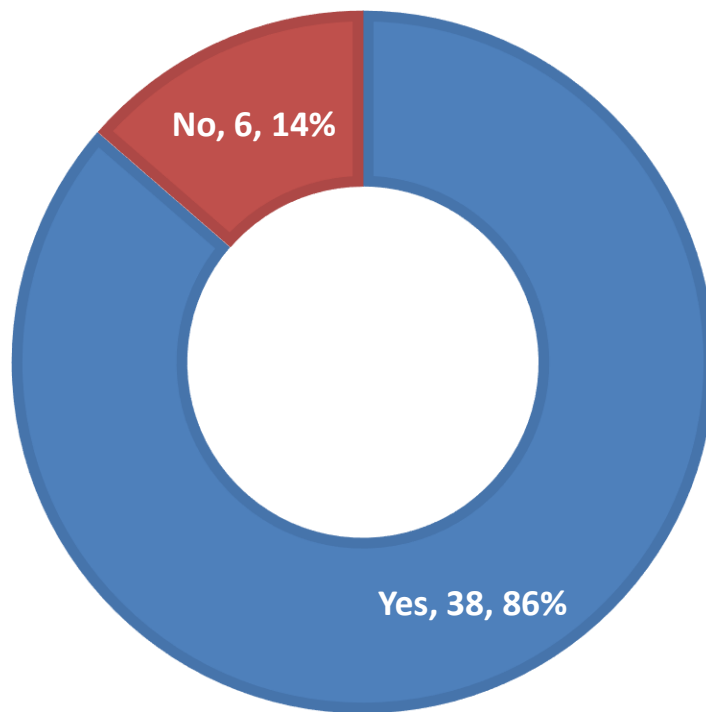


Figure 7 Educational Level of Patients

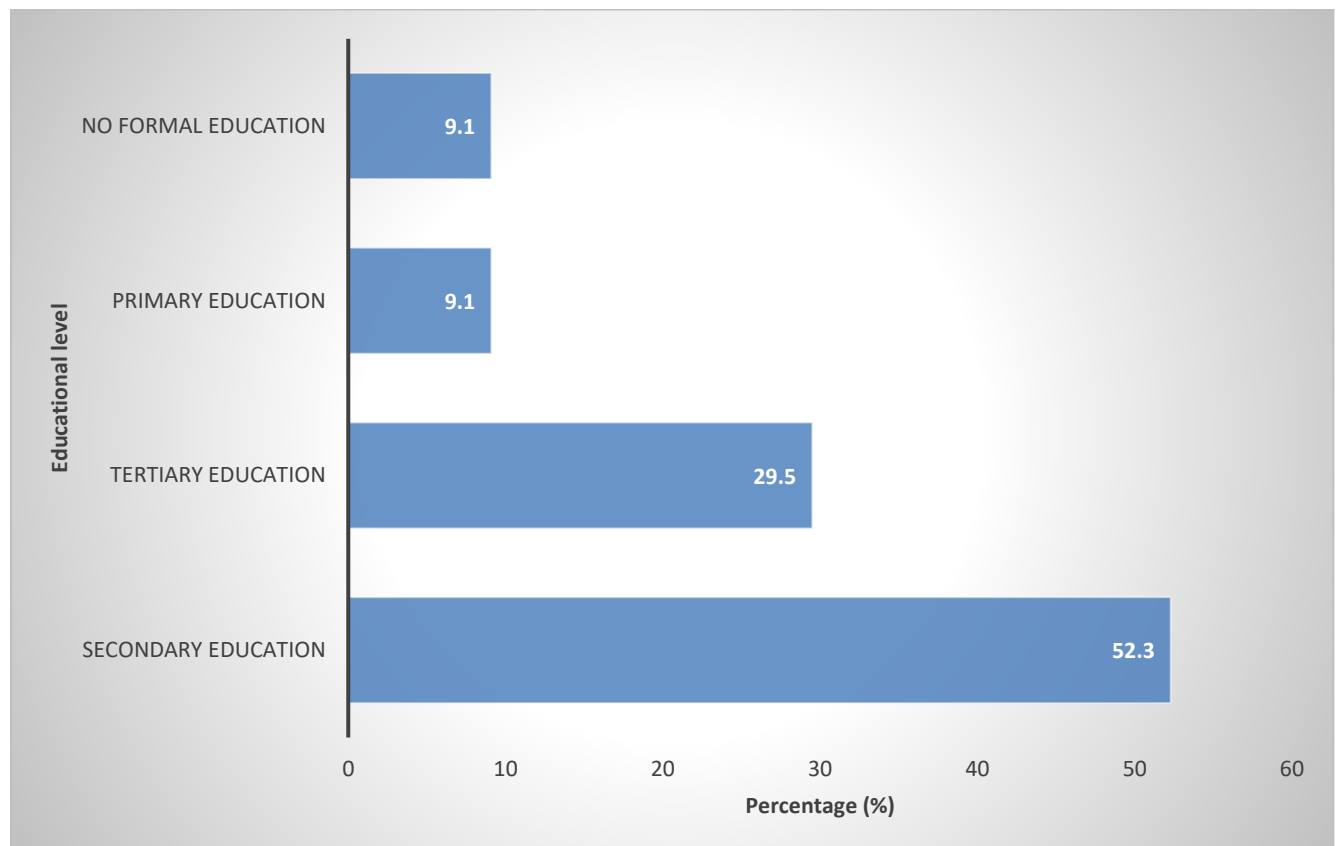
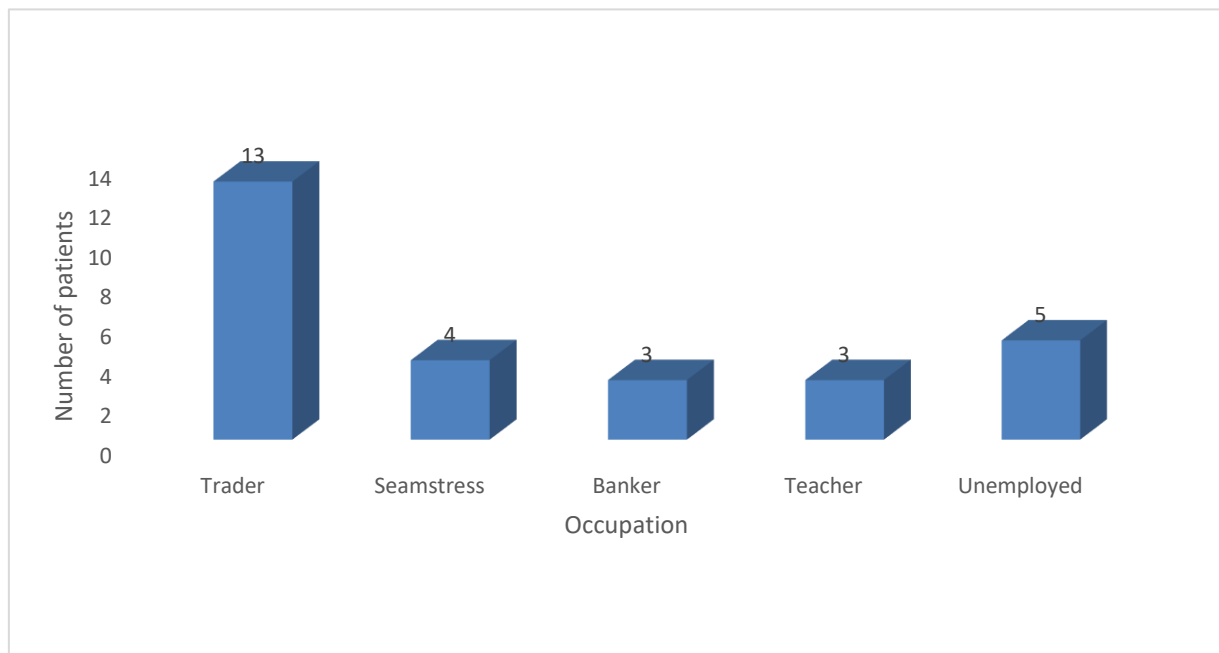


Figure 8 Top 5 Occupations



4.2 SYMPTOMATOLOGY

Duration of symptoms

18 out of 44 patients, representing 40.9% had symptoms ranging between 3 to 6 months. 15 patients (34.1%) had symptoms between 6 to 12 months. 7 patients had their symptoms for less than three months while 4 had symptoms for more than a year.

All the patients seen in this study reported in the affirmative to presence of early morning pain after a few couple of steps and also to pain after prolonged periods of inactivity. Thirty eight patients responded yes to pain decreasing with increasing level of activity. Twenty three responded yes to pain worsening at the end of the day with seventeen admitting that pain was present at all times.

Twenty out of 44 patients (representing 46%) presented with bilateral foot pain, while 10 each (representing 27%) presented with pain confined to the right or left foot.

