JOURNAL RIPHAH COLLEGE OF REHABILITATION SCIENCES

OPEN ACCESS

ORIGINAL ARTICLE

Frequency of Tarsal Tunnel Syndrome in Salesperson of Rawalpindi and Islamabad: A Cross-Sectional Study

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Article Info.

Received: August 04, 2025
Accepted: April 01, 2026
Published: June 29, 2026

Cite this article as: Kainat I, Syed A F, Khursheed H, Shahzadi H, Ain N, Khalid Q, Frequency of Tarsal Tunnel Syndrome in Salesperson of Rawalpindi and Islamabad: A Cross-Sectional Study JRCRS.2026:14(2):118-123
https://dx.doi.org/10.53389/JRCRS.2026140210

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A B S T R A C T

Background: Tarsal Tunnel Syndrome (TTS) is a condition that occurs as a result of compression on a nerve in the foot, which leads to symptoms like pain, tingling, and numbness. People who spend long hours standing, like salespersons, may be more likely to develop this problem.

Objective: To determine frequency and severity of TTS in salesperson

Methodology: This descriptive cross-sectional study was conducted from June 2024 to July 2025 in shopping malls and retail stores of Rawalpindi and Islamabad. A total of 377 salespersons aged 18–45 years, who had at least one year of job experience and stood for 8 or more hours daily, were selected through non-probability convenience sampling. Screening for TTS was done using Tinel's Sign. Participants with a positive result were further assessed using the TTS Severity Rating Scale. Data were analyzed using SPSS version 21, and results were presented in terms of percentages, frequencies, and means.

Results: Statistical analysis was done through SPSS version 21.0. Total of 377 Salesperson were included. The mean age was 26.97+- 6.89 years. 10.9% of participants were tested positive for TTS. The remaining 89.1% did not exhibit symptoms consistent with the condition.

Conclusion: This study concluded that Tarsal Tunnel Syndrome is fairly common among salespersons, especially those who stand for long hours daily. As most of the symptoms were mild, the findings showed that early detection, better footwear, and workplace changes will help reduce the occurrence of this condition.

Keywords: Foot, Pain, Standing position, Tarsal tunnel syndrome, Tibial nerve

Introduction

Tarsal Tunnel Syndrome (TTS), also known as tibial nerve dysfunction or posterior tibial nerve neuralgia, is a condition that comes under entrapment neuropathies, resulting from the compression of the structures located in tarsal tunnel, mostly the posterior tibial nerve.[1] The tarsal tunnel is a closed fibro-osseous canal situated just posteroinferior to the medial malleolus. Its roof is formed by the flexor retinaculum, a strong fibrous band that extends from the tip of the medial malleolus down to the medial calcaneal process and then to the plantar aponeurosis. On the other hand, the floor of the tunnel is comprised of the medial surfaces of the tibia, talus, and calcaneus bones.[2]

In this tunnel, there are several vital anatomical structures, including the tendons of the tibialis posterior, flexor digitorum longus (FDL), and flexor hallucis longus (FHL), along with the posterior tibial artery, vein, and the posterior tibial nerve itself, with nerve roots from L4 to S3.[3] Pressure on the posterior tibial nerve or its branches in this area can cause noticeable clinical symptoms.[2] Individuals affected by TTS typically experience pain localized over the tarsal tunnel, which radiates to the arch and plantar aspect of

the foot. In some cases, the pain may extend upwards towards the calf or even higher.[3]

Patients often describe their discomfort as sharp or shooting pain along with numbness and paresthesia throughout the distribution of the posterior tibial nerve.[2] These symptoms may aggravate during extreme dorsiflexion and eversion of the foot, activities that stretch the nerve.[2] Apart from this, individuals might report tingling or burning sensations, which can be localized to the medial side of the ankle or the plantar surface of the foot.[2]

The severity and distribution of symptoms largely depend on whether the entire posterior tibial nerve or only one of its branches is being compressed.[2] Most of the time patients report that symptoms aggravate during nighttime, or after activities that involve prolonged walking, standing, or physical exertion. On the other hand, resting tends to reduce discomfort.[2]

In addition to sensory disturbances, there may be some weakness of the intrinsic foot muscles.[2] Many patients also report that their dysesthesias, “unpleasant abnormal sensations” worsen during the night, also disturbing their sleep.[2] TTS can arise from both intrinsic and extrinsic causes.[1 4] Intrinsic factors are those that originate within the tarsal tunnel itself. These include structural abnormalities such as tendinopathies, tenosynovitis, and perineural fibrosis, hypertrophy of the retinaculum, osteophyte formation, and space-occupying.

