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PREVALENCE AND CONTRIBUTING FACTORS OF LOW BACK PAIN IN PRIMARY SCHOOL TEACHERS

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Abstract: **Background and Purpose:** Low back pain (LBP) is a common work-related musculoskeletal problem, and teachers are at risk because of prolonged standing, repetitive bending, awkward postures and psychosocial stress. India-specific physiotherapy research on primary school teachers is limited. This study aimed to determine the prevalence of LBP among primary school teachers and to identify the demographic, occupational, ergonomic, lifestyle and workplace-related factors associated with it.

Methods**:** This observational, cross-sectional study was conducted in Maharashtra, India. Using convenience sampling, 163 primary school teachers (Standards I–V; age 25–60 years; at least 2 years of experience) completed an online questionnaire distributed through Google Forms. It included the Nordic Musculoskeletal Questionnaire (NMQ) and a questionnaire on factors associated with LBP. Prevalence was reported with exact 95% confidence intervals. Associations were examined using Welch's t test, Mann–Whitney U test, chi-square or Fisher's exact tests, and binary logistic regression. The Holm correction was applied for multiple comparisons, with $p < .05$ considered significant.

Results**:** The mean age of participants was 35.79 ± 8.66 years, and 65.64% were female. The 12-month prevalence of LBP was 74.85% (95% CI 67.46–81.31%), the 7-day prevalence was 55.21%, and 70.49% of those with 12-month LBP reported activity limitation. After adjustment for age, gender and BMI, higher BMI (OR 1.136, 95% CI 1.026–1.257) was associated with LBP, and male gender was associated with lower odds than female gender (OR 0.464, 95% CI 0.217–0.992). Suitable classroom furniture (OR 0.179, 95% CI 0.054–0.592), work satisfaction (Holm-adjusted $p = .003$) and work-related stress (OR 1.351 per point, 95% CI 1.100–1.659) remained significantly associated with LBP after Holm correction. Age, teaching experience, standing and sitting duration, workplace support, ergonomic training and exercise frequency showed no significant association after adjustment.

Conclusion**:** LBP is highly prevalent among primary school teachers and often limits daily activities. BMI, classroom furniture suitability, work satisfaction and work-related stress were the key factors associated with LBP, indicating that it is influenced by both physical and psychosocial workplace conditions. Ergonomic classroom improvements, stress management, back-care education and physiotherapy-based preventive programmes are recommended.

IndexTerms **- Low back pain; primary school teachers; prevalence; Nordic Musculoskeletal Questionnaire; ergonomics; work-related stress; occupational health**

INTRODUCTION

Low back pain (LBP) is one of the most prevalent musculoskeletal conditions globally and is recognized as a leading cause of years lived with disability. It significantly affects functional capacity, participation in work, and overall quality of life. Chronic low back pain, in particular, is associated with long-term physical limitation and reduced productivity, making it a major public health and occupational concern [(6)].

Work-related musculoskeletal disorders are increasingly common in both developed and developing countries, and they impose a substantial burden not only on individuals but also on healthcare systems and workplaces. Among various occupational groups, teachers are considered to be at high risk due to the physical, psychological, and ergonomic demands of their profession. Teaching requires prolonged standing, repetitive movements, frequent bending, twisting, and maintaining static postures such as writing on boards or leaning forward while interacting with students. Over time, these activities can lead to cumulative stress on the spine and surrounding musculoskeletal structures [(4)].

Studies have reported that musculoskeletal disorders affect a large proportion of teachers worldwide, with an overall prevalence of approximately 68%, and that the lower back and neck are the most commonly affected areas, each accounting for nearly half of reported complaints [(3)]. Reported prevalence of low back pain among school teachers ranges from about 51% to 75% [(2,5)]. This highlights the strong occupational link between teaching activities and spinal health problems.

