

PREVALENCE OF PLANTAR FASCIITIS IN SCHOOL TEACHERS AND ITS CORRELATION WITH BMI AND AGE

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INTRODUCTION

Plantar fasciitis (PF) is a common musculoskeletal disorder that leads to heel pain, specifically in individuals who spend prolonged hours standing or walking posture for longer duration. It is characterized by inflammation, micro-traumas and degenerative changes in the plantar fascia, causing pain and discomfort, especially in the morning or after periods of rest ^[1]. The condition affects a significant portion of the population, with an increased prevalence among individuals with a high body mass index (BMI), older age, and those involved in occupations requiring prolonged weight-bearing activities, such as school teachers ^[2].

School teachers are particularly vulnerable to plantar fasciitis due to their prolonged standing and walking during teaching hours. These repetitive mechanical stresses lead to excessive strain on the plantar fascia, causing micro trauma and inflammation ^[2]. Additionally, increased BMI and aging are known to alter the biomechanics of the foot, leading to increased plantar pressure, reduced elasticity of the fascia, and impaired shock absorption capacity. Therefore, studying the prevalence of plantar fasciitis in school teachers and its correlation with BMI and age is essential for understanding risk factors and developing preventive strategies.

The plantar fascia, also known as the plantar neurosis, is a thick, fibrous connective tissue structure that plays a crucial role in maintaining the integrity of the foot arch. It originates from the medial tubercle of the calcaneus and extends distally to insert into the metatarsal heads and proximal phalanges, dividing into medial, central, and lateral bands. The central band is the thickest and most clinically relevant, as it provides the primary structural support to the medial longitudinal arch of the foot^[1].

The plantar fascia is composed of collagen fibers, particularly type I collagen, which provides tensile strength and elasticity ^[4]. It functions as a passive stabilizer, supporting the foot arch during static and dynamic weight-bearing activities. However, excessive mechanical loading, repetitive microtears and age-related degeneration can compromise its structural integrity, leading to plantar fasciitis ^[3].

Bio mechanically, the plantar fascia plays a critical role in the windlass mechanism, which enhances foot stability during the gait cycle. During the push-off phase of walking or running, Dorsi flexion of the toes tightens the plantar fascia, elevating the medial longitudinal arch and converting the foot into a rigid lever for propulsion. This mechanism optimizes energy transfer, reducing strain on muscles and

joints ^[1]. However, excessive stress, abnormal foot biomechanics, and prolonged standing can disrupt this mechanism, leading to overloading of the plantar fascia and eventual inflammation^[4]

Contributing Biomechanical Factors:

Several intrinsic and extrinsic factors influence plantar fascia loading:

1. **Intrinsic Muscles of the Foot:** Flexor Digitorum Brevis, abductor Hallucis, and Huadratus Plantae work Synergistically to support the arch and reduce plantar fascia strain. Weakness or dysfunction in these muscles may increase tensile stress on the plantar fascia, contributing to microtears and pain.

2. **Extrinsic Muscles Influencing Plantar Fascia Strain:** Gastrocnemius and soleus tightness increases tension on the Achilles tendon, indirectly affecting the plantar fascia by increasing tensile loading ^[1].

Tibialis posterior dysfunction can lead to excessive foot pronation, increasing stress on the plantar fascia and predisposing individuals to plantar fasciitis.

3. Foot Biomechanics and Gait Abnormalities:

Excessive pronation (flat feet) leads to increased elongation and tension on the plantar fascia.

Supination (high arches) reduces shock absorption, leading to increased impact forces transmitted to the plantar fascia ^[3].

