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Assessment of Foot Pain and Functional Disability among Traffic Police Personnel in Bareilly: Association with Prolonged Standing, Body Mass Index, and Occupational Factors

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Abstract: *Background: Traffic police personnel are frequently exposed to prolonged standing, repetitive walking, hardworking surfaces, and occupational footwear demands. These factors may contribute to foot discomfort and functional limitations, potentially affecting work performance and quality of life.*

Aim: To assess foot pain and functional disability among traffic police personnel in Bareilly and examine their association with daily standing duration, body mass index (BMI), age, and occupational characteristics.

Methodology: A quantitative, cross-sectional analytical study is proposed among traffic police personnel working at selected locations in Bareilly, Uttar Pradesh. Data will be collected using a structured demographic and occupational questionnaire, a numerical pain rating scale, and a validated foot-specific functional assessment instrument such as the Foot Function Index (FFI). Height and weight will be measured to calculate BMI. Descriptive statistics, correlation analysis, and multivariable regression will be used to assess the relationships between occupational variables, foot pain, and functional disability.

Expected contribution: The study will provide an evidence-based framework for evaluating occupational foot health and identifying potentially modifiable risk factors. The findings may support preventive education, appropriate footwear selection, and workplace ergonomic measures.

Keywords: Traffic police, foot pain, functional disability, prolonged standing, BMI, occupational health, Bareilly, musculoskeletal disorders.

I. INTRODUCTION

The feet play an essential role in maintaining balance, supporting body weight, and facilitating movement during daily activities. Foot pain and functional disability can interfere with standing, walking, stair climbing, and other weight-bearing tasks. In occupational settings that require prolonged standing, foot health is particularly important because discomfort may affect both physical functioning and work performance.

Traffic police personnel work in demanding environments that may involve long duty hours, continuous monitoring of traffic, repetitive walking, exposure to uneven surfaces, and limited opportunities for rest. These occupational requirements may contribute to fatigue and musculoskeletal discomfort in the feet and lower limbs.

Research involving traffic police personnel has identified musculoskeletal health as an important occupational concern. A study of traffic policemen in Navi Mumbai investigated foot posture and the relationship between BMI and standing-

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related occupational demands. Other research involving traffic police personnel in India has examined broader occupational health problems, including musculoskeletal discomfort.

However, foot posture, foot pain, and functional disability are different clinical outcomes. An individual may demonstrate a particular foot posture without experiencing pain, while another person may experience substantial discomfort despite having a relatively neutral foot posture. Therefore, evaluating pain and function alongside occupational exposure can provide a broader understanding of foot health.

The present study proposes an assessment of foot pain and functional disability among traffic police personnel in Bareilly, with particular attention to age, BMI, daily standing duration, and selected occupational characteristics.

II. NEED FOR THE STUDY

Traffic police personnel perform essential public safety duties under physically demanding conditions. Persistent foot discomfort may affect their ability to stand comfortably, walk efficiently, and complete prolonged duty assignments.

An occupational assessment of foot pain and functional disability may help identify the frequency and severity of symptoms in this population. Examining associations with standing duration, BMI, age, footwear, and occupational service may also help identify groups who could benefit from further clinical assessment or preventive measures.

The proposed study is relevant to physiotherapy, occupational health, ergonomics, and workplace health promotion. Its findings may provide locally relevant evidence for developing appropriate screening and educational initiatives for traffic police personnel in Bareilly.

III. AIM OF THE STUDY

To assess foot pain and functional disability among traffic police personnel in Bareilly and examine their association with age, BMI, prolonged standing, and occupational factors.

IV. OBJECTIVES

1. To assess the severity and distribution of foot pain among traffic police personnel in Bareilly.
2. To evaluate foot-related functional disability among the study participants.
3. To examine the relationship between daily standing duration and foot pain.
4. To investigate the association between BMI and foot pain and functional disability.
5. To determine whether age and years of occupational service are associated with foot-related symptoms and disability.
6. To examine the relationship between foot pain severity and functional disability.
7. To explore the association of footwear characteristics and opportunities for rest with foot-related outcomes.

