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A Study of Prevalence of Plantar Fasciitis in Zumba Exercisers

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ABSTRACT

Introduction: Plantar fasciitis is a common cause of heel pain, often resulting from excessive strain, repetitive stress, and biomechanical imbalances. Zumba, a high-impact aerobic dance workout, involves frequent jumping, pivoting, and rapid directional changes, which may contribute to plantar fascia strain. Despite the increasing popularity of Zumba, there is limited research on the prevalence of plantar fasciitis among its participants.

Methodology: This study was conducted after the Ethical clearance was obtained from the Institution Ethical Committee. A cross-sectional observational study was conducted on 97 female Zumba participants aged 25–40 years with a BMI above 23 kg/m², training for more than three months. Data collection included demographic details, history of Zumba training, pain assessment using the Numerical Pain Rating Scale (NPRS), and diagnosis using the Windlass test.

Result: The study found a prevalence of **53.61%** for plantar fasciitis among Zumba exercisers. The mean age of participants was **32.91 years**, with an average BMI of **29.11 kg/m²**. The Windlass test, a clinical diagnostic tool for plantar fasciitis, showed **53.61% positive cases**, indicating a high association between Zumba and foot-related stress injuries.

Conclusion: The findings highlight a significant prevalence of plantar fasciitis in Zumba exercisers, suggesting that high-impact dance workouts contribute to foot strain and injury risk. Preventive measures such as stretching routines and weight management should be emphasized to reduce injury rates.

Keywords: *Plantar Fasciitis, Zumba, Windlass Test, Obesity, Numerical Pain Rating Scale (NPRS)*

1. INTRODUCTION

The foot is anatomically complex, and it comprises several structures that work together to aid movement and support. The foot consists of 26 bones divided into 3 groups: tarsals (7), metatarsals (5) and phalanges (3 per toe and 2 in the greater toe). It contains several Key joints including subtalar joint (between calcaneus and talus), talocrural joint (ankle) and metatarsophalangeal joints (toe). Muscles within the foot, mainly intrinsic muscles like the flexor digitorum brevis and abductor hallucis, contribute to movement and stability. Ligaments play a vital role in upholding foot structure, with the plantar fascia supporting the arch along with other ligaments that stabilize the ankle and toes.

Nerve supply primarily comes from the medial and lateral plantar nerves, branches of the tibial nerve, while blood circulation is maintained through the posterior tibial artery and its branches.

2. PLANTAR APONEUROSIS

Plantar aponeurosis is a dense, fibrous connective tissue. It extends from the calcaneal tuberosity to the toes forming a strong intermuscular septum between the lateral, intermediate and medial plantar muscle groups. (1) The structure is divided into

three bands: Medial band (thin, covering the abductor hallucis muscle), Central band (thickest and strongest, providing arch support), Lateral band (thinner, covering the abductor digiti minimi muscle) [2] In order to function as a shock absorber, the plantar fascia elongates with increased loads; however, its elongation capacity is limited (especially with decreasing elasticity common with age). Plantar fasciitis is a term for pain, tenderness or discomfort of the plantar aponeurosis primarily caused by collagen degeneration which lead to inflammation and microtears in the plantar fascia. It is one of the most common causes of heel pain in sports and activities that place repetitive. stress on the foot. It is frequently observed in runners, long-distance walkers, dancers, and tennis players, as well as in individuals whose occupations require prolonged standing, weight-bearing activities, hopping, or jumping. Additionally, plantar fasciitis is not exclusive to athletes; it is also common among non-athletes who engage in activities that exert constant pressure on the foot. The primary contributing factors to plantar fasciitis include excessive strain, overuse, and biomechanical imbalances, which compromise the integrity of the plantar fascia over time. The characteristic symptom is sharp or stabbing pain, typically most pronounced during the first steps taken in the morning or following extended periods of inactivity. As the condition progresses, discomfort may also increase after prolonged physical activity, making movement more difficult.

ZUMBA Zumba is a dance-based cardio workout inspired by Latin styles like salsa, merengue, and reggaeton. It combines aerobic moves such as jumping, squats, and lunges, providing a full-body workout that strengthens muscles, improves flexibility, and boosts cardiovascular endurance, helping to combat lifestyle-related health issues such as obesity and diabetes. Its combination of music, diverse dance styles, and aerobic exercises makes it effective for people of all age groups.