Low back pain in teachers is influenced by multiple factors including prolonged standing, improper posture, workload, ergonomic challenges, and psychosocial stress. In addition to occupational factors, individual characteristics such as age,

gender, and lifestyle habits may also contribute to the development and persistence of symptoms. The impact of LBP extends beyond physical discomfort, often leading to reduced efficiency, absenteeism, and decreased teaching performance [1,5].

Despite its significant consequences, low back pain among teachers—particularly those working in pre-primary and primary education—remains under-recognized in many settings. Early identification of contributing factors is essential to develop preventive strategies and ergonomic interventions that can help reduce the burden of musculoskeletal problems in this professional group [2].

In India, physiotherapy-based data on low back pain among primary school teachers remain limited. Therefore, the present study was undertaken to determine the prevalence of low back pain and to identify the demographic, occupational, ergonomic, lifestyle and workplace-related factors associated with it among primary school teachers.

Pathophysiology

Low back pain is a multifactorial condition that arises due to structural, mechanical, neurological, and psychosocial influences. In most individuals, especially in occupational groups like teachers, it is commonly classified as mechanical or degenerative low back pain, where no single pathological source can be clearly identified [6].

1. Mechanical Stress and Tissue Overload

Occupational activities such as prolonged standing, bending forward, repetitive movements, and maintaining static postures lead to continuous mechanical loading on spinal structures4. Over time, this results in:

- Microtrauma to muscles and ligaments [9]
- Increased strain on intervertebral discs [8]
- Stress on facet joints [9]

These repetitive stresses disrupt normal spinal biomechanics and may initiate tissue irritation and inflammation [8].

2. Degenerative Changes

Chronic mechanical loading can accelerate degenerative processes in spinal components such as:

Intervertebral discs [8]

- Vertebral endplates [6]
- Facet joints [9]
- Ligaments [8]

Degenerative disc changes may include loss of hydration, annular fissures, and reduced disc height, which alter load distribution within the spine8. These structural alterations may contribute to instability and abnormal motion patterns, further increasing stress on surrounding tissues [9].

Recent evidence suggests that vertebral endplates are richly innervated and may serve as a significant source of pain due to increased nociceptor density in areas of degeneration [6].

3. Pain Mechanisms

Low back pain may arise through different pain pathways:

- Nociceptive pain – resulting from tissue injury or inflammation
- Neuropathic pain – due to nerve irritation or compression
- Nociplastic pain – arising from altered central pain processing without clear tissue damage

Persistent mechanical stress may sensitize nociceptors in spinal tissues, leading to chronic pain even in the absence of major structural damage [6].

4. Muscular Dysfunction

Sustained postural demands can cause:

- Muscle fatigue
- Reduced endurance
- Imbalance between stabilizing and mobilizing muscles

This may impair spinal support and contribute to abnormal movement patterns, further perpetuating pain [9].

5. Psychosocial and Occupational Factors

Psychosocial stress, workload, and occupational demands can influence pain perception and chronicity. Fear-avoidance behaviors, reduced activity levels, and stress may contribute to the persistence of symptoms and disability [6].

6. Functional Impact

The combined effects of structural degeneration, altered biomechanics, and sensitized pain pathways can result in [6]:

- Reduced functional mobility
- Activity limitation
- Work absenteeism

Ultimately, these mechanisms contribute to the development and maintenance of chronic low back pain in occupational populations such as teachers.

NEED OF STUDY:

Limited India-specific physiotherapy research for primary teachers. Primary school teachers are exposed to prolonged standing, frequent bending, lifting children, sitting on low chairs, and working in awkward postures, which may increase

their risk of developing low back pain. Early identification of risk factors will help in planning preventive strategies, ergonomic modifications, and physiotherapy-based interventions to reduce disability and improve quality of life. This study will contribute valuable data for developing evidence-based guidelines to reduce occupational low back pain among primary school teachers.

AIM

To Determine prevalence & contributing factors of low back pain in primary school teachers

OBJECTIVES

1. To determine the prevalence of low back pain among primary school teachers using a Nordic musculoskeletal questionnaire.
2. To identify demographic factors associated with low back pain age, gender, BMI, years of teaching experience using a questionnaire of associated factors of low back pain.
3. To determine occupational, lifestyle and workplace-contextual factors using a questionnaire of associated factors of low back pain.