lesions like varicose veins, ganglion cysts, lipomas, tumors, and neuromas.[2] Extrinsic causes also involve external influences that exert pressure on the tarsal tunnel. These may include poorly fitting footwear, traumatic injuries, biomechanical abnormalities like tarsal coalition or hind foot malalignments (Valgus or Varus), generalized lower extremity swelling, systemic inflammatory arthropathies, diabetes mellitus, and postsurgical scar formation.[2] Also, when considering Idiopathic TTS symptoms are typically aggravated by prolonged standing and walking, showing that these activities can be a contributing factor.[5, 6, 7, 8]

In around 80% of the cases, a specific cause leading to nerve entrapment can be identified.[2] Idiopathic tarsal tunnel syndrome is rare. There have been studies that observe more frequently among athletes and individuals whose lifestyles or occupations demand strenuous activities.[9]

Prolonged standing is defined as standing for more than eight hours per day.[10] Such long periods of standing causes excessive stress on the lower limbs that increases the risk of entrapment neuropathies.

Given the complex nature of foot and ankle pain, it is believable that prolonged standing, a common occupational hazard for many individuals, including sales personnel, can contribute to the development of degenerative changes and conditions such as tarsal tunnel syndrome (TTS).

Prolonged standing has been shown to notably elevate the risk of foot pain. Specifically, a study found that individuals exposed to extended periods of standing have a 1.7-fold greater likelihood of experiencing foot pain compared to those who do not.[12]

The occupational setting also plays a significant role in the development of musculoskeletal disorders. For instance, studies have shown that clinical physiotherapists are at high risk of work-related musculoskeletal disorders due to ergonomic risk factors, such as repetitive task and working in same position.[13] The nature of a salesperson's job inherently involves prolonged standing, manual handling tasks such as lifting, carrying, and arranging products, as well as pushing and pulling heavy loads.[14] It is also specified that repetitive application of force, high- frequency manual activities, and awkward working postures are physical risk factors that collectively contribute to the development of musculoskeletal injuries.[15]

Exposure to these occupational demands with time leads to a combined load on the lower extremities, which can initiate a cycle, if pathological changes result in disorders. Salespersons most of the time find themselves standing continuously for many hours each day, sometimes exceeding the threshold is considered safe. In result of their occupational exposure, they are at a higher risk for developing conditions associated with prolonged weight-bearing.[16] Hence the present study is designed to investigate the prevalence of tarsal tunnel syndrome among salespersons. As existing literature highlights prolonged standing as a prominent etiological factor in the development of TTS, making this population, specifically salesperson, more prone to it and thus ideal for this study. Based on the results we will achieve regarding the frequency and characteristics of TTS within this group, we aim to contribute valuable data that can inform preventive strategies and therapeutic interventions for at-risk individuals.

It is important to detect TTS at an early stage to counter it. However, diagnosing TTS early is challenging. If it is not treated then chronic compression of the posterior tibial nerve can lead to permanent nerve damage, persistent pain, functional impairments, and low quality of life. Early intervention, workplace modifications, ergonomic improvements, and awareness programs can minimize the incidence and impact of TTS among salespersons.

Methodology

A descriptive cross-sectional study was conducted among 377 Salesperson. These participants were included from different Shopping Centre, Convenience Stores and Retail sector of twin cities. Non-probability based purposive sampling was used. The sample size calculated through Raosoft sample calculator was 377 with population size of 20,000, margin of error 5% confidence level 95%, and response distribution of 50%.

The ethical approval **(FF/FUMC/215-534/Phy/24)** was taken from Foundation University Islamabad. Sample was taken based on eligibility/ineligibility criteria. Salesperson with age bracket of 18-45 years, working experience of 1 year, 8 hours of standing per day, both genders and working in twin cities were included. Those with Diabetes, Hypertension, Hypothyroidism, Obesity, Repeated Ankle Sprain, Posterior Tibial Tendon Syndrome, Plantar Fasciitis, Charcot Foot and Salesperson who do heavy lifting were excluded from the data. Screening tools that were used are Navicular Drop Test, Windlass Test, Single Limb Heel Raise Test, Tinel's sign and Severity Rating Scale. Diagnostic application of Tinel's sign and severity rating scale were used to determine the frequency and severity of TTS. Age, gender, BMI, working experience, footwear type was also determined in addition to finding frequency and severity of TTS whereas, Navicular Drop Test, Windlass Test, Single Limb Heel Raise Test were used to screen out Flat Feet, Plantar Fasciitis and Posterior Tibial Tendon Syndrome respectively.

Upon securing ethical approval form the ethical review committee of Foundation University School of Health Sciences data collection was initiated. We began the data collection process by first conducting a demographic evaluation, which included gathering basic information such as age, gender, work experience and average daily standing time. To ensure the health status of participants, we also screened for common medical conditions such as Hypertension and Diabetes as well as took a repeated Ankle Injury history to rule out other contributing factors. Before performing the main tests, participants were screened for Plantar Fasciitis and a Single Limb Heel Raise Test to check the strength and function of their calf muscles. These tests helped us make sure that the person met the requirements to be included in our study.

