IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 2, October 2026
Impact Factor: 8.2

Occupational Foot Health Among Traffic Police Personnel: A Review of Foot Posture, Prolonged Standing, Footwear Comfort, and Musculoskeletal Discomfort

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Abstract: ***Background:*** *Traffic police personnel perform physically demanding duties involving prolonged standing, intermittent walking, repetitive weight-bearing, and exposure to variable road surfaces. These occupational conditions may contribute to foot discomfort, lower-limb fatigue, and musculoskeletal symptoms. Foot posture, anthropometric characteristics, standing duration, and occupational footwear are important factors to consider when evaluating foot health.*

Objective: *This review examines the existing literature on occupational foot health, with particular emphasis on foot posture, prolonged standing, footwear comfort, body mass index (BMI), foot pain, and functional disability among traffic police personnel and other occupational groups with similar work demands.*

Review approach: *A narrative review approach was used to organize relevant literature on foot posture assessment, occupational standing, footwear characteristics, and musculoskeletal health. Published clinical assessment studies and occupational health reviews were considered. The review emphasizes the relevance of these findings to traffic police personnel in Bareilly, Uttar Pradesh, India.*

Review findings: *The literature indicates that prolonged standing is associated with several adverse health outcomes, including lower-limb discomfort and fatigue. Footwear characteristics, such as cushioning, sole hardness, fit, and insole design, may influence foot comfort and mechanical loading. Standardized tools, including the Foot Posture Index-6 (FPI-6), can support quantitative assessment of standing foot posture. However, static foot posture, pain intensity, and functional disability represent different outcomes and should be assessed separately. The available evidence does not establish that age, BMI, or standing duration necessarily causes a particular foot posture in traffic police personnel.*

Conclusion: *Occupational foot health should be considered an important component of preventive health assessment among traffic police personnel. Future research in Bareilly should investigate foot posture, footwear comfort, standing duration, BMI, pain, and functional limitations using standardized assessment methods. Evidence from appropriately designed studies may inform occupational health screening and further evaluation of preventive strategies.*

Keywords: Occupational foot health, traffic police, foot posture, prolonged standing, footwear comfort, BMI, foot pain, musculoskeletal disorders, Bareilly.

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DOI: 10.48175/IJARSCT-38891

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I. INTRODUCTION

Occupational health is an important component of workforce well-being, particularly among employees whose duties involve prolonged physical activity, sustained standing, and repetitive movements. Traffic police personnel perform essential public safety functions, including regulating traffic, maintaining road safety, assisting road users, and responding to traffic-related incidents. These responsibilities may require long periods of standing, frequent walking, and working on hard or uneven surfaces.

The foot is a complex anatomical structure that supports body weight, contributes to balance, and facilitates movement. Its bones, joints, muscles, ligaments, and soft tissues work together to maintain stability and accommodate changes in loading during standing and walking. Differences in foot structure and posture are common, and their clinical significance depends on factors such as symptoms, function, mobility, and individual characteristics.

Traffic police personnel may experience occupational demands that place sustained mechanical loads on the feet and lower limbs. These demands can be influenced by the duration of standing, walking patterns, footwear characteristics, work surfaces, opportunities for rest, and individual anthropometric characteristics. Prolonged standing has been associated with discomfort, fatigue, and musculoskeletal health concerns in occupational settings. Waters and Dick (2015) reviewed evidence on the health risks of prolonged standing and discussed interventions such as suitable footwear, shoe inserts, floor mats, and opportunities to alternate standing with other positions.

Footwear is another relevant consideration because workers may wear the same occupational shoes for extended duty periods. Shoe fit, cushioning, sole stiffness, and insole characteristics may affect perceived comfort and plantar loading. A systematic review published in Safety and Health at Work in 2026 examined footwear characteristics among workers in prolonged-standing occupations and highlighted the importance of balancing cushioning, support, and stability.

In addition to footwear and standing duration, age and BMI may be relevant variables in studies of foot health. However, these characteristics should be evaluated empirically rather than treated as established causes of abnormal posture or pain.