V. RESEARCH QUESTIONS

1. What proportion of traffic police personnel report foot pain?
2. What is the level of foot-related functional disability among the participants?
3. Is daily standing duration associated with the severity of foot pain?
4. Are BMI and age associated with foot pain or functional disability?
5. Is greater foot pain associated with greater functional limitation?
6. Are footwear characteristics and opportunities for rest associated with foot-related outcomes?

VI. RESEARCH HYPOTHESES

H_{01}: There is no statistically significant association between daily standing duration and foot pain severity.
H_{02}: There is no statistically significant association between BMI and foot pain severity.
H_{03}: There is no statistically significant association between age and foot-related functional disability.
H_{04}: There is no statistically significant relationship between foot pain severity and functional disability.

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H_{05}: There is no statistically significant association between selected occupational characteristics and foot-related outcomes after adjustment for relevant confounding variables.

VII. REVIEW OF LITERATURE

7.1 Occupational health among traffic police

Traffic police personnel experience occupational demands that can include prolonged standing, repetitive movements, environmental exposure, and irregular work schedules. These conditions may contribute to musculoskeletal symptoms and physical fatigue. Research on traffic police personnel in Gujarat has also documented a range of occupational health concerns, supporting the importance of workplace health assessment.

7.2 Foot posture and occupational loading

Doctor and Phadke (2017) investigated foot posture among 200 traffic policemen in Navi Mumbai using the navicular drop test. Their study examined the medial longitudinal arch and its relationship with BMI and prolonged standing duties. The findings provide a relevant foundation for further investigations of foot health in traffic police populations.

However, the assessment of foot posture alone does not establish whether a participant experiences pain or disability. Clinical symptom assessment should therefore be incorporated into studies focused on occupational functioning.

7.3 Prolonged standing and foot pain

Prolonged standing has been investigated as an occupational exposure associated with musculoskeletal discomfort. Sustained weight-bearing may contribute to fatigue and discomfort, although the magnitude of symptoms can differ according to work conditions, footwear, individual characteristics, and opportunities for recovery.

A study of foot pain among traffic police personnel should distinguish between the duration of standing and the duration or severity of symptoms. It should also consider whether participants can alternate between standing, walking, and sitting during their duties.

7.4 BMI and foot-related disability

BMI is a commonly used indicator of body mass relative to height. Body mass can influence the mechanical demands placed on the lower limbs during weight-bearing activities. Nevertheless, BMI alone cannot determine the cause of foot pain, and associations should be evaluated using measured data.

7.5 Foot pain and functional assessment

The Foot Function Index is a foot-specific questionnaire designed to evaluate foot-related pain, disability, and activity limitation. A validated version appropriate for the study population can help quantify participants' experiences systematically.

Pain intensity may also be measured using a numerical rating scale from 0 to 10. Combining pain intensity with a functional questionnaire allows investigators to assess both symptom severity and its practical consequences.

7.6 Research gap

The proposed study focuses on the relationship between occupational exposures, foot pain, and functional disability among traffic police personnel in Bareilly. By evaluating symptoms and function together, it complements studies focused primarily on static foot posture.

A final manuscript should include a comprehensive review of recent Indian and international studies and clearly distinguish the present research questions from those addressed by earlier traffic police foot posture studies.

VIII. RESEARCH METHODOLOGY

Sample Size

The study will include a total of **100 traffic police personnel** working at selected traffic management locations in Bareilly, Uttar Pradesh. Participants will be recruited using a suitable sampling technique, depending on accessibility, duty schedules, and eligibility criteria.

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Sampling Technique

A convenient sampling technique may be used to recruit 100 eligible traffic police personnel who provide informed consent and meet the inclusion criteria.

Study Design

A quantitative, cross-sectional analytical study will be conducted to assess foot pain and functional disability and examine their associations with age, body mass index (BMI), daily standing duration, and occupational characteristics.

Sample Distribution

Study parameter	Details
Total sample size	100
Study population	Traffic police personnel
Study location	Bareilly, Uttar Pradesh
Age	Recorded in completed years
BMI	Calculated in kg/m²
Standing duration	Average hours per duty day
Foot pain	Numerical Pain Rating Scale (0–10)
Functional disability	Validated Foot Function Index
Statistical analysis	Descriptive statistics, correlation, and regression

Statistical Analysis

Data from all 100 participants will be analyzed using appropriate statistical software. Frequencies, percentages, means, and standard deviations will summarize the study variables. Pearson or Spearman correlation will be used as appropriate to examine relationships between foot pain, functional disability, age, BMI, and daily standing duration. Multivariable regression may be used to assess associations after adjustment for relevant confounding factors. Statistical significance will be set at p less than 0.05, with effect estimates and 95% confidence intervals reported.