After confirming that the individual was suitable for study, we used Tinel's sign test as a main method to detect the signs of TTS. If the Tinel's sign was positive, which suggested nerve involvement, we then used a Severity Rating Scale to measure the intensity of symptoms. We followed a clear, step-by-step method to collect data only from participants who met the study criteria.

This study was safe and did not pose any risk to the participants. Informed consent was obtained from all the participants, with a commitment to preserving the confidentiality of shared information. Data was analyzed by SPSS version 21. The mean of continuous variables was calculated and for categorically variables percentage/frequency was analyzed. The overall mean age was 26.97$\pm$6.8 years. The study population consisted of predominantly males, with a frequency of 96.3% while females accounted for 3.7%.

Results

The mean age of 377 participants was 26.97$\pm$6.89 years including a relatively young working population.

Other data came with gender distribution that showed 14 (3.7) were females and 363 (96.3) were males out of 377. The BMI distribution showed that majority of individuals fell into the normal weight category, accounting for 64.7% of the sample. 20.2% of participants were categorized as overweight (BMI 25-29.9Kg/m^2), while 14.6% were underweight (BMI < 18.5kg/m^2). The distribution of participants based on working experience revealed that 28.6 percent of the participants fell into category of 6-10.9 Working Years. The most common Footwear reported was Joggers and Dress Shoes were the second most common worn footwear followed by Slippers, Sneakers and Pumps. While evaluating the occurrence of TTS it was found that 10.9% (n=41) of participants tested positive for TTS. The remaining 89.1% (n=336) did not exhibit symptoms consistent with the condition.

The severity of TTS showed that majority (89.1%) fell into Excellent category, scoring a full 10. A smaller proportion of 10.1% was classified as having good score and only 0.8% was categorized under Fair score. No participants reported poor scores.

Scree plot indicated 2 components with eigenvalue that was more than 1 of 10 items (Fig. 1). As such, these only two components were used in the factor analysis. There is an obvious inflection point following the second factor while factor analysis demonstrated that both elements explained a collective 71.62% of the total variance of the entire items.

Table 1: Demographic Data			
		Frequency (n)	Percent (%)
Gender	Male	363	96.3
	Female	14	3.7
BMI	Underweight (BMI < 18.5)	55	14.6
	Normal weight (18.5 ≤ BMI < 24.9)	244	64.7
	Overweight (25 ≤ BMI < 29.9)	78	20.2
Work Experience	1-3.9 years	98	26.0
	4-5.9 years	75	19.9
	6-10.9 years	108	28.6
	11-15.9 years	44	11.7
	16-20.9 years	32	8.5
	21-25.9 years	12	3.2
	26+ years	8	2.1
Footwear Type	Joggers	147	39.5
	Slippers	74	19.9
	Sneakers	46	12.2
	Dress shoes	105	28.1
	Pumps	1	.3

Table 1: Occurrence and Severity of TTS			
		Frequency (n)	Percent (%)
Occurrence	Yes	41	10.9
	No	336	89.1
Severity	Excellent (10)	336	89.1
	Good (8-9)	38	10.1
	Fair (6-7)	3	.8
Involved Side	Right	10	2.7
	Left	17	4.5
	Both	14	3.7

Table 3: Occurrence of TTS with BMI, Work Experience, and Footwear			
		TTS Present and Absent	
		Yes n (%)	No n (%)
Gender Category	Male	37 (10.2%)	326 (89.8%)
	Female	4 (28.6%)	10 (71.4%)
BMI Category	Underweight (BMI < 18.5)	7 (12.7%)	48 (87.3%)
	Normal weight (18.5 ≤ BMI < 24.9)	29 (11.5%)	216 (88.5%)
	Overweight (25 ≤ BMI < 29.9)	5 (6.6%)	73 (93.4%)
Work Experience	1–3.9 years	15 (15.30%)	83 (84.70%)
	4–5.9 years	7 (9.30%)	68 (90.70%)
	6–10.9 years	10 (9.30%)	98 (90.70%)
	11–15.9 years	3 (6.80%)	41 (93.20%)
	16–20.9 years	6 (18.80%)	26 (81.30%)
	21–25.9 years	0 (0.00%)	12 (100.00%)
	26+ years	0 (0.00%)	8 (100.00%)
Footwear Type	Joggers	18 (12.10%)	131 (87.90%)
	Slippers	10 (13.30%)	65 (86.70%)
	Sneakers	3 (6.50%)	43 (93.50%)
	Dress Shoes	10 (9.40%)	96 (90.60%)
	Pumps	0 (0.00%)	1 (100.00%)

Discussion

Our study aimed to determine the frequency and severity of Tarsal Tunnel Syndrome (TTS) among salespersons working in Rawalpindi and Islamabad. The findings revealed that 10.9% of the sample population tested positive for TTS. Among those affected, the majority showed symptoms on the left side (4.5%), followed by both sides (3.7%) and the right side (2.7%). The results suggest a significant presence of TTS in this occupational group, particularly their prolonged standing and workload.