REVIEW OF LITERATURE

1. Almansour et al. (2024) studied secondary school teachers in Saudi Arabia, reporting a 62.6% prevalence of low back pain. Women had significantly higher rates (73.4%) than men (51.5%). Key risk factors were older age, greater number of classes per week, perceived workplace stress, and being female. Moderate and severe disability due to LBP was more common in women, and the condition substantially impacted quality of life, attendance, and work productivity. [25]
2. A 2024 systematic review and analysis by Tahernejad et al. assessed musculoskeletal disorders among teachers, pooling data from 44 studies (15,972 teachers), and found that the overall prevalence of musculoskeletal disorders was 68%, with neck and low back pain being most common (both 47%). The authors highlighted that ergonomic risk factors, lack of preventive training, and inadequate workplace design were major contributors, calling for regular ergonomic interventions and occupational health assessments for teachers. [3]
3. In an Ethiopian study by Kebede et al. (2019), the 12-month prevalence of LBP among public primary school teachers was 74.8%. Multivariate analysis confirmed strong independent associations with sleep disturbance (AOR=6.99), prolonged standing (AOR=4.78), irregular exercise, and being dissatisfied with the working environment. Teachers with more teaching experience, higher BMI, and those lacking workplace support were also at higher risk. [2]
4. Shegere et al. (2025) found in a BMJ Open study that 51.5% of school teachers had LBP, with higher BMI, older age, and inadequate physical activity being significant predictors. Psychosocial factors, including job dissatisfaction and workplace stress, also played a substantial role. [5]
5. The study reported a moderate level of low back discomfort among teachers, with an average pain score of 25.35%. The authors observed that LBP prevalence and severity tended to rise with the number of years spent working as a teacher. Teachers with more years of professional experience generally reported greater problems in activities of daily living due to ongoing or recurrent LBP. [1]
6. Articles have similar patterns in Indian and international studies, with LBP prevalence ranging from 40% to over 70% depending on region, work conditions, and gender. Common aggravating factors include prolonged standing or sitting, marking papers, poor furniture, psychosocial stress, and insufficient rest/exercise. [1,11,12,21]

METHODOLOGY

- **Study Design:** cross-sectional study.
- **Study type:** An observational study.
- **Sampling Method:** Convenience sampling.
- **Study Location:** The study was conducted in Maharashtra, India.
- **Study Population:** Primary school teachers teaching Standards I to V.
- **Sample Size:** A total of 163 participants.

MATERIALS

- **Study Instruments**

Data were collected using an online questionnaire administered through Google Forms.

The questionnaire consisted of a Nordic Musculoskeletal Questionnaire (NMQ) and another Questionnaire for factors associated with low back pain containing questions from different articles present in the references.

- **Ethical Considerations**

Ethical approval for the study was obtained from the ethics committee associated with Tilak Maharashtra Vidyapeeth, Pune, before the study was conducted.

Participation was voluntary, and informed consent was obtained through Google Forms before participants proceeded to the questionnaire. The confidentiality of participant's responses was maintained, and results were intended to be reported in aggregate form without identifying individual participants.

OUTCOME MEASURES

- **Nordic Musculoskeletal Questionnaire**

The Nordic Musculoskeletal Questionnaire was used to record pain during the previous 12 months and the previous 7 days.

- Reliability test results obtained Cronbach's value = 0.896; PABAK coefficients ranged from 0.57 to 0.90 [26]. The NMQ has also been reported to have acceptable validity and reliability for assessing occupational musculoskeletal symptoms [7].

- **Questionnaire on factors associated with low back pain**

https://drive.google.com/file/d/1uUTBKhCIjVOTOAjCqhhFca-Hs7eFdLlm/view?usp=sharing

The questionnaire was used to collect information about demographic, occupational, ergonomic, lifestyle, and psychosocial characteristics
The Questionnaire contains questions from different articles and is not self-made. The questionnaire was available in English and Marathi to make participation easier for teachers comfortable with either language.