Plantar Fasciitis and Its Correlation with BMI and Age Impact of BMI on Plantar Fasciitis

Increased BMI is a significant risk factor for plantar fasciitis due to the additional mechanical loading on the plantar fascia. Studies have shown that individuals with a higher BMI experience increased plantar pressure, particularly in the heel and midfoot regions, which accelerates fascial degeneration. Excess weight also alters gait biomechanics, leading to abnormal foot Pronation, increased ground reaction forces, and prolonged stress on the fascia ^[2] Additionally, obesity is associated with systemic inflammation and metabolic Dysregulation, which may contribute to chronic inflammatory responses in the plantar fascia. These factors collectively predispose overweight and obese individuals to a higher risk of developing plantar fasciitis compared to those with a normal BMI^[5]

Age-Related Changes in the Plantar Fascia

Aging is another critical factor influencing plantar fasciitis prevalence. As individuals age, several structural and functional changes occur in the plantar fascia:

Reduced Collagen Elasticity: With age, collagen fibres undergo degeneration, leading to decreased tensile strength and elasticity in the plantar fascia, making it more susceptible to injury^[8].

Decreased Fat Pad Thickness: The heel fat pad, which provides cushioning and shock absorption, becomes thinner with age, increasing the impact stress on the plantar fascia ^[6].

Delayed Tissue Repair: Aging slows down the healing process due to decreased fibro blast activity and reduced vascularization, leading to prolonged inflammation and chronic pain in plantar fasciitis patients ^[5].

Considering the occupational demands of school teachers as in standing for longer duration and maintaining a static posture for extended period of time, this study aims to investigate whether the combined effect of prolonged standing, increased BMI, and aging-related degenerative changes contributes significantly to the prevalence of plantar fasciitis.

NEED OF STUDY

- One of the significant occupation teachings is also associated with this condition but still it is not well

studied. Evidences are available showing high prevalence of the musculoskeletal pain among school teachers.
[5]

- Plantar fasciitis is one of the most common causes of heel pain. Risk factors, for plantar fasciitis include obesity, heel pad atrophy, aging, occupations requiring prolonged standing, and weight bearing.^[3]
- Evidences are available showing that the heel pain is also intensified by gaining weight. Excess body weight changes the gait mechanics and more weight is shifted to the lower extremities causes mechanical loading of the foot and plantar fasciitis.^[3] School teachers are especially vulnerable to this condition due to the demands of their profession, which often involves prolonged standing, walking, and insufficient rest periods. Understanding the prevalence of this condition in teaching profession can help in identifying preventive measures and also the impact of age and obesity on this condition.

- This study aims to assess the prevalence of plantar fasciitis in school teachers and its correlation with BMI and age. A better understanding of these associations can aid in developing effective preventive and therapeutic strategies, ultimately improving occupational health and reducing the burden of plantar fasciitis in this population.

MATERIALS AND METHODOLOGY

METHODOLOGY-

- Study type- Observational study
- Targeted Population-School teachers in PCMC area school.
- Study setting- PCMC schools
- Study duration-6 months Duration.
- Sample size-150

Assuming prevalence rate is 46 per 100, the sample size is calculated using WINPEPI software version with acceptable difference 8 per 100.

- Sampling method- convenient sampling were used.

MATERIALS USED-

- Pen
- Paper
- Questionnaire for plantar fasciitis – Foot Function Index (FFI)
- Measuring tape
- Weighing scale

ELIGIBILITY CRITERIA

Inclusion criteria-

1. Age- 25 to 55 years^[4]
2. Gender- male and female
3. Individuals with teaching experience of 2 years and more.
4. Individuals with 5-6 hours of long standing daily

Exclusion Criteria-

1. Degenerative disorders.
2. Individuals who have had any recent injuries such as ankle fractures, RTA, etc.



Foot Function Index

Patient Name: _____ Date: _____

This questionnaire has been designed to give your therapist information as to how your foot pain has affected your ability to manage in everyday life. Please answer every question. For each of the following questions, we would like you to score each question on a scale from 0 (no pain or difficulty) to 10 (worst pain imaginable or so difficult it required help) that best describes your foot over the past WEEK. Please read each question and place a number from 0-10 in the corresponding box.