One of the most attractive aspects of Zumba is its dynamic and engaging environment, which sets it apart from traditional workout routines. The combination of rhythmic music and dance-inspired movements creates an atmosphere that feels more like a festive event than a fitness session unlike structured gym workouts. Zumba is an effective workout for calorie burning and weight management, incorporating high-intensity interval training (HIIT) with fast-paced movements and short recovery periods. On average, participants can expect to burn between 300 and 900 calories per hour, making it ideal for weight loss, fat reduction, and cardiovascular health improvement. [3] Zumba is a high-energy dance fitness program that involving repetitive movements and quick directional changes, making participants prone to musculoskeletal injuries. The most affected areas include the knees, ankles, legs, and lower back**,** with risk factors such a**s** improper biomechanics, unsuitable flooring and excessive overloading of weight playing a significant role in injury occurrence. Obesity and excess body weight contribute to musculoskeletal injuries by increasing joint stress, altering biomechanics, and slowing recovery. Excess weight places greater strain on the knees, ankles, and hips, intensifying the impact during movements like jumping and pivoting. Obese individuals frequently have limited flexibility, which increases the likelihood of developing plantar fasciitis, knee pain, and Achilles tendinopathy in those participating in Zumba. Furthermore, obesity is linked to chronic inflammation and slower healing, leading to more persistent injuries and extended recovery periods. [4] [5] Despite the well-documented risk factors for plantar fasciitis there is limited research specifically focusing on the prevalence of this condition among Zumba and aerobic exercisers. Understanding the extent of plantar fasciitis in this population can help inform targeted preventive strategies, including proper footwear recommendations, warm-up and cool-down protocols, and modifications in exercise techniques to minimize strain on the plantar fascia The findings of this research could have significant implications for fitness instructors, healthcare professionals, and exercise enthusiasts. By identifying key risk factors and prevalence rates, this study can contribute to better injury prevention guidelines, improved workout modifications, and enhanced awareness among individuals who engage in Zumba and aerobic exercise. Ultimately, these insights can help reduce the burden of plantar fasciitis and promote safer, more sustainable fitness practices.

3. METHODODLOGY

A Cross Sectional Observational study conducted on Zumba exercisers and Gymnasiums around Kolhapur City using Convenient sampling method, for a duration of 6 months.

Study subjects were selected fulfilling inclusion and exclusion criteria

Inclusion criteria- Female Zumba exercisers who are of ages 25-40 years with a BMI above 23kg/m^2, training for more than 3 months.

Exclusion criteria- Recent trauma around lower limb, Deformities of lower limb, All the other lower limb musculoskeletal syndromes

4. PROCEDURE

The study protocol was presented for approval in front of the Institutional Ethical Committee and Protocol Committee of D. Y. Patil Medical College, Kolhapur. After approval, participants were approached, and purpose of study was explained. Participant willing to participate were included according to inclusion exclusion criteria. Written consent was obtained from each subject and data was collected using diagnostic criteria.

The participants for study were selected from gyms and fitness centers around the Kolhapur city- Ruggedian Gym and Muscle Unit Gym. Initially, a brief demographic data as per data collection sheet was documented. A verbal as well as written

consent was taken from all the subjects.

Diagnostic tools – Windlass test – heel pain elicited with passive dorsiflexion of toes indicates a positive Windlass test in both Weight bearing and non-weight bearing positions, Early morning pain and stiffness while first steps in ambulation, Palpation of inferomedial surface of calcaneus triggers pain.