Table 10 Duration of symptoms

Duration of symptoms	Frequency	Percent
<3 months	7	15.9
3-6 months	18	40.9
6 months to -1 year	15	34.1
>1 year	4	9.1
Total	44	100

Figure 9 Durations of symptoms

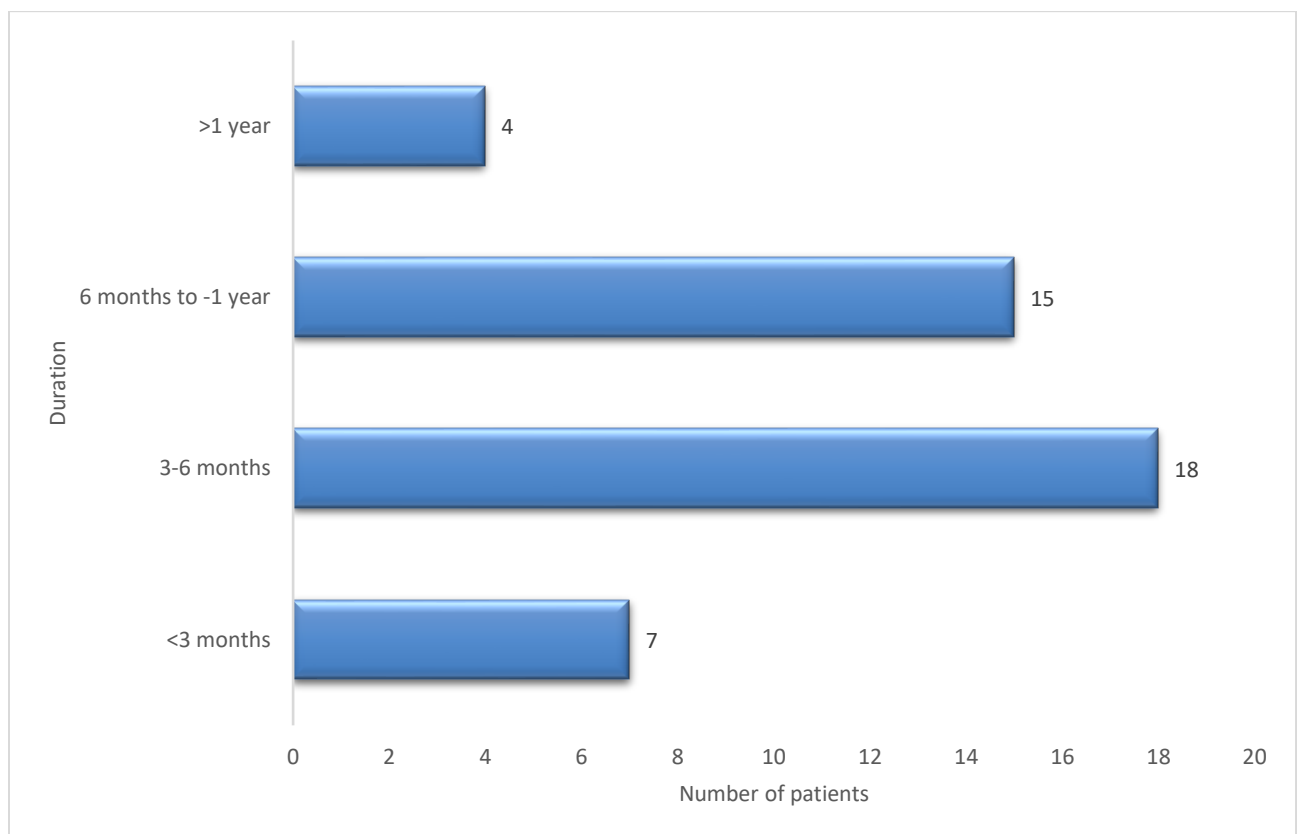


Table 11 Frequency of symptoms associated with PF

	Frequency	Percentage (%)
Pain upon weight bearing after prolong periods of inactivity		
Yes	44	100
No	0	0
Classical morning pain marked with few couples of steps		
Yes	44	100
No	0	0
Pain decreasing with increasing level of activity		
Yes	38	86.4
No	6	13.6
Pain worsening towards end of the day		
Yes	23	52.3
No	21	47.7
Pain present at all times		
Yes	17	38.6
No	27	61.4

Figure 10 Frequency of symptoms associated with PF

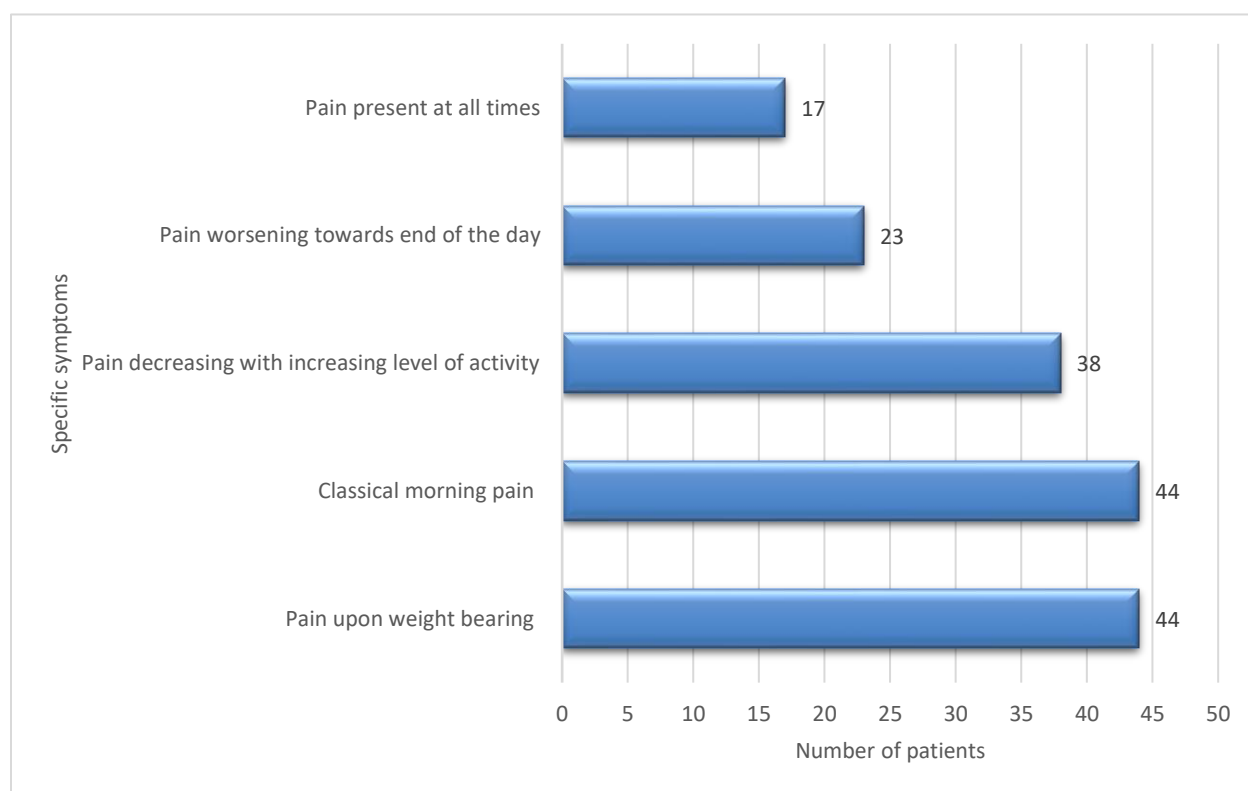
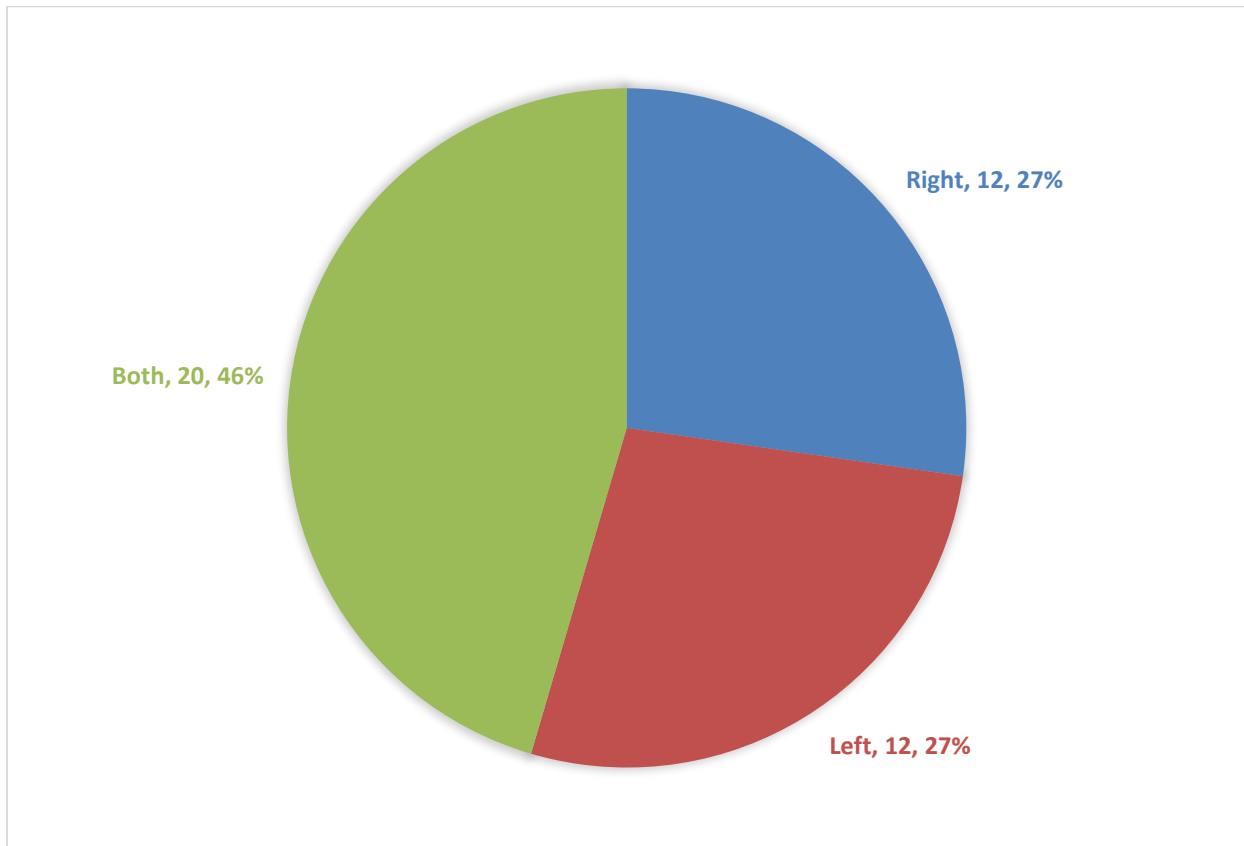


