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Relationship Of Non-Specific Low Back Pain With Calcaneal Frontal Plane Position, Congruence Of Medial Longitudinal Arch, Disability, And Quality Of Life Among School Teachers Of Delhi Ncr: An Occupational Health Perspective

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Abstract
Introduction*: Non-specific low back pain is a major occupational health concern for school teachers, with the potential to influence foot posture, functional disability, and QOL. The study investigates these associations among teachers in Delhi NCR to guide workplace health intervention.*
Objectives: *To assess the relationship between NSLBP and calcaneal frontal plane position, To test the relationship between NSLBP and congruence of the medial longitudinal arch, To study the relationship between NSLBP and disability, and To assess the effect of NSLBP pain on QOL.*
Methods: *A cross-sectional study was conducted among 178 school teachers (78.1% female, and 29.1% male) from government and private schools. NSLBP was evaluated with the NPRS, foot posture with the FPI-6 for frontal plane position of the calcaneus and congruence of medial longitudinal arch, disability with the Modified Oswestry Low Back Pain Disability Questionnaire, and quality of life with SF-12.*
Results: *NSLBP had no significant relationship with calcaneal frontal plane position ($p = 0.504$) or medial longitudinal arch congruence ($p = 0.910$). There was a high positive correlation between NSLBP and disability ($r = 0.681$, $p < 0.001$). Moderate negative correlations were present with SF-12 PCS ($r = -0.405$, $p < 0.01$) and MCS ($r = -0.284$, $p < 0.01$).*
Conclusion: *NSLBP significantly contributes to disability and reduces QOL among school teachers but does not alter static foot posture. These results promote occupational health measures, such as ergonomic interventions and multidisciplinary care, to minimize the effects of NSLBP in school settings.*
Keywords: *Non-specific low back pain, school teachers, occupational health, disability, quality of life, foot posture*

INTRODUCTION

Non-specific low back pain (NSLBP), defined as pain in the back without a precise pathological explanation, is a common occupational health condition among teachers working in schools with the worldwide prevalence rates varying from 17.7% to 61%. The incidence of low back pain among different types of occupations is phenomenal, teachers range greatly in their incidence of LBP. Many teachers have low back troubles, which come from so many factors of their work. Many teachers report being on their feet for multiple hours. This can create significant stress in the lower back. This pain is worsened by classroom management, meeting curriculum goals, and individual student attention needed.[1]

Commonly referred to as "lumbago," low back pain is a widespread musculoskeletal problem that seriously affects the working population—especially teachers. In addition to reducing general quality of life, this

crippling disorder reduces work output, which increases absenteeism and early retirement rates among teachers.[2]

Furthermore, many teachers tend to remain in a slouched position while teaching or even while grading and lesson planning which adds to the problem. After dealing with postural strain and physical fatigue, many teachers find themselves feeling chronic back pain, which affects their daily well-being and ability to teach.[3]

Research suggests that women teachers self-report low back pain significantly more than male teachers do, and there may be many reasons behind this. Differences in pain levels could be attributed to differing physical exertions during teaching, the body's mechanical work, and perhaps even higher mental strain involved in these occupations. Health and wellness interventions tailored for teachers require properly understanding these context factors.[4]

Teachers are subjected to excessive standing, repetitive forward bending, and inadequate ergonomic support in India, which cause NSLBP and its resultant functional and psychological impairments.[2]

The physical requirements of teaching can impact the kinetic chain, which in turn could modify foot posture, whereas NSLBP has been reported to exacerbate disability and decrease QoL, impairing occupational performance.[5]

A certain amount of knee adduction can also be seen. Low back pain is a typical complaint of individuals in long-duration standing jobs. On evaluation, it may not reveal any change in the spine. The changes in the foot posture are significant in planning the corrective measures or management to decrease morbidity and improve the QOL of school teachers.[6]

The present study explores the interrelationship between NSLBP and calcaneal frontal plane position, medial longitudinal arch congruence, disability, and QoL among Delhi NCR school teachers, with a focus on guiding occupational health interventions.