IX. RESULTS AND STATISTICAL ANALYSIS

The proposed study aimed to assess foot pain and functional disability among 100 traffic police personnel in Bareilly and examine their association with age, body mass index (BMI), daily standing duration, and occupational characteristics.

Note: The following numerical results are hypothetical examples to demonstrate the presentation of findings. They are not based on actual participant observations.

9.1 Demographic and Occupational Characteristics

Table 1. Demographic and Occupational Profile of Participants (N = 100)

Variable	Illustrative result
Age (years), mean ± SD	38.6 ± 8.2
BMI (kg/m²), mean ± SD	25.4 ± 3.6
Daily standing duration (hours), mean ± SD	7.2 ± 1.5
Daily duty duration (hours), mean ± SD	8.4 ± 1.2
Occupational service (years), mean ± SD	12.1 ± 6.4

Interpretation: In this illustrative example, participants had a mean age of 38.6 years and a mean BMI of 25.4 kg/m². The average reported standing duration was 7.2 hours per day. These characteristics provide a basis for examining the relationship between occupational exposure and foot-related symptoms.

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9.2 Distribution of Foot Pain

Table 2. Severity of Foot Pain Among Participants

Foot pain category	Number (n)	Percentage (%)
No pain (score 0)	20	20%
Mild pain (scores 1–3)	35	35%
Moderate pain (scores 4–6)	30	30%
Severe pain (scores 7–10)	15	15%
Total	**100**	**100%**

Interpretation: In this hypothetical distribution, 80% of participants reported some degree of foot pain, while 20% reported no pain. Mild pain was the most common category, followed by moderate and severe pain. If confirmed by actual data, these findings would indicate that foot discomfort warrants further occupational health assessment in the study population.

9.3 Assessment of Foot-Related Functional Disability

Table 3. Illustrative Foot Function Index Results

Outcome	Illustrative mean ± SD
Pain subscale (0–100)	34.8 ± 18.2
Disability subscale (0–100)	27.6 ± 16.5
Activity limitation subscale (0–100)	19.4 ± 14.1

Note: These values assume a Foot Function Index version in which higher scores indicate worse symptoms or function. The scoring and applicability of each subscale must be checked against the validated version selected for the study.

Interpretation: In this illustrative example, the mean pain subscale score was higher than the disability and activity limitation scores. This hypothetical pattern would suggest that pain may be reported even when the resulting activity limitation is comparatively lower. Actual conclusions must be based on the observed scores.

9.4 Association Between Age, BMI, Standing Duration, and Foot Pain

Table 4. Illustrative Correlation Analysis

Variable	Correlation with foot pain	p-value
Age	0.24	0.016
BMI	0.31	0.002
Daily standing duration	0.42	Less than 0.001

The correlation coefficients and p-values above are hypothetical and are not calculated from actual participant data.

Interpretation: In this example, daily standing duration shows the strongest positive correlation with foot pain, followed by BMI and age. The illustrative p-values indicate statistically significant associations under the assumed data. These results cannot be used to conclude that the associations exist in the actual Bareilly traffic police population until the data are analyzed.

9.5 Relationship Between Foot Pain and Functional Disability

Table 5. Illustrative Correlation Between Pain and Disability

Variables	Correlation coefficient	p-value
Foot pain and disability score	0.68	Less than 0.001
Foot pain and activity limitation	0.54	Less than 0.001

Interpretation: The hypothetical results indicate a positive association between foot pain and functional disability. Participants with higher pain scores would tend to report greater disability if this pattern were observed in actual data. The strength and statistical significance of this relationship must be established through the completed analysis.

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9.6 Illustrative Multivariable Regression Analysis

Table 6. Factors Associated With Foot Pain Severity

Predictor	Illustrative adjusted coefficient (β)	p-value
Age (years)	0.08	0.120
BMI (kg/m²)	0.35	0.021
Daily standing duration (hours)	0.91	Less than 0.001
Years of occupational service	0.04	0.310

These are hypothetical regression coefficients. The units, model specification, confidence intervals, and diagnostic results would need to be reported in the final analysis.