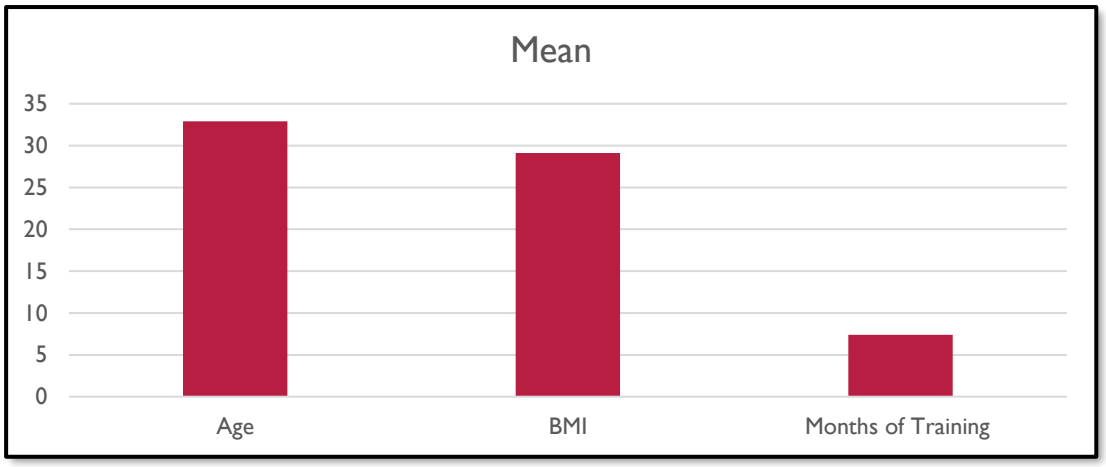
Fig 1: Windlass test in non- weight bearing position, being performed on the subject

Fig 2: Windlass test in weight bearing position, being performed on the subject

5. RESULTS

A study on plantar fasciitis among 97 Zumba exercisers revealed a prevalence rate of 53.61%,

This table shows mean of age, BMI and months of training of all the participants. The mean of participant age is 32.91, BMI is 29.11 and for months of training it is 7.40 respectively.



Graph 1: Age, BMI and Months of training distribution.

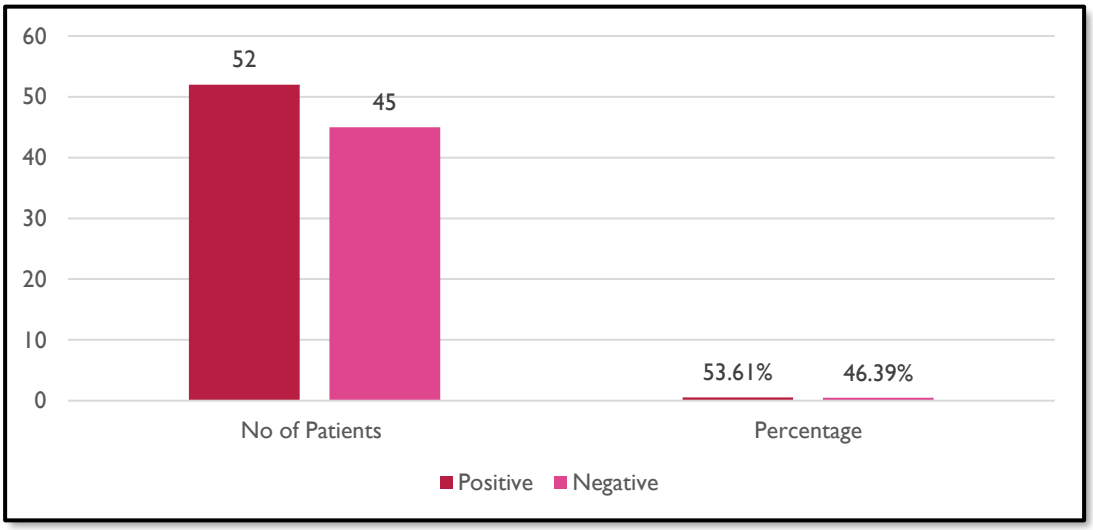
Graph 1 shows graphical representation of mean of age, BMI and months of training of all the participants. The mean of participant age is 32.91, BMI is 29.11 and for months of training it is 7.40 respectively.