Table 12 Site Affected

Site affected	Frequency	Percentage (%)
Right	12	27.3
Left	12	27.3
Both	20	45.5
Total	44	100

Figure 11 Site Affected



4.3 RISK FACTORS

Twenty six out the 44 patients seen representing 59.1 % were found to be engaged in occupations that involved prolonged weight bearing and standing such as trading and teaching.

Thirty seven patients seen, representing 84.1% wore flat shoes most of the time. Seven patients preferred high heeled shoes most of the time.

For intrinsic risk factors, 9 patients representing 20.5% were found to be having pes planus.

None of the patients seen had pes cavus nor leg length discrepancy. One patient had heel pad atrophy.

The body mass index was computed for 40 out of 44 patients. Four patients had a normal body mass index, representing 10%. Eight (20%) fell in the overweight category. Twenty three (57.5%) fell in the obese category while 5(12.5%) were found to be morbidly obese.

The presence of heel spur was found in 35 (79.5%) out of the 44 patients.

Table 13 Occupational prolonged standing and weight bearing

Occupational prolonged standing and weight bearing	Frequency	Percentage (%)
Yes	26	59.1
No	18	40.9
Total	44	100

Figure 12 Occupational prolonged standing and weight bearing

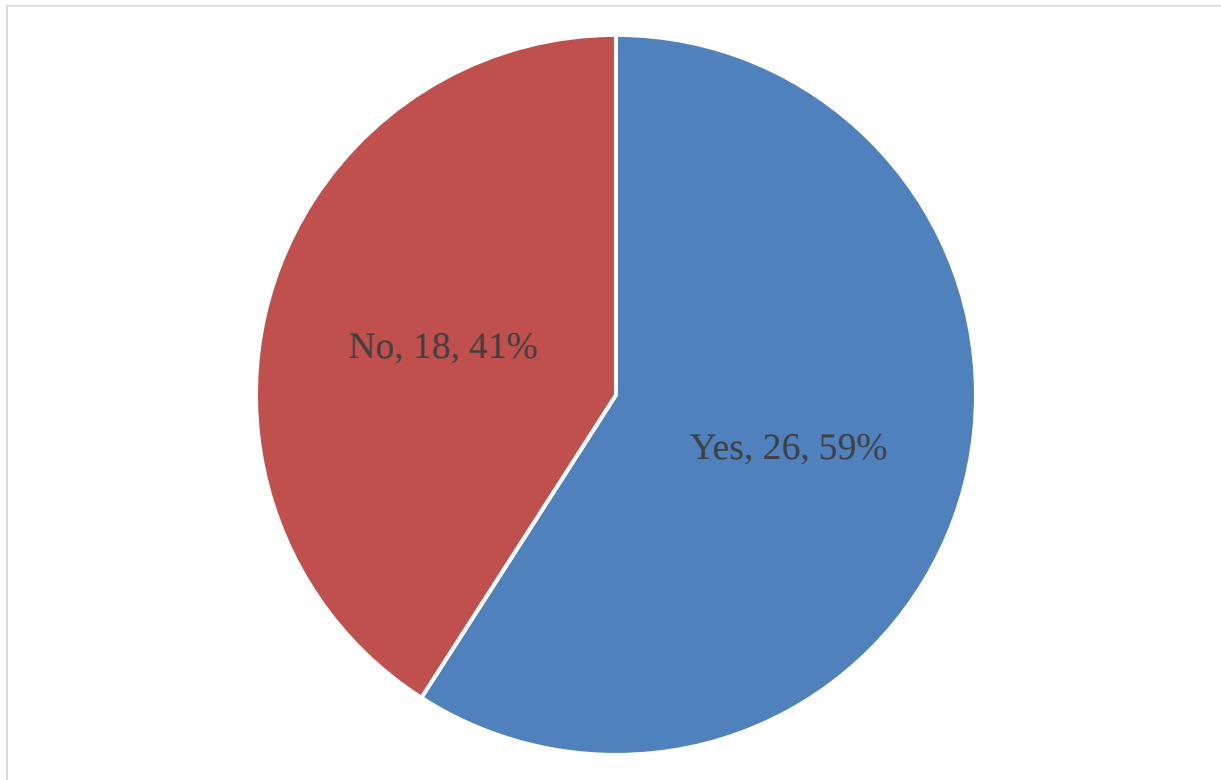


Table 14 Type of shoe wear usually worn

TYPE OF SHOE WEAR	Frequency	Percentage (%)
Flat shoes	37	84.1
High heeled shoes	7	15.9
Total	44	100

Figure 13: Type of shoe wear usually worn

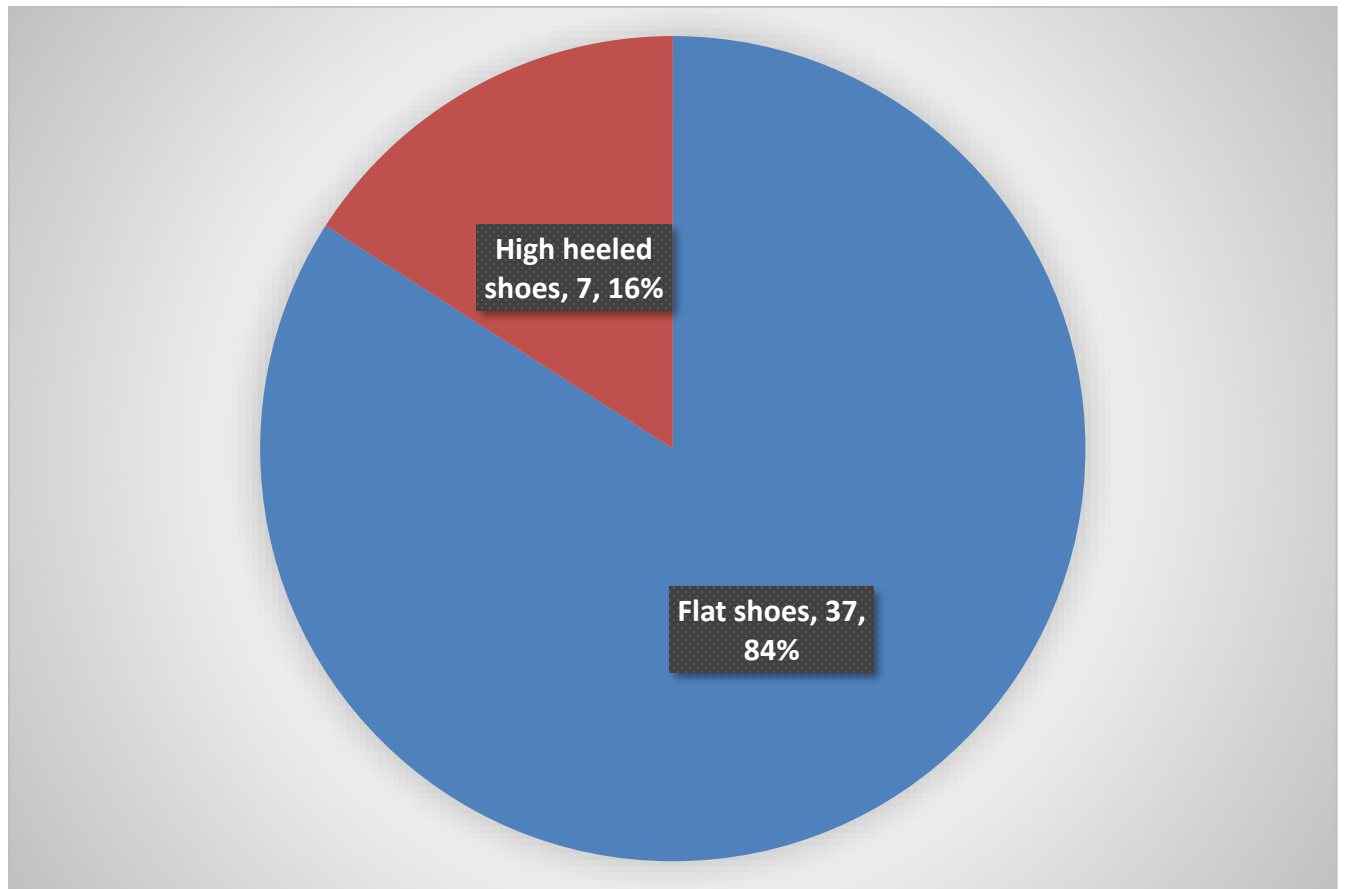


Table 15 Risk Factors

Structural factors	Frequency	Percentage (%)
Presence of Pes Planus		
Yes	9	20.5
No	35	79.5
Presence of Pes Cavus		
Yes	0	0
No	44	100
Leg length discrepancy		
Yes	0	0
No	44	100
Degenerative factors		
Heel fat pad atrophy		
Yes	1	2.3
No	43	97.7

