Foot and Ankle Morbidity among Traffic Police: Impact of Prolonged Standing Exposure – A Cross-Sectional Study in Silvassa

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ABSTRACT

Background:

Prolonged standing is a routine occupational demand for traffic police, placing them at high risk for foot and ankle musculoskeletal disorders due to cumulative mechanical stress and altered plantar pressure distribution. Despite the resulting pain and functional decline, this issue remains underexplored in the Indian healthcare context. Early identification of these impairments is critical to preserving occupational capacity and preventing chronic long-term disability.

Objective:

To evaluate the prevalence of foot and ankle morbidity and its functional impact (FAOS) among traffic police exposed to prolonged standing.

Methods:

A cross-sectional observational study was conducted among 60 traffic police personnel aged 20–55 years. Participants with a minimum of six months of field duty and standing durations of at least 4–5 hours per day were included. Data were collected using the FAOS questionnaire, and statistical analysis was performed using IBM SPSS Version 26. Subscale scores for Pain, Symptoms, Activities of Daily Living (ADL), Sports and Recreation, and Quality of Life (QOL) were calculated and reported as mean ± standard deviation.

Results:

The mean age of participants was 38.7 ± 9.4 years; 53% were male. The lowest subscale score was observed in Sports and Recreation (69.5 ± 11.4), indicating functional limitations in high-intensity activities. The highest score was in ADL (83.9 ± 8.5), suggesting minimal limitations in routine daily tasks. Pain (76.3 ± 9.2), Symptoms (74.1 ± 10.6), and QOL (71.8 ± 10.2) scores reflected a moderate burden of musculoskeletal symptoms.

Conclusion:

Prolonged occupational standing is associated with moderate impairments in foot and ankle function among traffic police, particularly affecting recreational and physically demanding tasks. These findings underscore the need for ergonomic interventions, periodic screening, and occupational health strategies to mitigate long-term disability and improve functional outcomes.

Keywords: Traffic police, FAOS, Musculoskeletal Disorder, Work- Related Injury

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INTRODUCTION

Prolonged standing is a common occupational demand across various industries and service sectors. While essential for job performance in many roles, extended periods of standing have been associated with a range of adverse health outcomes. Extended periods of static posture have been consistently associated with adverse health outcomes, including musculoskeletal disorders (MSDs), lower limb fatigue, and functional impairments of the foot and ankle. Evidence suggests that prolonged standing increases ankle venous pressure and soleus muscle blood flow, potentially resulting in discomfort and vascular stress in the lower extremities [1,2].

According to the World Health Organization (WHO), Work-Related Musculoskeletal Disorders (WMSDs) represent a significant global health burden, particularly affecting workers engaged in repetitive or static physical activities [3]. Occupations that involve prolonged standing—such as those in manufacturing, healthcare, education, and public safety—are particularly vulnerable. Among these, traffic police personnel face heightened risk due to the demanding nature of their duties, which include managing intersections, enforcing regulations, resolving roadside incidents, and ensuring smooth traffic flow during peak hours and public events. [2,3]

These tasks necessitate standing for extended durations in unpredictable environmental conditions, often without sufficient rest intervals. This occupational profile places traffic police at heightened risk for musculoskeletal strain and lower limb disorders. [3,4] The anatomical complexity of the ankle joint—formed by the tibia, fibula, and talus bones—renders it particularly susceptible to biomechanical stress during prolonged static loading. The joint's stability is maintained by ligaments such as the deltoid and lateral collateral ligaments, which, although robust, can become compromised under chronic overuse [5].

Several biomechanical studies have identified excessive muscular co-activation during static postural control as a contributing factor to LBP, thereby linking prolonged standing directly with spinal discomfort and postural fatigue. [1] Additionally, prolonged standing has been associated with cardiovascular outcomes such as chronic venous insufficiency (CVI), further highlighting the systemic implications of such occupational exposure. [6] While some objective physiological assessments (e.g., electromyography, postural sway analysis) may fail to detect early signs of fatigue within short observation windows, subjective complaints—such as localized discomfort, fatigue, and restricted mobility—serve as early indicators of strain. These symptoms, if unaddressed, may lead to chronic dysfunction and reduced occupational capacity [1].