A. Windlass test

Windlass Test	No of Patients	Percentage
Positive	52	53.61%
Negative	45	46.39%
Total	97	100.00%

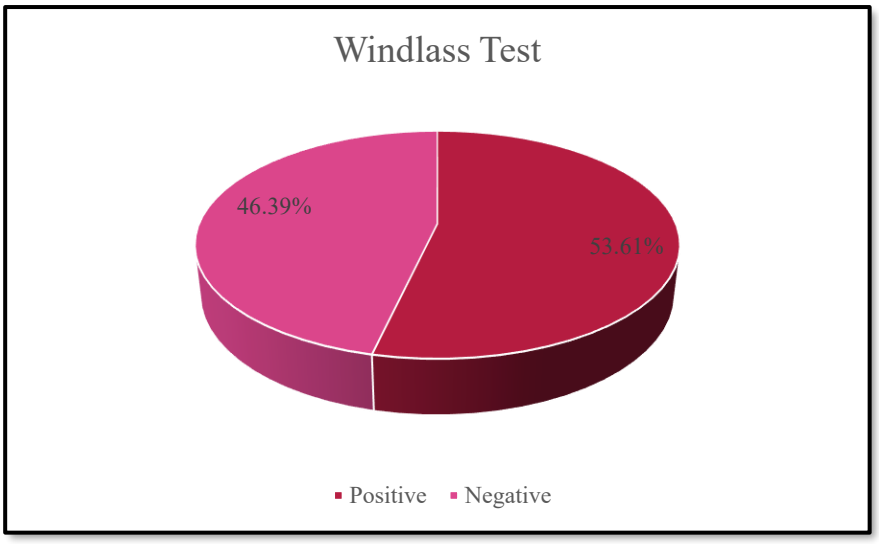
Table 1: no. of participants and percentage of positive/ negative for Windlass test

Table 1 shows tabular representation of participants who underwent Windlass test. Among total of 97 participants, 52 participants were tested positive and 45 were negative along with the percentages 53.61% positive and 46.39% negative respectively.



Graph 2: no. of participants and percentage of positive/ negative for Windlass test

Graph 2 shows bar graph representing the Windlass Test Results among a total of 97 participants who underwent the Windlass test, 52 tested positive (53.61%), while 45 tested negatives (46.39%).



Graph 3: no. of participants and percentage of positive/ negative for Windlass test

Graph 3 shows pie chart representing the Windlass Test Results among a total of 97 participants who underwent the Windlass test, 53.61% tested positive, while 46.39% tested negatives.

This indicates that more than half of the Zumba participants in the study experienced plantar fasciitis, highlighting a significant association between high-impact workouts and foot strain.

6. DISCUSSION

The present study aimed to assess the prevalence of plantar fasciitis among Zumba exercisers and to evaluate the efficacy of the Windlass test as a diagnostic tool. The findings revealed a high prevalence rate of 53.61% among the study participants, indicating a significant correlation between Zumba exercise and plantar fasciitis. This highlights the potential risks associated with high-impact aerobics activities that involve repetitive jumping, pivoting, and rapid directional changes.

Impact of Obesity and BMI on Plantar Fasciitis

The mean age of the participants was 32.91 years, with a BMI of 29.11, suggesting that a significant proportion of the study population falls within the overweight or obese category. This aligns with previous literature indicating that increased body weight contributes to higher mechanical stress on the plantar fascia, predisposing individuals to plantar fasciitis.

The study by Serkan Taş et al. supports this finding by demonstrating that individuals with a higher BMI exhibit increased plantar fascia thickness and reduced stiffness, leading to an increased risk of foot-related disorders. Excessive body weight led to prolonged pressure on the plantar fascia, reducing its elasticity and making it more prone to microtears and inflammation. Additionally, obesity has been linked to chronic inflammation and delayed healing, exacerbating the progression of plantar fasciitis. [6] Furthermore, excess weight increases foot pronation, altering biomechanics and putting additional strain on foot structures, increasing the risk of overuse injuries. Individuals with higher BMI often experience excessive flattening of the medial longitudinal arch, leading to

increased tensile stress on the plantar fascia. This excessive strain can result in degenerative changes, which further contribute to chronic heel pain and discomfort. [5] [7]

Obesity also influences gait mechanics, affecting the force distribution across the foot. Research indicates that individuals with obesity tend to adopt compensatory gait patterns to reduce discomfort, such as increased step width and prolonged stance phase. These altered movement mechanics can place additional stress on the plantar fascia, exacerbating strain and leading to a higher likelihood of developing plantar fasciitis. [5]