The overall mean age of the participants was 26.97 ± 6.89 years, which mostly includes young working population, still at risk of developing entrapment neuropathies like TTS.

Our study was conducted on healthy subjects, in contrast to a study that was focused on finding the prevalence of obesity in high tarsal tunnel syndrome, which concluded that based on BMI, 17 patients out of 73 with TTS were overweight and 47 patients were obese.[20] While in our study, a relatively low prevalence of TTS among overweight participants compared to underweight or normal BMI groups was observed. This could be due to changes in footwear, differences in personal activity levels or reporting bias.

Regarding side involvement, left-sided symptoms were reported more often. However, there is weak evidence concluding that foot dominance, postural habits, or repeated pressure on one side may cause irritation of the nerve on one side only.[17,18]

The work experience of participants also influenced the results. TTS was most common in people with 1 to 10 years of experience, and no cases were found in those with over 20 years of experience. This may reflect a potential "survival effect" where long-standing workers either adjust better to physical demand or leave the job if they experience discomfort.[21]

Participants used different types of footwear. Joggers (39.5%) and dress shoes (28.1%) were the most used footwear. Although joggers provide comfort and support, the results suggest that using supportive and comfortable shoes only are not enough to reduce the effects of prolonged standing. Footwear plays an important role in anatomical and neurological health of the foot. Shoes that do not provide proper arch support or cushioning can increase pressure inside the tarsal tunnel and can irritate the nerve.[2,22] It is also important to note that most salespersons wearing joggers cannot afford to use high-quality brands. This can result in reduced support and comfort. Thus, the results prove that footwear may lead to the development of TTS, especially when using shoes like slippers and flat shoes as they may increase stress on the tibial nerve.

Salespersons with less than 5 years of experience had a higher rate of TTS compared to those with more experience. Similar findings have been reported in other retail health studies, which showed that newly hired workers often do not have proper training in body mechanics or access to good footwear. This can increase their risk of injury early in their careers.[19]

Recommendations: Our findings suggest that Tarsal Tunnel Syndrome develops due to multiple factors, including work-related stress, body mechanics, footwear, and physical condition. As other researchers have also suggested, early detection and prevention strategies such as foot screening programs, workplace ergonomics, and suitable footwear can help reduce the risk and impact of TTS among workers.

Limitations: Our study also had some limitations. It was difficult to include enough female participants, which may limit how well the findings apply to the general population, especially when comparing risk between male and females. Future studies should try to include larger and more gender-balanced samples.

Another limitation was that we did not use electro diagnostic tools such as nerve conduction studies (NCS) or electromyography (EMG), to confirm the presence of TTS. The diagnosis was based solely on clinical assessments which may lead to either under diagnosis or over diagnosis due to the lack of objective physiological data. Future research should include electro diagnostic tests to improve the accuracy of diagnosis.

This study also did not include long-term follow-up of participants to observe the progression, recovery, or treatment outcomes of TTS. This limits our understanding of how the condition develops and changes over time.

Conclusion

This study found that 10.9% of participants had Tarsal Tunnel Syndrome (TTS) and the rest of the 89.1% did not have any TTS symptoms. The severity of TTS among salespersons showed that 89.1% of participants, 89.1%, were in the "Excellent" category (score of 10) which means they had no TTS symptoms. 10.1%, was in a "Good" category (score 8–9) showing mild symptoms. 0.8% of participants came under the "Fair" range (score 6–7) having moderate discomfort or mild impairment. There was no participants with poor or severe scores.

Conflict of Interest: *None*

Funding Sources: *None*

Data Availability Statement: *The datasets generated and/or analysed during the current study are not publicly available due to ethical, legal, and participant confidentiality considerations but may be available from the corresponding author upon reasonable request, subject to institutional approval where applicable.*

Disclaimer: *We authors want to declare that we used AI-assistant tools in this article for improving language. We authors are fully responsible for the accuracy, originality, integrity, and scientific validity of this article.*

Acknowledgment: None

Author's contribution: *[1,2,7] Substantial contributions to the conception or design of the work for the acquisition, analysis or interpretation of data for the work. [3-5] Drafting the work or reviewing it critically for important intellectual content, [1-7] Final approval of the version to be published, agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.*

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