No Pain 1 2 3 4 5 6 7 8 9 10 Worst Pain Imaginable

Pain Subscale: How severe is your foot pain:

Foot pain at its worst?		Pain standing with shoes?	
Foot pain in morning?		Pain walking with orthotics?	
Pain walking barefoot?		Pain standing with orthotics?	
Pain standing barefoot?		Foot pain at end of day?	
Pain walking with shoes?			

Disability Subscale: How much difficulty did you have:

Difficulty walking in house?		Difficulty standing tip toe?	
Difficulty walking outside?		Difficulty getting up from chair?	
Difficulty walking 4 blocks?		Difficulty climbing curbs?	
Difficulty climbing stairs?		Difficulty walking fast?	
Difficulty descending stairs?			

Activity Limitation Subscale: How much of the time do you:

Stay inside all day because of feet?		Use assistive device indoors?	
Stay in bed because of feet?		Use assistive device outdoors?	
Limit activities because of feet?			

Office Use Only: Score: ____/230 points (MDC: 7 points; No Disability "0")

Number of PT Sessions: ____

Gender: M F

Age: ____

ICD-9 Code: ____

PT Initials: ____

OUTCOME MEASURES

Foot Function Index

Budiman-Mak E., Conrad, K. J., & Roach, K. E. (1991). The Foot Function Index: a measure of foot pain and disability. *J Clin Epidemiol*, 44(6):561-570.

N = 87, with RA

Test-retest reliability of FFI total and sub-scale scores: 0.87-0.69

Internal consistency: 0.96-0.73

Strong correlation between FFI total and sub-scale scores and clinical measures of foot pathology supported criterion validity of the index.

Minimal Clinically Important Change: ?

Pathology: Immune system diseases, musculoskeletal diseases, skin and connective tissue diseases

Diseases: **Arthritis, Rheumatoid**, Orthopedics [RA (tendonitis, foot and ankle joints, and the surrounding soft tissues)]

Objective: To measure the impact of foot pathology on function in terms of pain, disability, and activity restriction.

Number of Items: 23 (FFI-R long form: 68/ FFI-R short Form: 34).

http://www.proqolid.org/instruments/foot_function_index_ffi retrieved 02/08/2010

Score: $\frac{\text{___}}{230} \times 100 = \text{___}\%$ (SEM 5, MDC 7)

High scores indicate greater disability/decreased function

WINDLASS TEST

The patient stands on a stool or chair with the foot positioned so that the metatarsal heads rest on the edge of the stool while the patient maintains weight through the leg.

The examiner then passively Dorsiflexes the big toe. Pain or increased pain at the insertion of the plantar fascia indicates a positive test for plantar fasciitis.

[Orthopaedic Physical Assessment 7th Edition - June 4, 2020. Authors: David J. Magee, Robert C. Manske]

RESULT AND DISCUSSION

- A Total of 150 school teachers are included in the study. The mean age of participants is 38.62 ± 8.54 . The data is analyzed by using MS Excel. Descriptive statistics is performed for demographics.
- This study included age, gender, height, weight, BMI variables. All the variables and FOOT FUNCTION INDEX questionnaire questions are analysed based on their frequency distribution. A total of 150 school teachers are included in the study. There are 128 females and 22 males.

Table 1.1 shows descriptive statistics of total 150 participants.