The present review brings together these areas of research and discusses their relevance to occupational foot health among traffic police personnel, particularly those working in Bareilly, Uttar Pradesh.

II. OBJECTIVES OF THE REVIEW

The objectives of this review are:

1. To examine the relationship between prolonged standing and occupational foot-related discomfort.
2. To describe standardized approaches to quantitative foot posture assessment.
3. To review the role of BMI and age in studies of foot posture and foot-related symptoms.
4. To examine the relevance of occupational footwear comfort, fit, cushioning, and insole design.
5. To discuss the relationship between foot pain and functional disability.
6. To identify research gaps and recommend directions for future occupational foot health research among traffic police personnel in Bareilly.

III. REVIEW METHODOLOGY

3.1 Review design

A narrative literature review approach was adopted to integrate research relating to foot posture, occupational standing, footwear, and musculoskeletal health. The purpose is to summarize relevant concepts, identify recurring themes, and establish a foundation for future research.

This paper is a narrative review, not a newly conducted systematic review or meta-analysis.

3.2 Literature sources

Relevant literature can be identified through databases and scholarly platforms such as PubMed, PubMed Central, Scopus, Web of Science, and Google Scholar. Priority should be given to peer-reviewed articles, clinical assessment studies, occupational health reviews, and research involving prolonged-standing workers.

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3.3 Search concepts

The principal search concepts for this review include:

- Traffic police and occupational health.
- Foot posture and Foot Posture Index.
- Prolonged standing and musculoskeletal discomfort.
- Occupational footwear and foot comfort.
- BMI, age, and foot biomechanics.
- Foot pain and functional disability.
- Occupational ergonomic interventions.

3.4 Literature selection and synthesis

Literature was organized around four principal themes: foot posture assessment, prolonged standing, occupational footwear, and foot-related pain and disability. Research findings were interpreted in relation to their relevance to traffic police personnel.

Because this is a narrative review, no exhaustive database search, formal study-selection process, risk-of-bias assessment, or pooled statistical analysis is claimed. A journal requiring a systematic or scoping review would require a separate, documented review protocol.

IV. FOOT ANATOMY, BIOMECHANICS, AND POSTURE

4.1 Structure and function of the foot

The foot provides a foundation for standing and locomotion. Its structure supports body weight while allowing the distribution and transfer of forces during movement. The medial longitudinal arch, lateral longitudinal arch, and transverse arch contribute to foot structure and function.

The relationship between foot structure and function is influenced by multiple factors, including joint mobility, muscle activity, ligament characteristics, body mass, and the demands of the task being performed. Static standing posture is one component of foot biomechanics, but it does not fully describe how the foot behaves during walking or prolonged occupational activity.

4.2 Foot posture classification

Foot posture is commonly described along a continuum from supinated to neutral to pronated. These terms describe aspects of foot alignment and should not automatically be interpreted as diagnoses of disease.

A pronated posture is not necessarily associated with pain, and a supinated posture does not necessarily indicate functional impairment. Clinical interpretation should consider symptoms, movement, history, and functional performance.

4.3 Quantitative assessment using the Foot Posture Index

Redmond, Crosbie, and Ouvrier (2006) developed and validated the Foot Posture Index as a structured clinical method for scoring standing foot posture. The FPI-6 uses six observational criteria, each scored from −2 to +2, producing a total score between −12 and +12. Lower scores indicate a more supinated posture, while higher scores indicate a more pronated posture. Scores around zero generally indicate neutral posture.

The FPI-6 may be useful in occupational studies because it provides a standardized approach to describing standing foot posture. Both feet should be assessed separately, and the assessor should be trained in the scoring procedure.

However, the FPI-6 does not directly measure plantar pressure, dynamic gait mechanics, or pain. Consequently, researchers investigating occupational foot health should consider combining posture assessment with symptom questionnaires and other measures appropriate to their research objectives.