INCLUSION CRITERIA

1. Teachers working as primary school teachers teaching Standards I to V.
2. Teachers having a minimum of 2 years of teaching experience.
3. Age between 25 and 60 years of age.
4. Teachers willing to participate and provide informed consent.

EXCLUSION CRITERIA

1. History of significant spinal trauma or previous spinal surgery.
2. Pregnancy.
3. Unwillingness to participate or absence of informed consent.
4. Failure to meet the specified inclusion criteria.

PROCEDURE

1. Approval was obtained from the ethics committee of the institute.
2. The aims and objectives of the research were explained in detail to the participants.
3. Data were collected using Google Forms between April 2026 and September 2026. The questionnaire link was distributed to eligible primary school teachers through WhatsApp, email and other channels.
4. The questionnaire began with information about the study and an informed-consent process. Participants were asked to provide consent before proceeding with the questionnaire. Only participants who voluntarily agreed to participate were eligible to continue.
5. Participants completed the Nordic Musculoskeletal Questionnaire, demographic, personal information, occupational, ergonomic, lifestyle, and psychosocial factors.
6. Responses were compiled for statistical analysis. The data were reviewed for completeness, consistency, and suitability for analysis. The final analytical sample comprised 163 participants.

DATA ANALYSIS AND INTERPRETATION

The collected data were screened for completeness, consistency, and suitability for statistical analysis. All 163 participants were retained in the final dataset. Missing observations were handled using available-case analysis for the relevant statistical procedures, without imputation. Continuous variables were summarized using means and standard deviations (SDs) or

medians and interquartile ranges (IQRs), as appropriate. Categorical variables were presented as frequencies and percentages.

The primary outcome was the 12-month prevalence of low back pain, assessed using the Nordic Musculoskeletal Questionnaire (NMQ). The 7-day prevalence and activity limitation associated with low back pain were also assessed. Prevalence estimates were expressed as percentages with 95% confidence intervals (CIs) calculated using the Clopper–Pearson exact binomial method.

The distribution of selected continuous variables was examined using the Shapiro–Wilk test. Welch's independent-samples t test was used to compare age and body mass index (BMI) between participants with and without low back pain. The Mann–Whitney U test was used for teaching experience and work-related stress. Hedges' g and rank-biserial correlation coefficients were reported as the corresponding effect sizes.

Associations between categorical variables and 12-month low back pain were examined using Pearson's chi-square test. Fisher's exact test or a Monte Carlo approximation of Fisher's exact test with 50,000 replicates was used for contingency tables containing sparse expected frequencies. Cramér's V was calculated to quantify the strength of categorical associations.

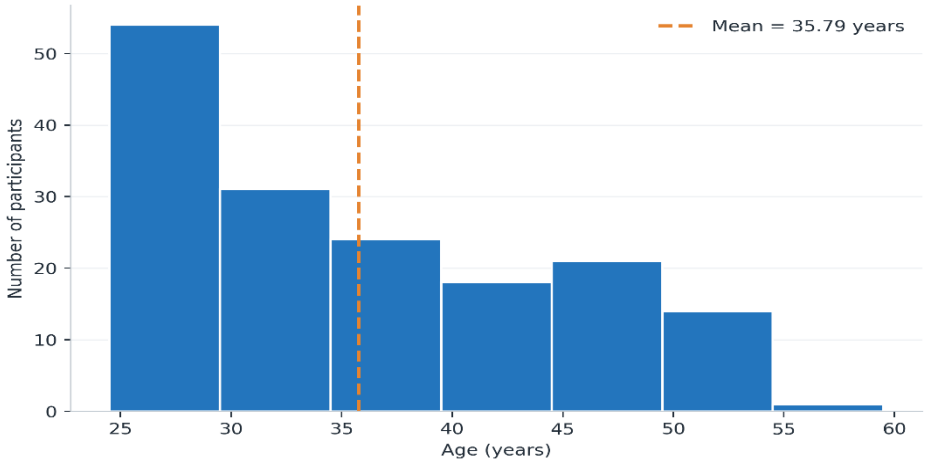
Binary logistic regression was performed to examine associations between demographic, occupational, lifestyle, and workplace-contextual factors and 12-month low back pain. Univariable models were fitted for age, BMI, teaching experience, and work-related stress. The primary multivariable model included age, gender, and BMI. Because of substantial collinearity between age and teaching experience, an alternative model included teaching experience, gender, and BMI.