Figure 14 Presence of Pes Planus

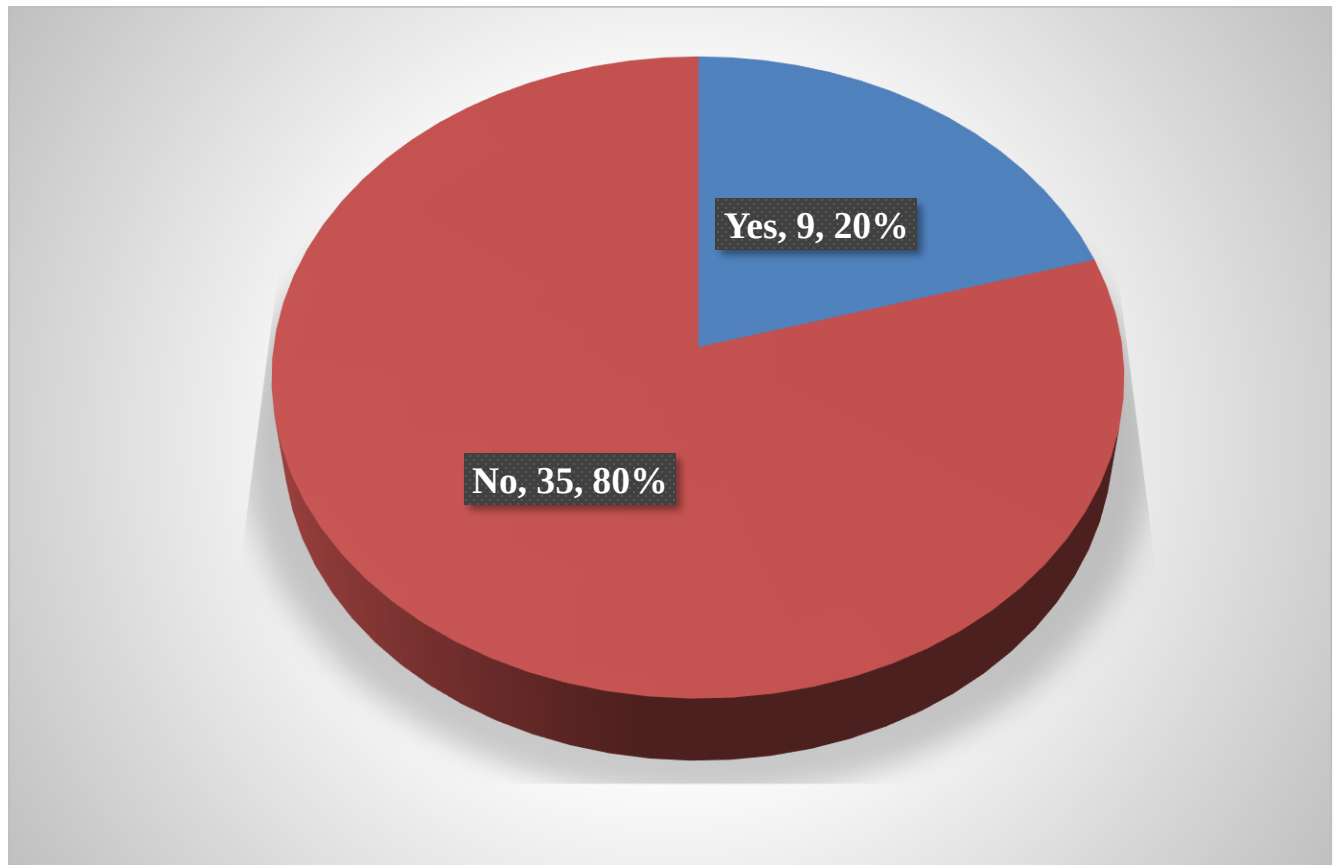


Figure 15 Heel Fat Pad Atrophy

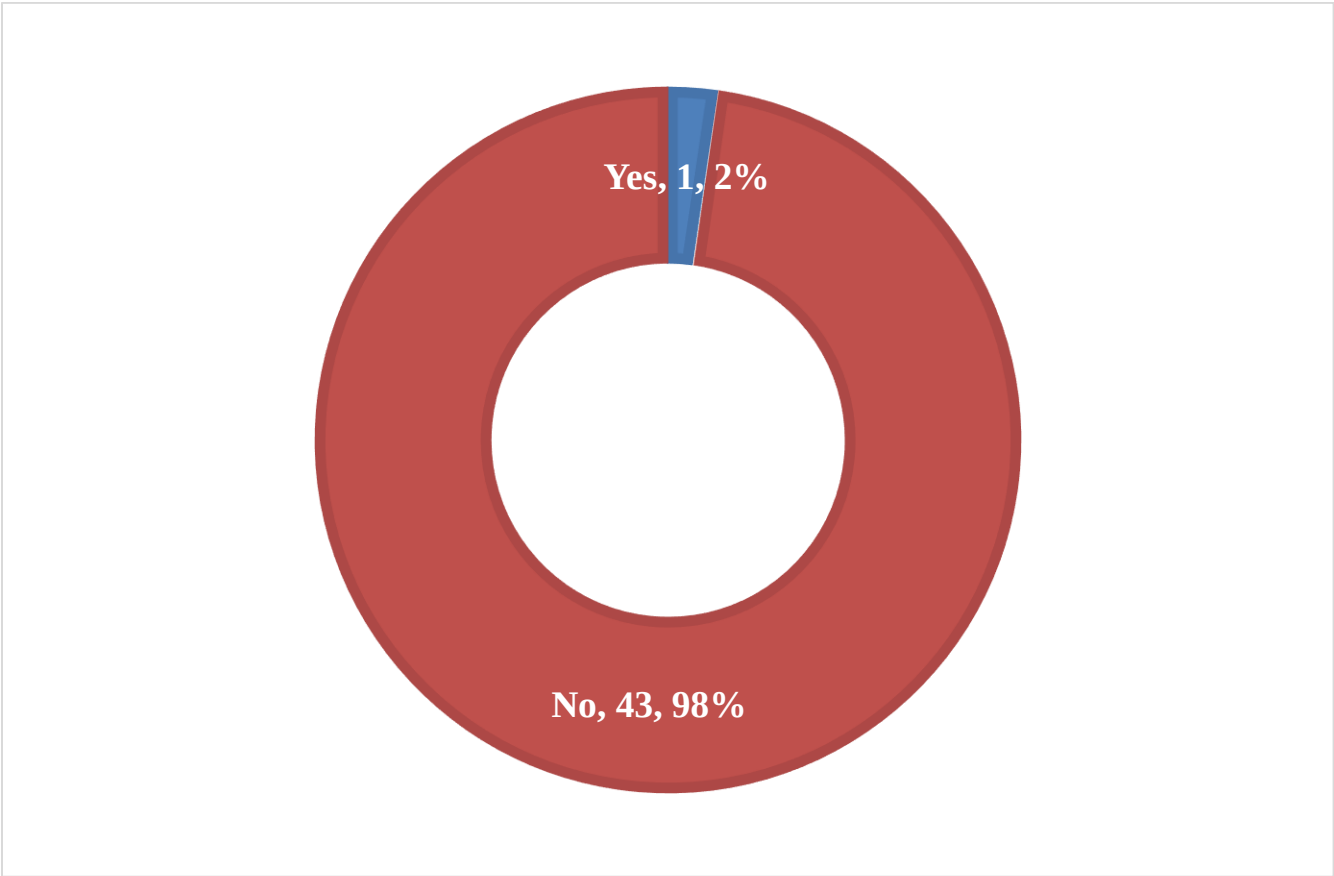


Table 16 Body Mass Index

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BMI Classification	Frequency	Percentage (%)
Normal weight (18.5 - 24.9)	4	10
Overweight (25 - 29.9)	8	20
Obese (30 - 39.9)	23	57.5
Morbid Obese (> 39.9)	5	12.5
Total	40	100