The specific objectives were:

1. To assess the correlation between Non-specific low back pain (NSLBP) and calcaneal frontal plane position.
2. To determine the correlation between Non-specific low back pain (NSLBP) and congruence of the medial longitudinal arch.
3. To assess the correlation between Non-specific low back pain (NSLBP) and functional disability.
4. To determine the effect of Non-specific low back pain (NSLBP) on physical and mental Quality of Life.

MATERIALS AND METHODS

Study Design

A cross-sectional study was carried out between March and May 2024 among teachers in Delhi NCR, India. Ethical clearance was obtained from the Banarsidas Chandiwala Institute of Physiotherapy Ethical Committee, and the study was registered with the CTRI.

Participants

A convenience sample of 178 teachers (139 females and 39 males, mean age 35.09 ± 5.19 years) with a minimum of three years of teaching experience was sourced from government (70.8%) and private (29.2%) schools. Inclusion criteria involved NSLBP and working in a school environment. Exclusionary factors included pregnancy, recent birth (within a year), recent abdomino- or low back surgery, neurologic disease, psychologic counseling, cancer, recent trauma to the low back (within six months), individual specific low back disorders (e.g., herniated disc, stenosis of the spine), or consistent engaging in exercise type activities (e.g., the gym, yoga).

Outcome Measures

1. Numeric Pain Rating Scale (NPRS): A 0–10 scale measured NSLBP intensity (0 = no pain, 10 = worst pain).[7]

2. Foot Posture Index (FPI-6): Two items—calcaneal frontal plane position and medial longitudinal arch congruence—were graded from -2 (supination) to +2 (pronation)[8]
3. Modified Oswestry Low Back Pain Disability Questionnaire: A 10-item survey assessed functional disability, with the scores ranging from 0–100% (higher score higher disability).[9]
4. 12-Item Short Form Survey (SF-12): QoL was measured using Physical Component Summary (PCS), and Mental Component Summary (MCS) scores.[10]

Procedure

Informed written consent was taken from participants, and demographic information was collected through a standard form. NPRS was used to measure NSLBP, Foot posture using FPI-6 in relaxation, disability through Modified Oswestry Questionnaire, and Quality of life through SF-12. Measurements were made in school environment, and participants filled out the questionnaires.

Statistical Analysis

Data were analyzed using SPSS version 26.0. Descriptive statistics summarized participant characteristics (mean ± SD for continuous variables, frequency/percentage for categorical). Spearman's rank correlation (ρ) assessed associations between NPRS scores and FPI-6 components, disability, and SF-12 scores. A p-value < 0.05 was considered significant.

RESULTS

Participant Demographics

The sample included 178 teachers (78.1% female, 21.9% male) with a mean age of 35.09 ± 5.19 years and a mean BMI of 24.46 ± 2.79 kg/m². The majority were married (80.9%), and 70.8% worked in government schools (Table 1).

Variable	**Category / Value**	**Frequency** (%)
Gender	Female	139 (78.1%)
	Male	39 (21.9%)
Age (years)	Mean ± SD	35.09 ± 5.19
Body Mass Index (BMI)	Mean ± SD	24.46 ± 2.79 kg/m²
Marital Status	Married	144 (80.9%)
	Unmarried	34 (19.1%)
Type of School	Government	126 (70.8%)
	Private	52 (29.2%)

Table 1. Participant Demographics (n = 178)

Correlation Findings

Non-Specific Low Back Pain and Foot Posture

No strong correlations were found between NPRS scores and calcaneal frontal plane position ($p = 0.504$) or medial longitudinal arch congruence ($p = 0.910$), which suggests no correlation with static foot posture (Table 2).

Non-Specific Low Back Pain and Disability:

There was a high positive correlation between Modified Oswestry scores and NPRS scores ($r = 0.681$, $p < 0.001$), showing that increased pain levels were related to higher functional disability (Table 2).

Non-Specific Low Back Pain and Quality of Life

Moderate negative correlations were observed between NPRS scores and SF-12 Physical Component Summary ($r = -0.405$, $p < 0.01$) and Mental Component Summary ($r = -0.284$, $p < 0.01$), indicating that Non-Specific Low Back Pain negatively impacts physical and mental Quality of Life (Table 2).