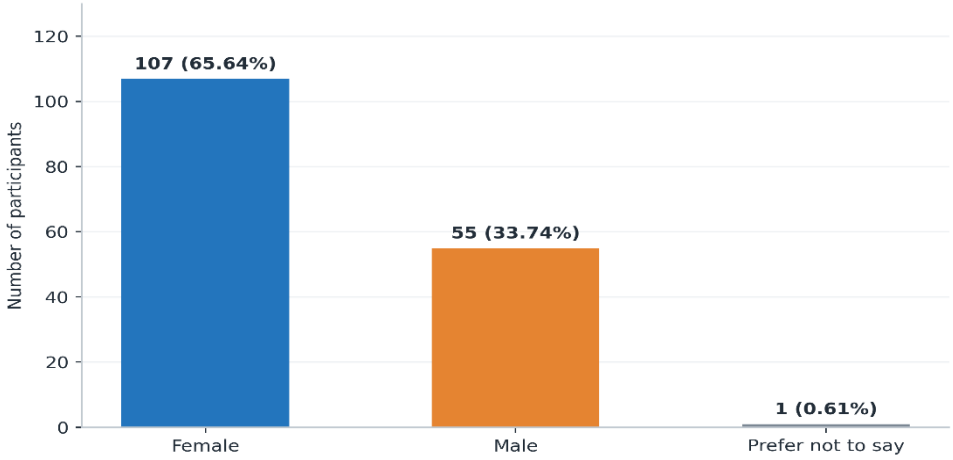
Separate multivariable logistic regression models examined classroom furniture suitability, workplace support, work satisfaction, exercise frequency, and work-related stress, with adjustment for age, gender, and BMI. Regression results were expressed as odds ratios (ORs) with 95% CIs. Likelihood-ratio tests were used to evaluate overall model and predictor contributions. Multicollinearity was examined using variance inflation factors and tolerance values, while potentially influential observations were identified using Cook's distance. No observations were automatically excluded.

The Holm procedure was applied to the specified families of multiple comparisons. Statistical tests were two-sided where applicable, and a significance level of $p < .05$ was adopted.

Table 1. Participant Characteristics

Variable	Category	n (%) or Mean (SD) or Median (IQR)
Age (years)		35.79 (8.66)
Height (cm)		162.01 (8.70)
Weight (kg)		64.77 (11.33)
BMI (kg/m²)		24.73 (4.19)
Teaching experience (years)		7.00 (14.25)
Work-related stress (1–10)		6.00 (3.00)
Gender	Female	107 (65.64)
	Male	55 (33.74)
	Prefer not to say	1 (0.61)
Marital status	Married	100 (61.35)
	Unmarried	60 (36.81)
	Divorced/Widowed	3 (1.84)