Figure 16 Body Mass Index

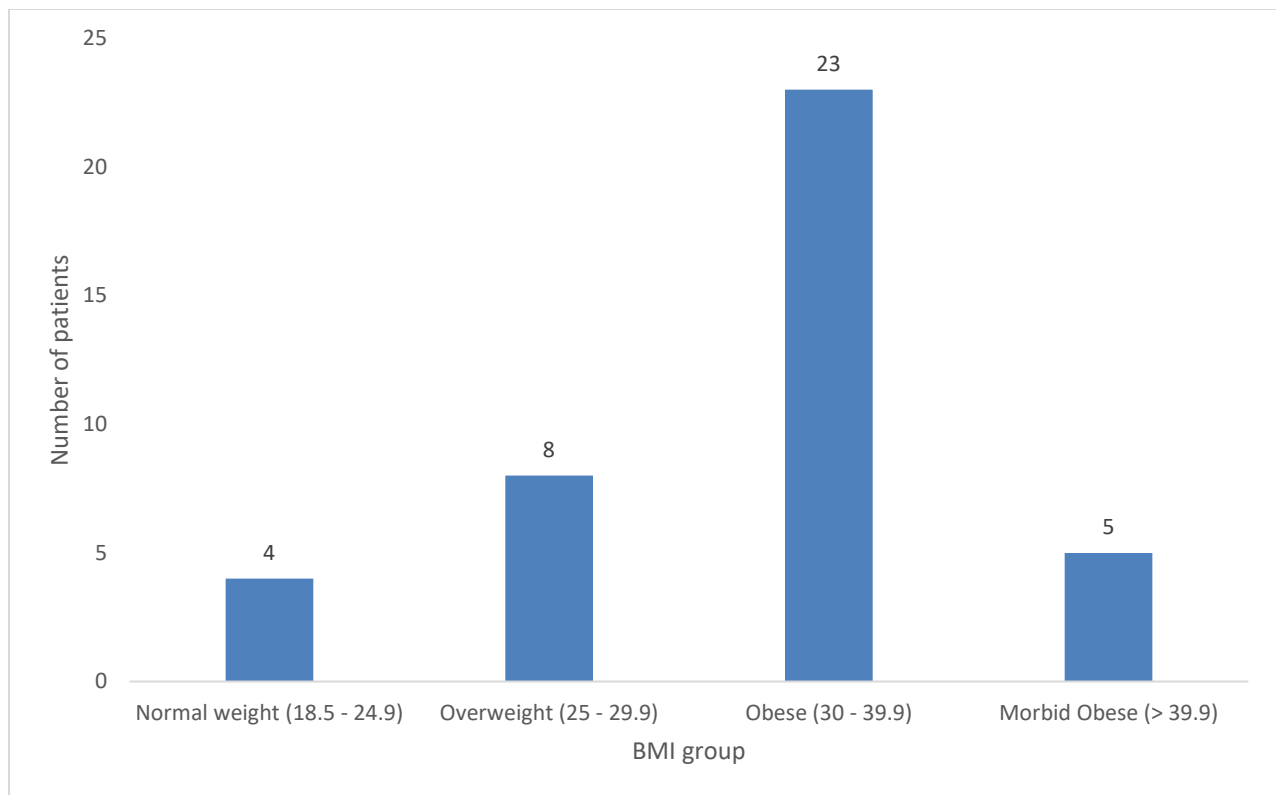
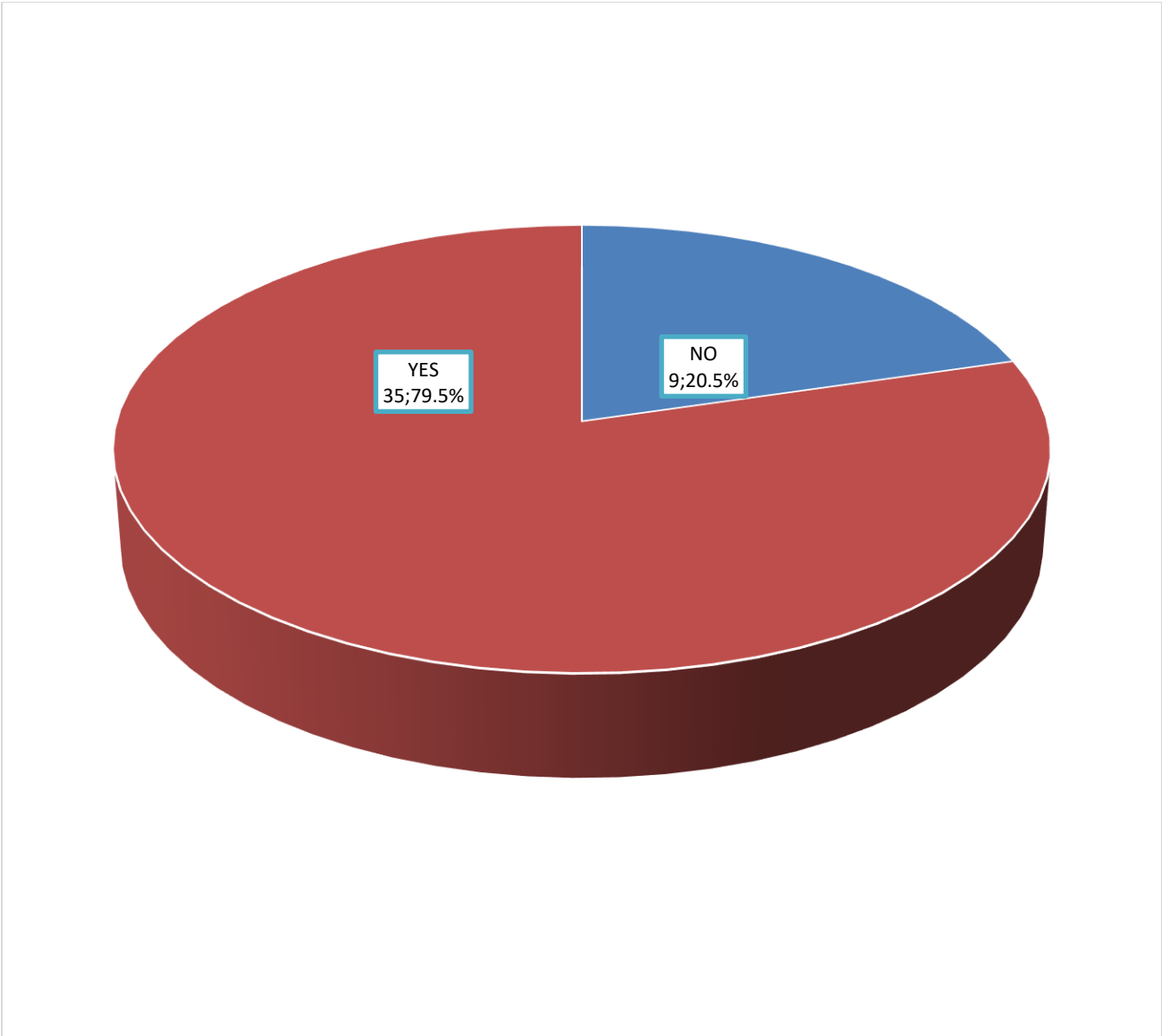


Figure 17: Presence of Heel Spur



4.4 TREATMENT AND OUTCOME

Forty four patients meet the inclusion criteria for this study; two dropped out at the end of the 4th week, three more at the end of the 8th week and two more at the end of the 12th week. This implies that a total of seven patients were lost to follow up by the 12th week.

The VAS score was grouped into mild pain (<4), moderate pain (4-7), and severe pain (>7).

A modification of the foot function index was used to group pain, difficulty and activity limitation in to mild (0-10), moderate (11-20), and severe (21-30).

All the forty four patients started with physiotherapy as baseline treatment; VAS score and modified FFI were assessed at 4, 8 and 12 weeks.

At the end of the 4th week, five out of the 42 patients available for follow up had steroid injection in addition to physiotherapy on account of no improvement or worsening VAS and Modified Foot Function Index Scores.

At the end of the 8th week, 39 patients were available for follow up; one out of these 39 patients had steroid injection in addition to physiotherapy.

All patients continued with physiotherapy at the end of the 12th week.

At baseline, a total of 21 patients had severe pain, another 21 had moderate pain while the remaining two had mild pain by using the VAS score. At the end of four weeks the number of patients with severe pain dropped from 21 to nine; then to one at eight weeks and then zero at the end of twelve weeks.

At the end of the twelve weeks, 32 out of the 37 patients available for follow up had mild pain while the remaining five had moderate pain.

The modified FFI score saw 6 patients in the severe group at baseline dropping to two, one and zero at 4, 8 and 12th week respectively.

At the end of twelve weeks, 35 patients out of the 37 available for follow up fell in the mild group with the remaining two falling in the moderate group.

The means and (standard deviations) for VAS scores at baseline, 4th week, 8th week and 12th week were, 7.05 (2.2); 5.05 (2.5); 3.15 (1.6); 1.9 (1.2) respectively.

The means for the modified FFI at baseline, 4th week, 8th week and 12th week were, 16.0, 11.4, 6.8, 3.7 respectively, with corresponding standard deviations of 4.0, 5.6, 4.6, and 3.0 respectively

For the pain subscale of the modified FFI, the means and standard deviations at baseline, 4weeks, 8 weeks and 12 weeks were 7.2 (2.2), 4.8 (2.6), 2.8 (1.9), 1.5 (1.2) respectively

The difficulty subscale under the modified FFI had means and (standard deviations) of, 5.2 (1.3), 3.9 (1.8), 2.7 (1.7), 1.6 (1.1) at baseline, 4 weeks, 8 weeks and 12 weeks respectively.