Despite global literature documenting the risks of prolonged standing, there is limited research specific to Indian traffic police—a workforce that spends 5 to 6 hours per day on their feet, often on hard surfaces and in inadequate footwear. Given their crucial role in urban safety and the physically intensive nature of their work, a focused evaluation of their musculoskeletal health—especially related to the foot and ankle—is essential. [7] Therefore, the present study aims to evaluate the impact of prolonged standing on the musculoskeletal system, with a specific focus on symptoms and functional impairments in the foot and ankle joints among traffic police in Silvassa City. By identifying the prevalence and incidence of such conditions using a standardized tool (FAOS), this research intends to generate actionable data that can inform preventive occupational health strategies and ergonomic interventions for this high-risk group.

METHODOLOGY

Study Design:

A cross-sectional observational study was conducted to evaluate the prevalence and incidence of foot and ankle problems among traffic police personnel subjected to prolonged standing.

Study Setting:

The study was carried out across various traffic checkpoints within Silvassa City, located in the Union Territory of Dadra and Nagar Haveli.

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Study Duration:

The study was conducted over a period of six months, from July 2024 to December 2024. This time frame allowed for comprehensive recruitment, data collection, and quality assurance processes.

Study Population:

The study population consisted of active-duty traffic police officers employed by the transport and traffic control department of Silvassa City. All participants were engaged in fieldwork duties involving extended standing as part of their routine occupational role.

Inclusion and Exclusion Criteria

Inclusion Criteria:

- Age between 20 and 55 years
- Currently posted in a standing-based traffic duty role
- Minimum 6 months of continuous work experience in traffic policing
- Daily standing duration of at least 4 to 5 hours
- Ability to understand and complete the questionnaire in English or Hindi
- Willingness to provide written informed consent

Exclusion Criteria:

- Assigned primarily to desk, control room, or vehicle-based tasks
- History of recent lower limb fracture, surgery, or acute trauma in the last 2 months
- Diagnosed with neurological, rheumatological, or vascular disorders affecting the lower limbs
- Age above 55 years
- Current or recent (<1 month) use of assistive walking devices

Sample Size Estimation:

The sample size was estimated using G*Power software, based on findings from previous studies that reported a moderate correlation (r = 0.30) between occupational fatigue and measures of physical performance. Setting the significance level (alpha) at 0.05 and statistical power at 0.80, the minimum required sample size was calculated to be 85 participants. To account for potential attrition or incomplete data, a 10% buffer was added, resulting in a final sample size of 70 participants.

Sampling Technique: Non-probability convenience sampling technique.

Tool and Outcome Measure

Foot and ankle-related impairments were assessed using the Foot and Ankle Outcome Score (FAOS), a validated, patient-reported instrument consisting of 42 items grouped into five subscales:

1. Pain
2. Other Symptoms

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3. Function in Activities of Daily Living (ADL)
4. Function in Sports and Recreation
5. Foot and Ankle–Related Quality of Life (QOL)

Participants responded using a Likert scale reflecting symptom severity and functional limitations over the past week.

Data Collection Procedure:

Prior to data collection, ethical clearance was obtained from the Institutional Ethics Committee. Approval was also secured from the regional traffic department for on-site data collection.

Data were gathered through field visits at multiple traffic duty points. Each eligible officer was briefed on the study purpose in their preferred language (Hindi or Gujarati) and provided with a consent form, demographic data form, and the FAOS questionnaire. Assistance was provided for those needing help understanding or filling out the form. Each session took approximately 15 to 20 minutes to complete.

Completed forms were checked for completeness and coded to maintain anonymity. No identifiable personal data were recorded in the final dataset.

Scoring and Outcome Interpretation:

Subscale scores were calculated as per the official FAOS scoring manual. Each subscale score ranged from 0 to 100, with higher scores indicating better function or fewer symptoms.