Interpretation: In this illustrative model, daily standing duration and BMI are statistically significant predictors of foot pain severity, whereas age and occupational service duration are not statistically significant after adjustment. This example demonstrates how regression results may be presented; it does not establish the actual predictors of foot pain.

X. DISCUSSION: RESULTS-LINKED DRAFT

If the collected data show that foot pain is common among traffic police personnel, the findings may indicate a need for greater attention to occupational foot health. An association between standing duration and pain could be consistent with concerns about sustained weight-bearing, although a cross-sectional study cannot establish causation.

If BMI is associated with pain, body mass and lower-limb loading may be relevant considerations. However, footwear, previous injuries, physical activity, and other confounding factors should also be evaluated.

A positive association between pain and functional disability would suggest that foot symptoms may have practical consequences for daily activities. Further studies could investigate whether footwear modifications, rest-break arrangements, or targeted occupational health interventions improve outcomes.

The discussion should interpret the actual prevalence and severity of foot pain and the observed levels of functional disability. Findings should be compared with relevant studies involving traffic police personnel and other occupational groups exposed to prolonged standing.

If longer standing duration is associated with greater foot pain, possible explanations may include sustained weight-bearing, fatigue, footwear characteristics, and insufficient recovery opportunities. Nevertheless, the cross-sectional design would not establish that standing duration caused the pain.

If BMI is associated with pain or disability, the findings should be interpreted in relation to body mass, occupational activity, and other potential confounders. A statistically significant association should not be interpreted as proof of a direct causal mechanism.

If participants reporting greater pain also demonstrate higher disability scores, this would indicate a relationship between symptom severity and perceived functional limitation. The clinical significance of the association should be considered alongside its statistical significance.

If the analysis finds no statistically significant relationships, those findings should be reported without alteration. Confidence intervals, sample size, measurement reliability, and variation in occupational exposures should be considered when interpreting the results.

Comparisons with previous research should be based on differences in population characteristics, measurement instruments, sampling procedures, and outcome definitions. The discussion should avoid claiming that the Bareilly population has a higher or lower prevalence than another population unless comparable data are available.

XI. OCCUPATIONAL HEALTH IMPLICATIONS

Depending on the findings, the study may inform the following occupational health measures:

1. Periodic assessment of foot pain and lower-limb symptoms.
2. Review of footwear fit, comfort, and suitability for prolonged duty.

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3. Opportunities to alternate standing with walking or seated rest where operationally feasible.
4. Education on foot care, symptom recognition, and timely clinical assessment.
5. Referral for physiotherapy or medical evaluation when persistent pain or functional limitation is identified.
6. Further evaluation of workplace ergonomics and preventive interventions.

These measures should be considered potential applications of the research rather than interventions proven effective by this cross-sectional study.

XII. LIMITATIONS

The cross-sectional design limits conclusions about causality and the temporal relationship between occupational exposure and symptoms. Self-reported pain and standing duration may be affected by recall error. Participants recruited from selected traffic police locations may not represent all personnel in Bareilly or other districts.

Foot pain may also be influenced by previous injuries, footwear, underlying medical conditions, physical activity, and other occupational exposures. The study will rely on the validity and reliability of the selected assessment instruments, and any language or scoring limitations should be acknowledged.

XIII. ETHICAL CONSIDERATIONS

Approval from the appropriate institutional ethics committee and permission from the relevant police authority will be obtained before recruitment. Written informed consent will be secured from all participants.

Participation will be voluntary, and refusal to participate will not affect employment or duty allocation. Confidentiality will be maintained through coded data and secure storage. Participants reporting persistent or concerning symptoms should be advised to seek suitable clinical assessment.

XIV. CONCLUSION

This proposed study provides a framework for evaluating foot pain and functional disability among traffic police personnel in Bareilly and investigating their relationship with age, BMI, standing duration, and occupational factors.

The combined use of a pain rating scale, a validated foot-specific functional assessment, and standardized anthropometric measurements may provide a more comprehensive description of occupational foot health than posture assessment alone.

The final conclusions must be based on the collected data. The findings may help identify associations requiring further investigation and inform future occupational health screening or ergonomic research among traffic police personnel.

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