With respect to activity limitation subscale, the means and standard deviations recorded were, 3.8 (1.1), 3.0 (1.3), 1.8 (1.1), 1.0 (0.8) at baseline, 4 weeks, 8 weeks and 12 weeks respectively

Table 17 Number of patients receiving treatment at each stage (Number receiving steroid in brackets)

Number of patients	Baseline	4 weeks	8 weeks	12 weeks	Total
Physio/(steroid)	44/ (0)	42(5)	39(1)	37(0)	
Drop outs	0	2	3	2	7

Table 18 VAS Scores for patients per severity at different times

Visual Analogue score (VA Score)	Frequency	Percentage (%)
VA Score at Baseline		
Severe (> 7)	21	47.7
Moderate (4-7)	21	47.7
Mild (<4)	2	4.5
VA Score at 4 weeks		
Severe (> 7)	9	21.4
Moderate (4-7)	20	47.6
Mild (<4)	13	31.0
VA Score at 8 weeks		
Severe (> 7)	1	2.6
Moderate (4-7)	13	33.3
Mild (<4)	25	64.1
VA Score at 12 weeks		
Severe (> 7)	0	0.0
Moderate (4-7)	5	13.5
Mild (<4)	32	86.5

Figure: 17 VAS Score per severity at different times

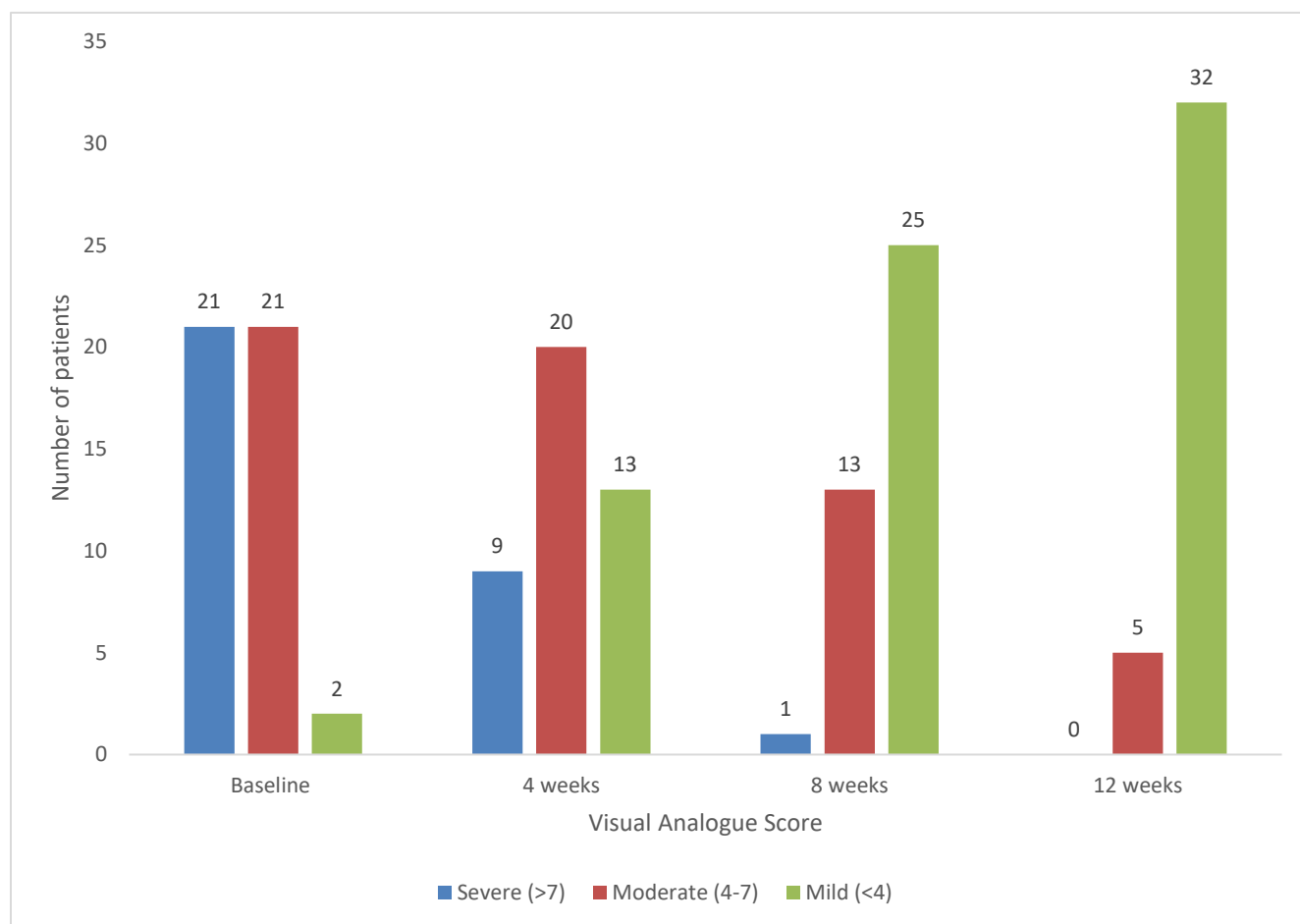


Table 19 Modified FFI scores for patients per severity at different times

	Frequency	Percentage (%)
FFI Score at Baseline		
Severe (21-30)	6	13.6
Moderate (11-20)	36	81.8
Mild (0-10)	2	4.5
FFI Score at 4 weeks		
Severe (21-30)	2	4.8
Moderate (11-20)	24	57.1
Mild (0-10)	16	38.1
FFI Score at 8 weeks		
Severe (21-30)	1	2.6
Moderate (11-20)	10	25.6
Mild (0-10)	28	71.8
FFI Score at 12 weeks		
Severe (21-30)	0	0.0
Moderate (11-20)	1	2.7
Mild (0-10)	36	97.3

Figure 18: Modified FFI score per severity at different times

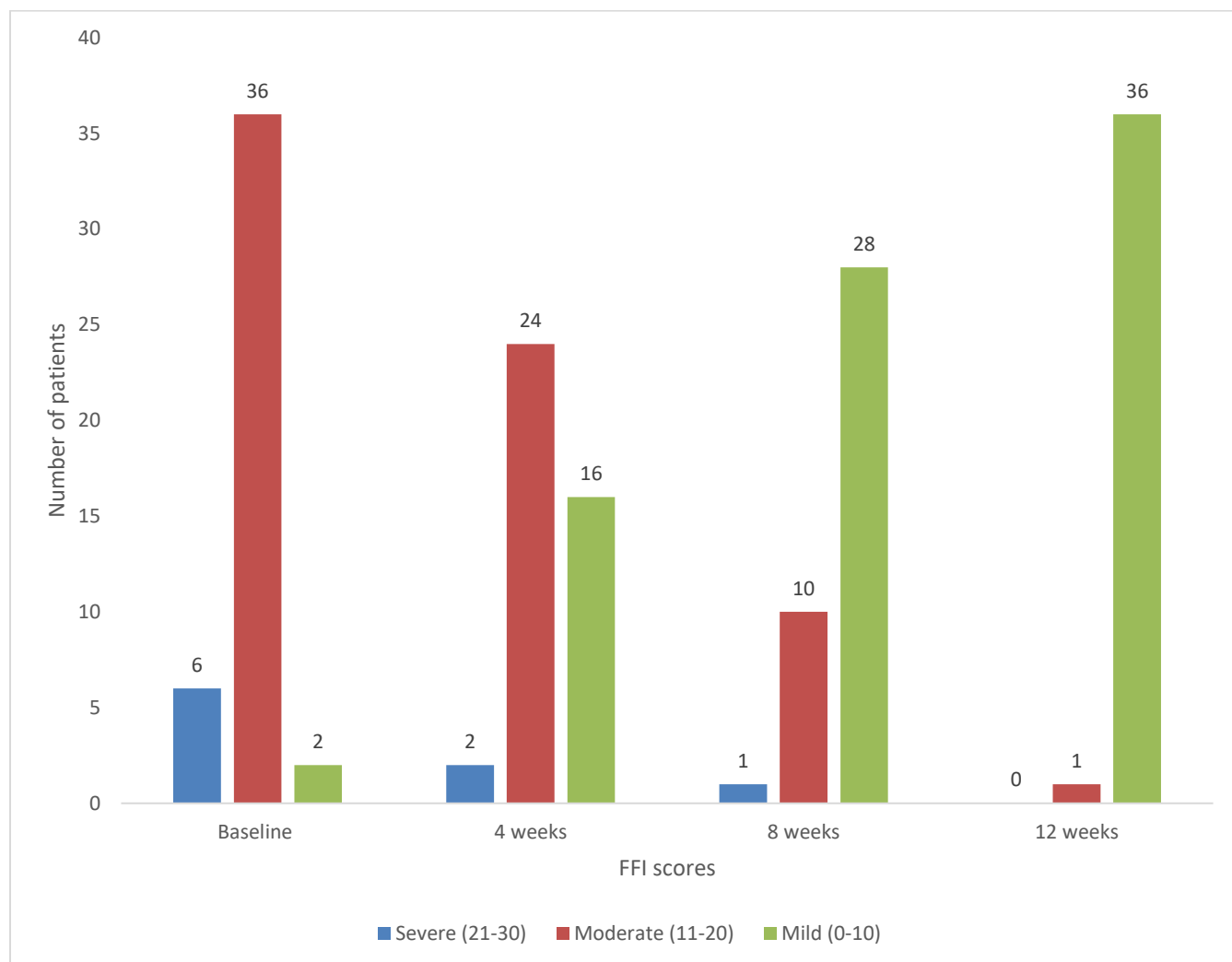


Table 20 Severity of various components of the modified FFI at various times

	Severe (>7)	Moderate (4-7)	Mild (<4)
Baseline			
Pain	21	21	2
Difficulty	3	39	2
Activity Limitation	0	27	17
4 weeks			
Pain	8	22	12
Difficulty	1	24	17
Activity Limitation	0	15	27
8 weeks			
Pain	1	13	25
Difficulty	1	12	26
Activity Limitation	0	2	37
12 weeks			
Pain	0	4	33
Difficulty	0	1	36
Activity Limitation	0	1	36