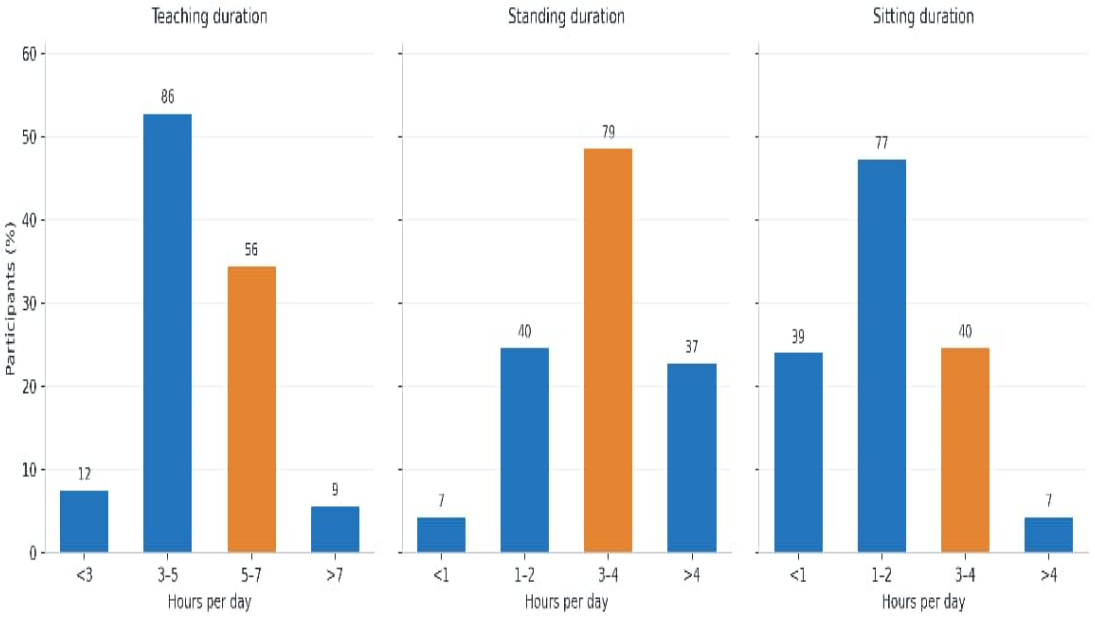


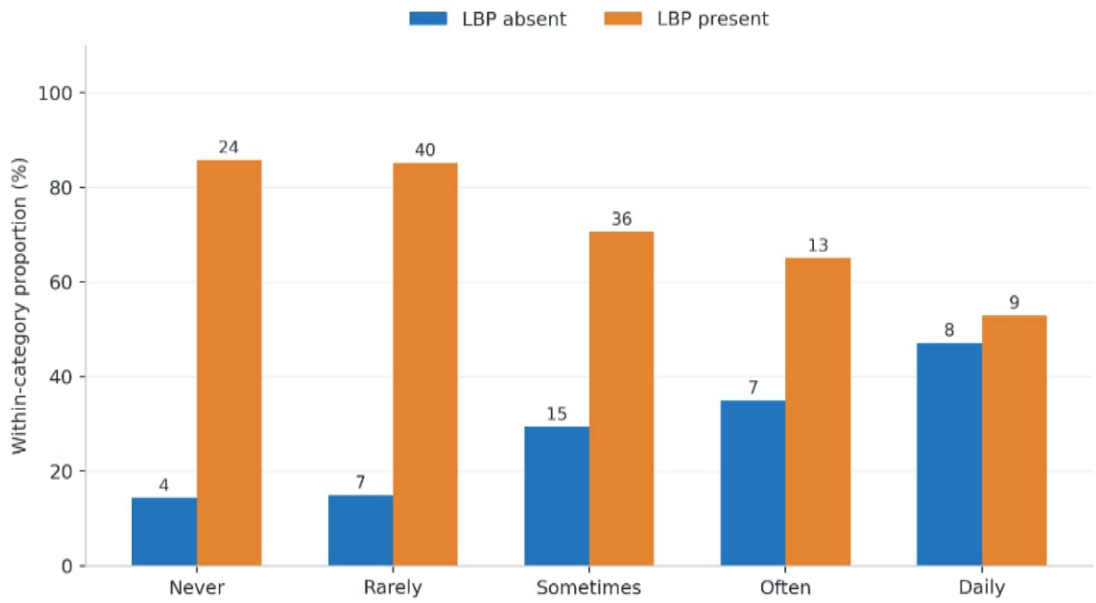
Interpretation: The participants had a mean age of 35.79 years and mean BMI of 24.73 kg/m². Female teachers constituted the majority of the sample.