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V. PROLONGED STANDING AND OCCUPATIONAL FOOT HEALTH

5.1 Occupational demands of traffic police personnel

Traffic police personnel may be required to maintain standing positions at intersections, monitor traffic movements, and move between duty locations. Their work patterns may include alternating periods of standing and walking, although the extent of these activities depends on duty assignment and workplace conditions.

Prolonged standing should not be treated as a uniform exposure. The effect of standing may differ according to whether workers can move freely, change posture, sit during breaks, or alternate between different tasks.

5.2 Musculoskeletal effects of prolonged standing

Waters and Dick (2015) reviewed the evidence on prolonged standing and occupational health. Their review identified associations with outcomes such as discomfort, fatigue, and lower-back and leg pain, while also discussing workplace interventions intended to reduce standing-related risks.

These findings provide a rationale for studying foot-related symptoms in traffic police personnel. Nevertheless, evidence about general musculoskeletal discomfort should not be interpreted as proof that prolonged standing changes static foot posture in every worker.

5.3 Standing duration and foot discomfort

The number of hours spent standing may be relevant to foot discomfort, particularly when opportunities for recovery are limited. However, total standing duration alone may not adequately represent occupational exposure.

Researchers should distinguish between continuous standing, intermittent standing, walking, and total duty hours. Information about rest breaks, work surfaces, footwear, and task rotation may improve interpretation of the relationship between occupational demands and symptoms.

5.4 Standing duration and foot posture

The association between standing duration and static foot posture requires direct empirical investigation. Fatigue or discomfort during a duty period does not necessarily indicate a permanent structural change in the foot.

Studies examining this relationship should record the timing and conditions of the posture assessment, including whether measurements are obtained before or after duty. Repeated measurements may help determine whether observed differences are temporary or persist across assessment periods.

VI. BMI, AGE, AND FOOT-RELATED OUTCOMES

6.1 Body mass index and foot health

BMI is calculated by dividing body weight in kilograms by the square of height in metres. It is frequently used in population studies to describe body mass relative to height.

Body mass is relevant to weight-bearing biomechanics because the feet support body weight during standing and movement. However, BMI does not directly measure body composition, foot structure, or plantar pressure. It should therefore be interpreted as one of several potentially relevant characteristics rather than a direct measure of foot loading.

6.2 BMI and foot posture

Researchers have investigated the relationships between anthropometric characteristics and foot posture, but associations may vary according to population characteristics, measurement methods, and study design.

A study of traffic police personnel should determine whether BMI is associated with FPI-6 scores rather than assuming that higher BMI necessarily produces pronated posture. Other variables, such as physical activity, previous injury, footwear, and occupational experience, may also contribute to differences between individuals.

6.3 Age and foot posture

Age may be associated with changes in joint mobility, muscle function, soft tissues, and the structure of the foot. Nevertheless, age-related changes vary between individuals and may be influenced by physical activity, health status, and occupational history.

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Cross-sectional research can identify statistical associations between age and foot posture but cannot establish that age caused the observed differences.

6.4 Age, BMI, and foot pain

Foot pain is a multifactorial outcome. Its occurrence and severity may be associated with several personal and occupational factors, and the influence of any single factor may be modest or inconsistent.

Research should distinguish between the presence of pain, pain severity, static foot posture, and functional disability. These outcomes should not be used interchangeably.

VII. OCCUPATIONAL FOOTWEAR AND FOOT COMFORT

7.1 Importance of footwear

Occupational footwear provides a contact surface between the foot and the ground. Its characteristics may influence perceived comfort, stability, and the distribution of forces beneath the foot.

Traffic police personnel may require footwear that accommodates prolonged standing, intermittent walking, and rapid changes in movement. Footwear suitability should therefore be evaluated in relation to both comfort and occupational function.

7.2 Shoe fit and comfort

Shoe fit may be influenced by length, width, toe-box space, heel fit, and the relationship between the shoe and the individual's foot shape. Poor fit may contribute to pressure or discomfort, although individual responses vary.

A structured questionnaire can help identify common concerns, including tightness, friction, inadequate toe space, perceived lack of support, and discomfort after prolonged use. Such questionnaires should be appropriately developed and tested before formal research use.