Table 21 Mean and Standard Deviation of VAS scores at various times

	VAS Score	
	Mean	Std. Deviation
BASELINE	7.05	2.2
4 WEEKS	5.05	2.5
8 WEEKS	3.15	1.6
12 WEEKS	1.9	1.2

Table 22 Standard deviation of FFI and subscales at different times

		BASELINE	4 WEEKS	8WEEKS	12 WEEKS
Pain	Mean	7.0	4.8	2.8	1.5
	Std. Deviation	2.2	2.6	1.9	1.2
Disability	Mean	5.2	3.9	2.7	1.6
	Std. Deviation	1.3	1.8	1.7	1.1
Activity Limitation	Mean	3.8	3.0	1.8	1.0
	Std. Deviation	1.1	1.3	1.1	0.8
Modified FFI score	Mean	16.0	11.4	6.8	3.7
	Std. Deviation	4.0	5.6	4.6	3.0

CHAPTER 5

Discussions

5.0 DISCUSSIONS

5.1 SOCIODEMOGRAPHIC CHARACTERISTICS

Sex

This study revealed a high incidence of plantar fasciitis in females than in males, 36 out of the 44 patients who meet the inclusion criteria were females, accounting for a female to male preponderance of 6.3:1. These findings are in support of other literatures which conclude that PF is more common in females than in males. Chigwanda²⁹ reported a female to male ratio of 9:1 in their community based study in Harare. Other studies that support a high incidence in females include work done by Davis PF et al³³ and Rano and colleagues³⁴ .

Oguntona and Ogunsemi in their paper on Plantar Fasciitis in Nigeria recorded a female to male ratio of 1.9:1³⁰. Work done by Chakraborty MK²⁸ al in Asia, Nepal also favored a higher incidence in females, with a female to male ratio of 2.3: 1.

Other studies however support a higher incidence in men than in women; this was demonstrated by Taunton JE³¹ and Lapidus PW³² in their studies.

The study by Taunton was carried out at a referral facility located on the campus of the University of British Columbia among 2002 runners with running related injuries. One hundred and fifty eight reported with Plantar Fasciitis. Eighty five (54%) were males and seventy three were females (46%).

That carried out by Lapidus was in the general population with a study population of 323 patients with 364 painful heels in New York, United States.

One can infer from this study and the above studies with exception to Lapidus study that, PF is largely a disease of females when one is looking at the non athletic populations

Age Group

Majority of the patients seen fell in the age group of 41-50 years, twenty three out of 44 representing 52.2%. This was followed by those in 31-40 and 51-60 years age groups, eight patients each making 18.2% to each group. Five patients were above the age of 60, corresponding to 11.4% of the total patients seen.

The mean age was 47.9 with a S.D of 9.7 years. These findings are in keeping with the review article published by Young⁶² in Medscape. He observed that the peak incidence occurred in women aged 40-60 years.

Again, work done in Asia, Nepal by Chakraborty²⁷ and Central Africa, Harare by Chigwanda²⁹ yielded a mean age of 46.1 and 48.1 respectively. These results are in keeping in what this study revealed. With the exception of Oguntona and Ogunsemi's³⁰ work which showed a mean age of 36 years, one can stipulate that PF largely occurs in the middle aged group as demonstrated by this study and other studies.

One can speculate that, middle aged women are getting close to menopause, with its attendant decline in oestrogen level. This causes the Planter Fascia to loss its elasticity hence predisposing them to PF.

A high incidence in men in this age group can be attributed to the fact that most middle aged men are physically active; they usually have to move around a lot to make a living; hence putting a lot of stress on the plantar fascia

Marital Status

Majority of the patients seen were married, 35 out of 44 (79.5%). This finding has no known correlation with plantar fasciitis in the literature.

Use of NHIS

Thirty eight patients out of the 44 (86.4%) assessed health care delivery using National Health Insurance Scheme. This encouraged patients to report for their physiotherapy sessions since it is covered by the NHIS.

Education Level

Twenty three of the patients have had secondary education (52.3%); thirteen have had tertiary education (29.5%). Four each had primary and no formal education. The literature on PF, has a relationship between the condition and occupational prolonged weight bearing or standing^{8,9} and not the level of education.

5.2 SYMPTOMATOLOGY

Duration

In this study, 18 (40.9%) out of the 44 patients had been experiencing symptoms for 3-6 month, 15 (34.1%) had symptoms for 6-12 months. Seven (15.9%) had symptoms for less than three months while 4 had their symptoms for more than a year. This implies that 84.1% of the patients seen have had their symptoms for three months or more.

In order to relieve symptoms and to improve activities of daily living these symptoms will have to be treated since this condition may take as long as 18 months to resolve on its own and in 80% of patients as reported by Young C.C et al⁴¹. One can also infer that no matter how long the duration of symptoms, patient could benefit from some form of treatment since this pain can be incapacitating sometimes.

Again it is not easy to tell which patient will be unfortunate to fall in the 20% group who do not develop resolution of symptoms

Frequency of common symptoms

The sine qua non of plantar fasciitis is a history of intense sharp heel pain with the first couple of steps in the morning or after other long periods without weight-bearing as described by Young C.C et al ⁴¹. All the patients seen in this study responded in the affirmative to the first two questions, that is, classical morning pain after few couple of steps and pain after prolonged

standing and weight bearing. Thirty eight representing 86.4% responded ‘yes’ to pain decreasing with increasing level of activity. Twenty three (52.3%) admitted to pain worsening at the end of the day, with seventeen (38.6%) responding ‘yes’ to pain at all times. According to Young CC et al⁴¹, these last two symptoms occur in patients with severe pain which is in agreement with the number of patients who had severe pain at baseline using the VAS score; twenty one(47.7%) of 44 patients in this study

Site affected

Twenty four (54%) out of the 44 patients seen in this study had one foot affected, with an equal distribution between the right and left foot. Both feet were involved in twenty patient representing 46%.

These findings are the exact opposite of what was observed by Wokhlu A et al⁶³ in their study conducted in India among 50 patients; Twenty four patients (46%) had unilateral symptoms and 26 (54%) bilateral symptoms.

Oguntona and Ogunsemi ³⁰ in their paper, Plantar Fasciitis in Nigeria also noted that the condition is mainly unilateral, with a very high percentage (90%).

Young's⁶² recent literature review in Medscape indicates that it is bilateral in a third of patients. It can clearly be seen that, this condition commonly affects one foot but the frequency varies from one region to the other.

5.3 RISK FACTORS

Occupational prolonged weight bearing

Twenty six (59.1%) out of the 44 patients admitted that their profession involved either prolonged standing or weight bearing. These include professions such as a Trading/Hawking, Teaching, Nursing and other Artisan jobs such as Masonry, Draughtsmanship.

Riddle et al ¹⁹, observed that 12(24%) out of 50 patients were involved in occupations that involved prolonged weight bearing. This yielded an odds ratio of 3.6 when compared to a control group. This finding makes occupational prolonged weight bearing an independent risk factor.

Recent increase in level of Activity

None of the patients seen in this study responded 'yes' to this question. This is a very important risk factor when one is looking at a subgroup of sports people.

David C. Reid⁶⁴ in his latest book, Sports Injury, Assessment and Rehabilitation noted that some sports people develop plantar fasciitis whenever there is an increase in their level of physical activity over a short time frame.

Type of shoe wear

A total of 37 (84.1%) out of the 44 patients seen, admitted to putting on flat shoes most of the time. The remaining seven (15.9%) preferred wearing high heeled shoes most of the time. Both high heeled and flat shoes are considered inappropriate shoe wears; they tend to increase the stress on the PF during walking. This leads to microtrauma at the point of insertion to the PF at the calcaneum.

Intrinsic structural risk factors

Nine (20.5%) out of the 44 patients had pes planus. None of the patients had Pes Cavus nor leg length discrepancy. Taunton³¹ recorded 19(12%), 11(12%) and 2 (8%) of Pes Planus, Pes Cavus and Leg Length Discrepancy in 158 patients with Plantar Fasciitis. Pes Cavus has been found to accentuate the windlass effect of the Plantar Fascia, which predisposes it to microtrauma at the heel³¹

Intrinsic degenerative risk factor

Heel pad atrophy which was detected by palpation was found to be an uncommon risk in this study. Only one (2.3%) patient out of the 44 had heel pad atrophy which was assessed by palpation. Heel pad atrophy has been identified as one of the intrinsic degenerative risk factors as described by Riedel²⁰. This finding should be distinguished from heel pain secondary to heel fat pad syndrome. Patients with heel fat pad syndrome do not have early morning pain after a few couple of steps and usually occur in elderly patients. The patient in this study was a 45 year old woman and a seamstress by profession with bilateral fat pad atrophy, protracted symptoms of more than a year and a VAS score of 8 in the foot with the severer pain. Her BMI was 32.5 (obese group). With this patient, the most likely reason why she will develop heel pad atrophy will be because of her profession; the heel serving as a fulcrum for the foot on the pedals of her sewing machine.