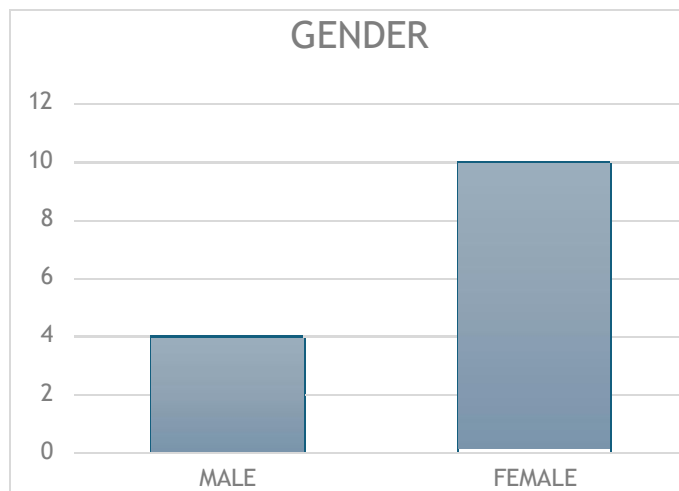
TABLE 1.1: Descriptive statistics of participants (n=150)

VARIABLES	MEAN $\pm$ SD
AGE	38.62 ± 8.54
HEIGHT(CM)	160.9 ± 6.33
WEIGHT(CM)	62.12 ± 10.37
BMI	26.75 ± 23.93

- TABLE 1.2 shows descriptive statistics of subjects with positive Windlass test (n=14)

VARIABLES	MEAN $\pm$ SD
AGE	42.28 ± 8.12
HEIGHT(CM)	163.5 ± 6.54
WEIGHT(KG)	67.92 ± 12.7
BMI	25.34 ± 4.61

Table 1.3 -shows gender-wise distribution of participants **positive** for windlass test

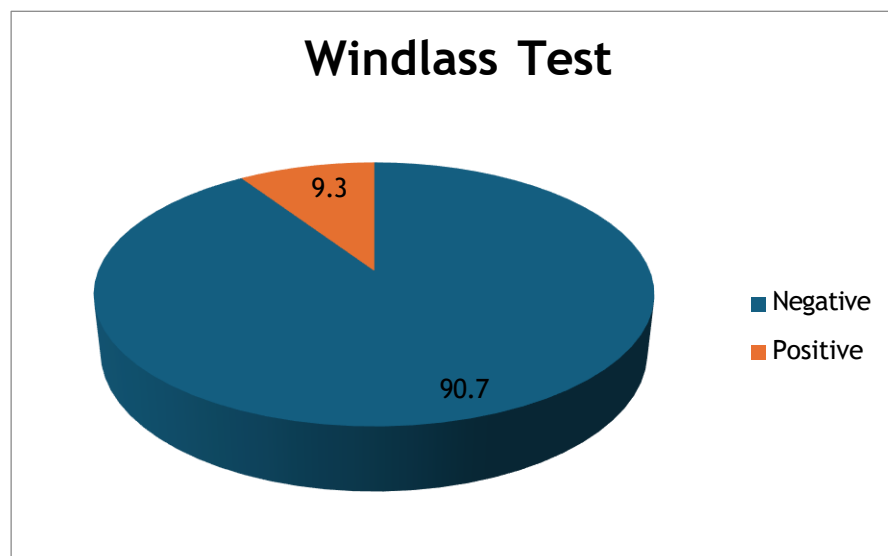


Column1	COUNT
MALE	4
FEMALE	10
TOTAL	14

Graph1.1-gender distribution of positive windlass test participants

Graph 1.2shows that 9.3% were found positive for the windlass test and 90.7% were found negative for windlass test.