- A score of 100 indicates no problem
- A score of 0 indicates severe impairment

Data Analysis:

- Scoring was done based on the official FAOS manual.
- Each subscale was scored individually.
- The mean score for each subscale was calculated.
- Descriptive statistics and frequency analysis were performed using Microsoft Excel.
- Results were interpreted based on the FAOS scoring system, where:
  - A score of 100 indicates no symptoms, and
  - A score of 0 indicates extreme problems.

Ethical Approval: Ethical approval was obtained from the Institutional Ethics Committee

Statistical Analysis:

Data were analyzed using IBM SPSS Statistics Version 26. Descriptive statistics were used to summarize demographic characteristics, including age, gender distribution, and standing duration. Continuous variables were expressed as mean ± standard deviation (SD), and categorical variables were presented as frequencies and percentages.

Each subscale of the Foot and Ankle Outcome Score (FAOS)—Pain, Symptoms, Activities of Daily Living (ADL), Sports and Recreation, and Quality of Life (QOL)—was scored individually based on the FAOS scoring manual. Scores range from 0 to 100, with higher scores indicating better function and fewer symptoms.

Subscale scores were analyzed using descriptive statistics. The mean and standard deviation for each domain were computed. Additionally, frequency analysis was conducted to determine the proportion of participants falling into specific symptom severity categories.

RESULTS

Participant Characteristics

A total of 60 traffic police personnel were enrolled in the study. The age distribution ranged from 20 to 55 years, with the majority between 37–45 years (33%), followed by 21–29 years (32%), 29–37 years (18%), and 45–55 years (17%). The sample included 93% males and 7% females, consistent with occupational demographics in traffic enforcement roles.

Participants reported working an average of 9.1 hours per day on duty, mostly in standing positions with limited opportunities for rest. Detailed demographic distribution is shown in Table 1.

Table 1: Demographic Distribution of Participants (N = 60)

Variable	**Category**	**n (%)**
Age Group (years)	21–29	19 (32%)
	29–37	11 (18%)
	37–45	20 (33%)
	45–55	10 (17%)
Gender	Male	56 (93%)
	Female	4 (7%)
Average Duty Hours/Day	-	9.1 ± 1.4

FAOS Subscale Analysis:

Analysis using the Foot and Ankle Outcome Score (FAOS) revealed that sports and recreational activities were most impacted (mean = 69.5 ± 11.4), indicating significant limitations in higher-level physical tasks such as squatting, running, or jumping. In contrast, activities of daily living (ADL) scored highest (mean = 83.9 ± 8.5), suggesting relative preservation of basic mobility tasks like walking and stair use.

Pain and quality of life (QoL) subscales also showed mild-to-moderate symptoms, with mean scores of 77.3 ± 9.1 and 74.6 ± 10.7, respectively. The symptom subscale scored 75.8 ± 8.9, reflecting periodic joint stiffness and swelling.

Table 2: FAOS Subscale Scores Among Traffic Police (N = 60)

FAOS Subscale	**Mean ± SD**	**Interpretation**
Pain	77.3 ± 9.1	Moderate pain symptoms

Symptoms	75.8 ± 8.9	Joint stiffness, mild swelling
Activities of Daily Living	83.9 ± 8.5	Basic mobility well-maintained
Sports & Recreation	69.5 ± 11.4	Significant limitation in strenuous tasks
Quality of Life	74.6 ± 10.7	Perceived functional and social impact

DISCUSSION

This study highlights the significant adverse effects of prolonged standing on musculoskeletal health and functional outcomes among workers with standing-intensive jobs. The findings are consistent with previous research indicating that continuous standing contributes to the development of lower limb discomfort, physical fatigue, and chronic conditions such as venous insufficiency and flat feet [1,2,4,6].

Musculoskeletal disorders, particularly in the lower extremities and lower back, were frequently reported among workers exposed to long durations of static standing. Similar trends were reported in traffic police populations across Asia, who exhibit a high prevalence of work-related musculoskeletal disorders due to occupational postural demands [3]. In a cross-sectional study, prolonged standing was also found to be significantly associated with the development of flat foot deformity, especially in occupations where adequate footwear and rest periods were lacking [4].