Body Mass Index

The body mass indices were assessed for 40 out of 44 patients on account of incomplete data entry. Four (10%) patients were within the normal range; eight (20%) in the overweight range.

Twenty three (57.5%) belonged to the obese range (i.e. BMI of 30-39.9); five were morbidly obese i.e. BMI of 40 and above.

Reidel et al²⁰ noticed that individuals who had a body-mass index of >30 kg/m² had an odds ratio of 5.6 (95% confidence interval, 1.9 to 16.6) when compared with the referent group of individuals who had a body-mass index of ≤ 25 kg/m². This finding makes obesity an independent risk factor. In the study by Reidel¹⁹, 80% of the 50 patients seen were overweight or obese. These findings are in keeping with what was observed in this study; 90% of the 40 patients who had their BMI assessed were overweight, obese or morbidly obese. Both studies demonstrate a significant effect of overweight or obesity on development of plantar fasciitis.

Frey and Zamora⁶⁵ also demonstrated a 1.4 fold increase probability of plantar fasciitis being diagnosed in overweight or obese patients.

In the study conducted in Nigeria by Oguntona and Ogunsemi²⁹, they reported that 50% of the 20 patients seen had normal weight with the remaining 50% being either obese or overweight. This does not demonstrate a clear association of PF and being overweight or obese.

Rome et al⁶⁶ suggested that BMI is not related to Plantar Fasciitis pain in the athletic population but factors such as low oestrogen in female athletes lead to a reduction in the elasticity of collagen in the plantar fascia, hence predisposing them to PF.

The patients seen in this study belonged to the non athletic group hence the strong association observed with elevated BMI was not unusual.

Presence of spur on X-ray

A total of 35 (79.5%) out of the 44 patients had a spur on X-ray. This finding is close to the observation made by Johal K.S et al⁶⁷ at University of Nottingham, UK. They observed a

significant incidence of 89% in 19 patients diagnosed of plantar fasciitis compared with 19 patients presenting with lateral ankle sprain.

Chigwanda et al²⁹ in his study in Harare, Central Africa, noticed that 40% of the 50 patients they saw, had heel spurs. This is in contract with what was observed in this study

Di Marcangelo MT et al¹³ and Barrett SL et al¹⁴, from imaging studies and endoscopic analysis respectively noticed that 50% of symptomatic patients and 20% of asymptomatic patients have heel spurs. In other words, 50% of patients with PF do not have spur on X-ray while 20% of people without symptoms of PF will have an incidental finding of spur on X-ray.

Plantar heel spur, delineates the presence of abnormal stresses across the plantar fascia for at least 6 months as reported by the American College of Foot and Ankle Surgeons heel pain committee⁶⁸ in their clinical practice guideline. This supports the Dictum, “the heel spur is not the problem; it’s the reaction to the problem”.

X-rays are however very helpful in evaluating the patient with heel pad pain, especially for ruling out differentials like tumours and fractures.

5.0 TREATMENT AND OUTCOME

Physiotherapy was the first line of treatment in patient's seen in this study. Corticosteroid injections were introduced at four or eight weeks in addition to physiotherapy for those patients who did not show an improvement in their VAS score or Modified Foot Function Score.

At the end of the 4th week, 42 patients were available for follow up; five (11.9%) of these patients had steroid injection in addition to physiotherapy. The remaining 37 (88.1%), persevered with physiotherapy.

At eight weeks, the number of patients reporting for review had dropped from 42 to 39. One (2.56%) patient among these 39 patients had steroid injection in addition to physiotherapy.

By the end of the 12 weeks, 37 patients were available for follow up. All, 37 persevered with physiotherapy on account of improved VAS and Modified FFI scores.

These findings show that conservative therapy in the form of plantar fascia stretching exercise is effective in the treatment of the symptoms of PF. This is supported by Wolgin M, et al⁶⁹ finding, of 83% success rate in 100 patients managed with stretching exercises with an average follow up of 47 months.

VAS score

At baseline a total of 21 patients had severe pain, another 21 had moderate pain and two had mild pain. At twelve weeks, 5 patients had moderate pain, 32 had mild pain with no patient experiencing severe pain. These finding show a marked improvement in pain on account of no patient experiencing severe pain, and 32 (86.5%) out of the remaining 37 patients experiencing mild pain.

The means and (standard deviations) for VAS scores at baseline, 4th week, 8th week and 12th week were, 7.05 (2.2); 5.05 (2.5); 3.15 (1.6); 1.9 (1.2) respectively. This shows a decreasing trend of pain over time and is an indicator that generally there was improvement in pain symptom from baseline to the end of 12 weeks

Modified FFI Score

The modified FFI score saw 6 patients in the severe group at baseline dropping to two, one and zero at 4, 8 and 12th week respectively. There were 36 patient with moderate symptoms and two with mild symptoms at baseline.

At the end of twelve weeks, 36 (97.3%) patients out of the 37 available for follow up, fell in the mild group with the remaining one falling in the moderate group. These results reveal a significant improvement in symptoms.

In considering the difficulty subscale of the modified FFI, at baseline, 39 out of the 44 patients had moderate difficulty, 3 had severe difficulty and 2 had mild difficulty. At the end of the 12th week 36 (97.3%) out of the 37 patients available for follow up had mild difficulty with the remaining one having moderate.

With respect to activity limitation no patient admitted to severe restriction in activity right from the onset; 27 out of the 44 patients had moderate while 17 had mild limitation in activity. At the end of the 12th week, 36 patients out of the 37 available for follow up had mild limitation in activity while one had moderate limitation in activity.

These findings show that severity of pain in Plantar Fasciitis did not correlate with severity of activity limitation. This can be explained by the fact that most of the patients seen had no choice than to go about their activities of daily living despite the severity of their pain.

In general there was improvement in pain and modified foot function indices with time in this study; this is evidenced by the means and standard deviations at various times.

The means for the modified FFI at baseline, 4th week, 8th week and 12th week were, 16.0, 11.4, 6.8, 3.7 respectively, with corresponding standard deviations of 4.0, 5.6, 4.6, and 3.0 respectively

All three subscales showed improvement with time as evidenced by their means and standard deviations;

For the pain subscale of the modified FFI, the means and standard deviations at baseline, 4 weeks, 8 weeks and 12 weeks were 7.2 (2.2), 4.8 (2.6), 2.8 (1.9), 1.5 (1.2) respectively

The difficulty subscale under the modified FFI had means and (standard deviations) of, 5.2 (1.3), 3.9 (1.8), 2.7 (1.7), 1.6 (1.1) at baseline, 4 weeks, 8 weeks and 12 weeks respectively.

With respect to activity limitation subscale, the means and standard deviations recorded were, 3.8 (1.1), 3.0 (1.3), 1.8 (1.1), 1.0 (0.8) at baseline, 4 weeks, 8 weeks and 12 weeks respectively

CHAPTER 6

Conclusions and Recommendations

6.0 Conclusions and Recommendation

6.1 Conclusions

The management of Plantar Fasciitis can be frustrating to both the patient and the Physician. Based on the findings from this study, Plantar Fasciitis can be said to be common in women in our environment. It is common in the middle aged group, probably because a lot of people are physically active in this age group.

The presence of early morning heel pain after a few couple of steps as well as pain after prolonged periods of inactivity are strongly related to Plantar Fasciitis.

Elevated Body Mass Index appears to be a major risk factor in most studies conducted in the non athletic population.

Other risk factors in our environment include, occupational prolonged standing and weight bearing, inappropriate shoe wear and to a less extent structural problems such as pes planus

The presence of a heel spur is an indication of an ongoing process at the medial aspect of the calcaneus; hence it is more of an effect rather than a cause. Heel Spurs are not present in all patients diagnosed of calcaneal spur.

Short term follow up shows that majority of patients do well with Plantar Fascia stretching exercises.

Corticosteroid injections should be considered for patients who are not responding to Plantar Fascia stretching exercise. Response should be assessed using instruments such as Visual Analogue Scale and Foot Function Index.

6.2 Recommendations

Future studies on this subject should involve large sample size which will be representative of what pertains in the community.

Studies with longer durations are recommended for follow up periods to assess long term benefits of the treatment offered.

Comparative studies on this subject with respect to different treatment options should be carried out to assess the effectiveness of one treatment over the other.

There should be an extensive education amongst clinicians so as to detect this condition early; most people would like to see a spur on X-ray before referring the patient as a case of heel spur. Quite a number of these clinicians are not familiar with the term Plantar Fasciitis.

Patients reporting at the Orthopaedic clinic should have their biodata and clinical information entered into a computer to serve as an information backup and also for tracking purposes

Plantar Fascia stretching exercises should be the first line of treatment for patients reporting with Plantar Fasciitis. Corticosteroid injection should be considered for patients with worsening symptoms which is being assessed with standard instruments such as VAS and FFI scores

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