Graph 1.2 Windlass Test Result

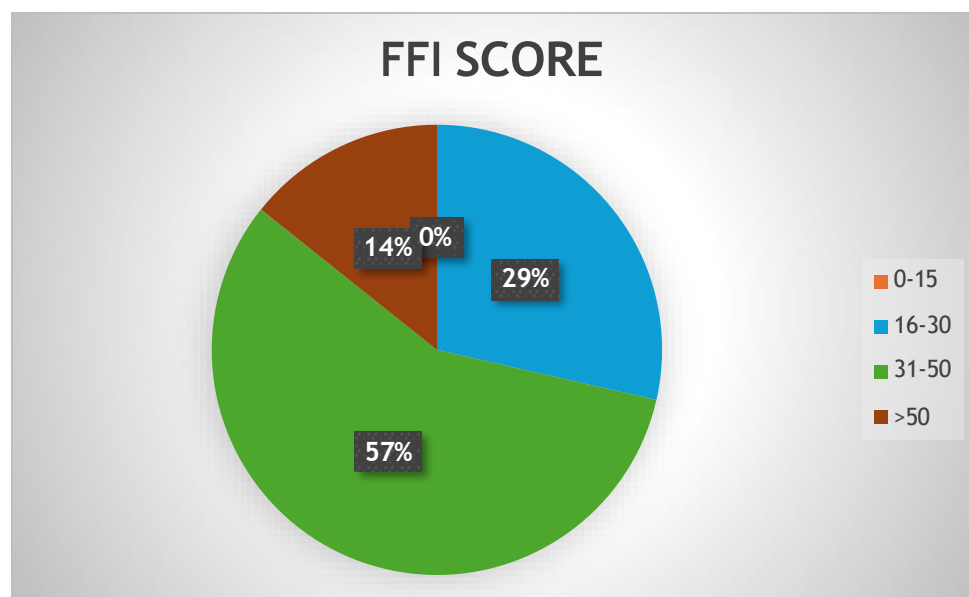


GRAPH 1.2

Table 1.4 shows the FFI score. 4 person got 16-30 % score, 8 person got 31-50% score, 2 persons got >50% score

FFI Score	No of Teachers	%
0-15	0	0
16-30	4	28.6
31-50	8	57.1
>50	2	14.3
Total	14	100

Graph 1.3 shows that 0% Teachers got 0-15% score, 28.6 % teachers got 16-30 % score, 57.1 % teachers got 31-50 % score and 14.3 % teachers got >50% score.



GRAPH 1.3

• Correlation of plantar fasciitis with BMI and Age –

The table below shows a negative correlation between FFI score for plantar fasciitis and both BMI ($r = -0.092$, $p = 0.756$) and Age ($r = -0.258$, $p = 0.373$).

Hence neither **age** nor **BMI** showed a significant correlation with severity of plantar fasciitis among teachers.

		Age	BMI
Total score	Pearson Correlation	-0.258	-0.092
	Sig. (2-tailed)	0.373	0.756

DISCUSSION

- The purpose of this study was to determine the prevalence of plantar fasciitis among school teachers and its correlation with BMI and age in PCMC area. A total of 150 participants were chosen based on the inclusion and exclusion criteria. The mean age, height, weight, and BMI are 38.62 ± 8.54 , 160.9 ± 6.33 , 62.12 ± 10.37 , 26.75 ± 23.93 respectively.
- Plantar fasciitis, which I found to have a 9.3 % prevalence and positive windlass test, is primarily happen by long standing hours, repetitive stress on plantar fascia, school work responsibilities.
- The majority of affected teachers reported moderate levels of pain and functional barriers in work, as indicated by FFI scores ranging from 31–50. This shows that although the condition is not extremely widespread, it substantially impacts the daily activities and work efficiency .
- While high ranges of BMI has been identified as a potential risk factor for plantar fasciitis due to increased continuous stress on the plantar fascia, the current study found no significant association between BMI and plantar fasciitis severity ($p = 0.756$).
- Similarly, no significant correlation was found with age ($p = 0.373$), suggesting that corresponding factors such as duration of standing, type of footwear, and surface for example hard surfaces may play a more significant role in this occupational group than demographic parameters.
- The study concludes that plantar fasciitis is moderately prevalent among school teachers (9.3%) In PCMC area, and most affected individuals experience moderate functional limitations. There was no significant correlation between plantar fasciitis severity and BMI or age, indicating that occupational factors such as prolonged standing, wrong footwear and other musculoskeletal problem are likely the main contributors. Preventive strategies focusing on ergonomics, footwear, and workplace modifications are essential to reduce the occurrence of plantar fasciitis among teachers.

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