7.3 Cushioning and sole characteristics

Kang and colleagues' systematic review, published in 2026, examined footwear and foot comfort in prolonged-standing occupations. The review reported that footwear characteristics may involve trade-offs between cushioning, stability, and support. It also highlighted the potential influence of insole design on comfort and pressure distribution.

These findings suggest that footwear selection should not rely solely on whether a sole is soft or hard. The suitability of footwear may depend on the work activity, individual foot characteristics, fit, and comfort during actual occupational use.

7.4 Insoles and orthotic interventions

Insoles may modify the interface between the plantar surface and footwear. Their effects can depend on material properties, shape, stiffness, and individual characteristics.

Although some footwear and insole interventions have shown potential to improve comfort or alter pressure distribution, findings should not be generalized to every worker. Any recommendation for custom orthoses or specific insole designs should be based on suitable assessment and evidence relevant to the intended outcome.

7.5 Footwear in traffic police settings

Research focused specifically on traffic police footwear in Bareilly could examine the footwear commonly used during duty, replacement frequency, perceived comfort, fit, and symptoms reported after prolonged standing.

Such an investigation could establish whether footwear-related complaints are common and whether they are associated with other occupational factors. An observational study could identify associations, while a controlled intervention study would be needed to evaluate whether changing footwear improves outcomes.

VIII. FOOT PAIN AND FUNCTIONAL DISABILITY

8.1 Foot pain as an occupational outcome

Foot pain may be reported in different anatomical regions, including the heel, arch, forefoot, toes, or ankle region. Its severity may vary throughout the working day.

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A comprehensive assessment should specify the anatomical location, duration, severity, and timing of pain. It should also distinguish between pain during duty and symptoms persisting after duty.

8.2 Functional disability

Functional disability refers to difficulty performing activities because of symptoms or physical limitations. Foot-related limitations may involve prolonged standing, walking, climbing stairs, or completing other weight-bearing tasks.

The Foot Function Index is one established instrument used to assess foot-related pain, disability, and activity limitation. Researchers should select a validated version and follow its scoring instructions. Questionnaire scores describe reported symptoms and limitations; they do not independently establish a medical diagnosis.

8.3 Relationship between pain and foot posture

The relationship between foot posture and pain is complex. A posture classification alone cannot determine whether a person will experience symptoms. Similarly, pain may arise from multiple factors that are not captured by a static posture assessment.

Studies of traffic police personnel should therefore assess posture and pain as separate outcomes. Where appropriate, researchers may investigate whether foot posture is associated with symptoms after accounting for relevant confounding variables.

8.4 Relationship between pain and occupational performance

Persistent foot discomfort may make prolonged standing and walking more difficult. However, the effect on actual occupational performance should be measured rather than assumed.

Future studies could include functional questionnaires, symptom diaries, or validated measures of work ability to determine whether foot-related symptoms are associated with meaningful occupational limitations.

IX. OCCUPATIONAL ERGONOMICS AND PREVENTIVE STRATEGIES

9.1 Opportunities to change posture

Where operationally feasible, opportunities to alternate between standing, walking, and seated rest may help reduce continuous exposure to static standing. The suitability of these arrangements depends on public safety requirements and duty responsibilities.

9.2 Footwear assessment

Footwear assessment may include shoe fit, comfort, stability, cushioning, and the presence of pressure points. Occupational footwear should satisfy workplace requirements while accommodating individual fit and comfort needs.

9.3 Work surfaces and duty organization

Work surfaces, the ability to move between positions, and the availability of rest breaks may influence occupational comfort. These factors can be included in future research to better characterize standing exposure.

9.4 Health education and clinical assessment

Personnel should be encouraged to report persistent foot pain, swelling, or functional difficulties and seek appropriate clinical assessment when needed. Preventive education can address footwear fit, recognition of symptoms, and the importance of reporting persistent problems.

9.5 Need for intervention research

Although the occupational health literature supports consideration of footwear and standing-related interventions, the effectiveness of any specific measure for traffic police personnel in Bareilly remains to be established. Controlled or longitudinal studies would be useful for evaluating changes in footwear, rest-break arrangements, or other workplace interventions.