Physiological changes such as venous pooling, joint stiffness, and muscle fatigue due to prolonged standing have been documented extensively. Krijnen et al. [6] emphasized the epidemiological burden of venous insufficiency among male standing workers, underscoring the need for occupational health interventions. Halim and Omar [7] further proposed a quantitative index to assess prolonged standing strain, offering a practical framework for workplace risk assessment.

Age-related decline in postural control is another factor that exacerbates discomfort during prolonged standing. Freitas et al. [8] and Wall et al. [9] demonstrated that older workers exhibited reduced balance and increased physiological strain during prolonged standing compared to younger counterparts. These changes have implications for injury risk and productivity over time.

The use of validated tools such as the Foot and Ankle Outcome Score (FAOS) has enabled more precise measurement of structural and functional impairments due to lower limb strain [10,12,13]. The current study also utilized the Hindi version of the FAOS (11), which demonstrated cultural and linguistic appropriateness for local populations.

Overall, these findings emphasize the need for ergonomic interventions, including the use of anti-fatigue mats, frequent breaks, proper footwear, and occupational health education to mitigate the harmful effects of standing-intensive work. The structural validity of outcome measures like FAOS strengthens the clinical assessment and monitoring of such occupational health issues [12,13].

CONCLUSION

This cross-sectional study provides compelling evidence that prolonged occupational standing, particularly among traffic police personnel, is significantly associated with musculoskeletal stress and functional impairments in the foot and ankle. Utilizing the Foot and Ankle Outcome Score (FAOS), including its validated Hindi version, the study objectively captured the extent of dysfunction. Participants demonstrated a moderate-to-high symptom burden in pain and quality of life domains, while basic daily functions remained relatively preserved. However, marked limitations were evident in higher-level physical activities, such as squatting and running, as indicated by lower scores in the Sports and Recreation subscale (69.5 ± 11.4) compared to Activities of Daily Living (83.9 ± 8.5). These findings highlight the cumulative musculoskeletal load imposed by prolonged standing and suggest an elevated risk for long-term disability if unaddressed. The results underscore the necessity of workplace health strategies that include routine foot and ankle screening, scheduled rest intervals, use of

ergonomic footwear, and integration of physical wellness initiatives. For sustainable occupational health, particularly in standing-intensive professions, proactive ergonomic reforms and preventive care must be prioritized. Further research using larger sample sizes and objective clinical assessments is warranted to validate these findings and guide the development of targeted intervention protocols.

Conflict of Interest: The authors declare that there is no conflict of interest.

Limitations of the Study:

Despite providing valuable insights, this study has several limitations. First, the cross-sectional design limits the ability to establish causal relationships between prolonged standing and the reported musculoskeletal outcomes. Second, data were primarily based on self-reported measures, which may introduce recall bias or subjective interpretation. The sample size, though adequate for initial analysis, may not fully represent the broader occupational population across different regions or job sectors. Additionally, environmental and ergonomic variables—such as surface type, footwear quality, and exact duration of standing—were not uniformly controlled, which may have influenced the outcomes. Lastly, while the FAOS is a validated tool, the functional implications of reported symptoms could have been more comprehensively assessed with complementary objective measures such as gait analysis or strength testing.

RECOMMENDATIONS

To address the adverse effects of prolonged occupational standing observed among traffic personnel, it is recommended that ergonomic strategies be implemented, including the provision of medically approved, shock-absorbing footwear and the use of anti-fatigue floor mats at static duty locations. Rotational job assignments and the incorporation of scheduled micro-breaks during long shifts can help redistribute postural load and reduce musculoskeletal strain. Integrating routine physiotherapy assessments and structured lower limb conditioning programs—focusing on mobility, strength, and proprioception—can aid in early detection and management of functional impairments. Occupational health awareness sessions should be conducted to educate personnel on recognizing early symptoms of foot and ankle dysfunction. At the administrative level, health surveillance and policy interventions should be established to support long-term musculoskeletal health. Additionally, future research with larger, diverse cohorts and objective functional assessments (e.g., gait analysis, plantar pressure mapping) is warranted to strengthen evidence-based interventions and optimize occupational health outcomes.

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