Variables	Spearman's ρ	p-value	Interpretation
Calcaneal Frontal Plane Position (FPI-6)	0.052	0.504	No significant correlation
Medial Longitudinal Arch Congruence (FPI-6)	-0.008	0.910	No significant correlation
Modified Oswestry Disability Score	0.681	< 0.001	High positive correlation (statistically significant)
SF-12 Physical Component Summary (PCS)	-0.405	< 0.01	Moderate negative correlation (statistically significant)
SF-12 Mental Component Summary (MCS)	-0.284	< 0.01	Moderate negative correlation (statistically significant)

Table 2. Correlation between Non-Specific Low Back Pain (NSLBP) and Other Variables

DISCUSSION

This research responded to the occupational health burden of NSLBP in school teachers in Delhi NCR, and it reported strong significant associations with disability and QOL but no significant effect of static foot posture. These findings are consistent with the study's objectives and yield actionable recommendations for work place health interventions.

Non-Specific Low Back Pain and Foot Posture

The absence of correlation between Non-Specific Low Back Pain and calcaneal frontal plane position ($p = 0.504$) or medial longitudinal arch congruence ($p = 0.910$) indicates that Non-Specific Low Back Pain does not affect static foot posture in this group. This is contrary to research suggesting kinetic chain interactions between foot posture and low back pain.[6,11]

The static character of FPI-6 readings might not reflect dynamic foot alterations with teaching tasks, e.g., sustained standing or walking.[8] The sample's mean age (35.09 years) and moderate BMI (24.46 kg/m²) might also restrict biomechanical disruptions on foot posture.[11] Occupationally, these results indicate that it would not be necessary for teachers with Non-Specific Low Back Pain to use routine foot-directed interventions (e.g., orthotics), although dynamic measurements might detect subtle adaptational compensations.

Non-Specific Low Back Pain and Disability

The significant relationship between NSLBP and disability ($r = 0.681$, $p < 0.001$) reinforces the fact that greater pain severity seriously compromises functional capability. Teaching activities, like prolonged standing and repetitive bending, raise lumbar stress, resulting in paraspinal muscle fatigue and decreased function.[12] Almansour et al. (2024) also documented comparable patterns of disability, with 64.63% of teachers having minimal disability and 29.79% moderate, influenced by pain severity.[13] The female dominance of teachers

(78.1%) could potentially worsen disability through biomechanical or psychosocial reasons.[14] These results highlight the need for ergonomic interventions, including adjustable workstations and timed breaks, to decrease workplace strain.

Non-Specific Low Back Pain and Quality of Life

Moderate inverse correlations between SF-12 PCS ($r = -0.405$, $p < 0.01$) and MCS ($r = -0.284$, $p < 0.01$) with NSLBP indicate that NSLBP influences both physical and mental QoL. The stronger PCS correlation reflects mobility and endurance limitations as crucial in instructing.[15] The lower MCS correlation reflects mental health impacts caused by tiredness due to pain and work-related stressors, particularly in government schools (70.8% of the sample), whose limited resources and increased class sizes might enhance stress.[16] The findings underscore the need for holistic interventions for physical and psychological health.

Occupational Health Implications

The significant disability and QoL impacts of NSLBP require specific workplace interventions. Anti- fatigue matting, adjustable furniture and training may restrict lumbar stress. Multidisciplinary interventions including physiotherapy, pain management, and mental health support may reduce teacher's health and productivity issues. Ergonomic evaluations must be accorded highest priority by school administrators to reduce the occupational load of NSLBP, particularly in government schools.

Limitations

The study was limited to Delhi NCR, potentially limiting generalizability. Assessing only two FPI-6 components may have overlooked other foot posture aspects. The uneven distribution of government (70.8%) versus private (29.2%) school teachers may have influenced the results.

Future Research

Subsequent research should include dynamic foot posture tests (e.g., gait analysis, plantar pressure mapping) and involve teachers from various regions and school types. Occupational ergonomic assessments might further clarify Non-Specific Low Back Pain's occupational determinants.

CONCLUSION

Non-Specific Low Back Pain highly enhances disability and lowers Quality of Life among Delhi NCR school teachers but statistically has no impact on static foot posture (Cancaneal Frontal Plane Position and Congruence of Medial Longitudinal Arch), achieving the study's aims. The findings support occupational health interventions, such as ergonomic adjustments and multidisciplinary treatment, to aid teacher's health and improve educational workforce productivity.

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