Additionally, excessive adipose tissue may produce inflammatory cytokines that contribute to systemic inflammation. Chronic low-grade inflammation has been suggested as a factor in delayed tissue healing and increased pain perception, making plantar fasciitis more persistent in overweight and obese individuals. This inflammatory response may explain why obese individuals often experience more severe and prolonged symptoms of plantar fasciitis compared to those with a normal BMI. [8]

Addressing obesity-related factors is essential for both the treatment and prevention of plantar fasciitis. Weight management strategies, including dietary modifications, low-impact exercise, and structured rehabilitation programs, can help reduce

excessive mechanical loading on the plantar fascia and improve foot function. Moreover, customized footwear, orthotic support, and physical therapy interventions can aid in alleviating symptoms and preventing further deterioration.

Efficacy of the Windlass Test in Diagnosis

The Windlass test was used as the primary diagnostic tool, with 53.61% of participants testing positive for plantar fasciitis. The high specificity of the Windlass test in weight-bearing conditions supports its role as a useful clinical assessment tool for identifying plantar fasciitis. However, its limited sensitivity, as noted in the study by Denise De Garceau et al., suggests that additional diagnostic measures may be necessary for a more comprehensive evaluation. The combination of patient-reported pain levels, palpation tests, and biomechanical assessments should be considered for a more accurate diagnosis. Additionally, studies indicate that the Windlass test is more effective when combined with a detailed patient history and functional assessment to differentiate plantar fasciitis from other foot conditions such as Achilles tendinopathy and metatarsalgia. [9] [10]

Association Between Zumba and Musculoskeletal Injuries

The results of this study are consistent with previous research highlighting the susceptibility of aerobic exercisers to foot and lower limb injuries. Studies by Verona da Toit and Richard Smith have shown that aerobic dance instructors experience a 77% injury rate, with 32.8% involving foot and ankle injuries, further supporting the notion that high-impact exercise routines contribute to musculoskeletal strain. Zumba, which combines elements of high-intensity interval training with dance movements, has been linked to increased stress on the foot's structural components. The frequent pivoting and jumping motions create repetitive strain, which can overload the plantar fascia and increase the likelihood of injury. [11]

Another key finding of this study is the potential link between prolonged participation in Zumba and the onset of plantar fasciitis. The mean duration of training among participants was 7.40 months, indicating that long-term engagement in high-intensity workouts without adequate foot support and conditioning may contribute to the development of plantar fasciitis. The repetitive nature of Zumba, particularly the combination of ballistic movements, side lunges, and jumps, places excessive strain on the plantar fascia. Individuals who engage in Zumba multiple times a week without adequate recovery may experience increased mechanical loading on the foot, leading to microtrauma and chronic pain. The risk is further exacerbated by improper footwear, insufficient warm-up, and exercising on hard surfaces, all of which contribute to plantar stress and potential injury.

Studies have also indicated that individuals who have a history of lower limb injuries or pre-existing biomechanical imbalances, such as excessive foot pronation, are at an even higher risk of developing plantar fasciitis when participating in high-impact aerobics activities like Zumba. Furthermore, research by Jill Inouye and Andrew Nicholas on Zumba-related musculoskeletal injuries highlights that improper landing mechanics during jumps and quick direction changes place additional strain on the foot and ankle structures. The findings emphasize that instructors should provide proper guidance on landing techniques and foot positioning to minimize stress on the plantar fascia. [3] [7]

7. CONCLUSION

This study highlights a substantial prevalence of plantar fasciitis among Zumba exercisers, emphasizing the need for preventive measures and early diagnosis to mitigate foot injuries. The Windlass test proved to be a useful diagnostic tool, although it should be supplemented with additional assessments for more accurate diagnosis. Given the increasing popularity of Zumba as a fitness activity, raising awareness about injury prevention and biomechanical considerations is crucial for ensuring a safe and effective exercise experience for participants. A multifaceted approach that includes proper footwear, weight management, structured training programs, and biomechanical assessments will be essential in mitigating the impact of plantar fasciitis among Zumba participants.

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