X. RESEARCH GAPS

The reviewed literature identifies several areas requiring further investigation.

First, occupation-specific evidence: Findings from retail, industrial, healthcare and other standing occupations may not fully represent the demands of traffic police work.

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Second, local evidence: Research specifically addressing foot posture, footwear comfort, and foot-related symptoms among traffic police personnel in Bareilly is needed to establish local patterns.

Third, combined assessment: Foot posture, pain, functional disability, and footwear comfort are often conceptually distinct. Studies measuring these outcomes together may provide a more complete picture of occupational foot health.

Fourth, measurement of exposure: Self-reported standing duration may not adequately capture continuous standing, movement, and rest patterns. More detailed exposure measurement could improve future studies.

Fifth, confounding variables: Age, BMI, occupational service, footwear, previous injury, physical activity, and duty assignment may influence observed associations. Appropriate adjustment is important when examining relationships between occupational exposure and foot health.

Sixth, intervention effectiveness: Further research is needed to determine whether specific footwear changes, insoles, or work-rest arrangements improve foot comfort and function among traffic police personnel.

XII. PROPOSED FRAMEWORK FOR FUTURE RESEARCH IN BAREILLY

A future observational study could recruit 150 traffic police personnel from selected duty locations in Bareilly, subject to sample-size justification and recruitment feasibility.

The following variables could be evaluated:

Domain	Suggested assessment
Demographic factors	Age and relevant personal characteristics
Anthropometry	Height, weight, and BMI
Occupational exposure	Standing duration, duty hours, walking, and rest breaks
Foot posture	Bilateral FPI-6 assessment
Foot pain	Numerical Pain Rating Scale
Functional disability	Validated Foot Function Index
Footwear	Type, fit, comfort, and replacement frequency
Relevant history	Previous foot or lower-limb injury and symptoms

The proposed study could use descriptive statistics to summarize foot posture and symptom distributions, correlation analysis to investigate associations, and multivariable regression to examine relationships after adjustment for relevant confounders.

Both feet should be assessed separately, and any analysis involving bilateral measurements should account for the fact that two feet from the same participant are not statistically independent. The study should obtain appropriate ethical approval and informed consent before recruitment.

A sample size of 150 is a proposed study target, not a result of the present review. Its adequacy should be assessed against the primary outcome and intended statistical analysis.

XII. STRENGTHS AND LIMITATIONS OF THE REVIEW

Strengths

This review brings together several related dimensions of occupational foot health rather than focusing exclusively on foot posture. It distinguishes static posture from pain, functional disability, and perceived footwear comfort. It also identifies practical directions for future research among traffic police personnel.

Limitations

This is a narrative review and does not claim to have conducted an exhaustive systematic search. The studies discussed may differ in population, exposure definitions, assessment methods, and outcome measures. Evidence from other occupations may not be directly generalizable to traffic police personnel.

Furthermore, the review does not provide original participant data or establish causal relationships between standing duration, BMI, footwear, and foot-related outcomes. Additional occupation-specific research is necessary to determine how these factors relate to foot health in Bareilly.

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XIII. CONCLUSION

Occupational foot health is an important consideration for traffic police personnel whose duties may involve prolonged standing, repetitive walking, and sustained weight-bearing. The literature reviewed in this paper indicates that prolonged standing is associated with occupational discomfort and that footwear characteristics may influence comfort and mechanical loading.

Standardized assessment tools, such as the FPI-6, can support quantitative evaluation of foot posture. However, foot posture, pain, and functional disability are distinct outcomes and should be assessed independently. Age, BMI, standing duration, footwear, and occupational history should be examined as potential correlates rather than assumed causes of foot-related problems.

Future research among traffic police personnel in Bareilly should integrate standardized foot posture assessment, validated symptom measures, anthropometric data, and detailed occupational exposure information. Such research may help establish locally relevant evidence and inform the evaluation of appropriate occupational health and ergonomic strategies.

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