Table 2. Occupational and Lifestyle Characteristics

Variable	Category	n (%)
Sleep duration (n = 161)	Less than 5 hours	3 (1.86)
	5–6 hours	50 (31.06)
	6–7 hours	69 (42.86)
	7–8 hours	35 (21.74)
	More than 8 hours	4 (2.48)
Teaching duration per day	Less than 3 hours	12 (7.36)
	3–5 hours	86 (52.76)
	5–7 hours	56 (34.36)
	More than 7 hours	9 (5.52)
Standing duration per day	Less than 1 hour	7 (4.29)
	1–2 hours	40 (24.54)
	3–4 hours	79 (48.47)
	More than 4 hours	37 (22.70)
Sitting duration per day	Less than 1 hour	39 (23.93)
	1–2 hours	77 (47.24)
	3–4 hours	40 (24.54)
	More than 4 hours	7 (4.29)
Exercise frequency	Never	28 (17.18)
	Rarely	47 (28.83)

	Sometimes	51 (31.29)
	Often	20 (12.27)
	Daily	17 (10.43)
Regular physical activity	No	70 (42.94)
	Yes	93 (57.06)

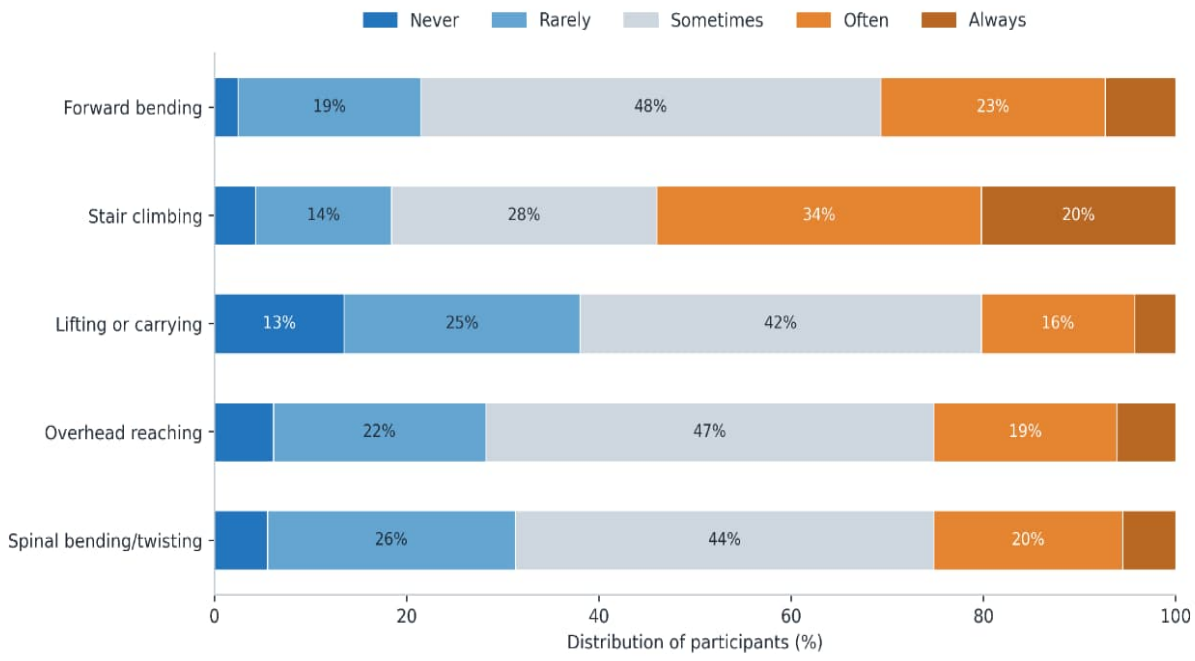




Interpretation: Most participants reported teaching for 3–5 hours and standing for 3–4 hours daily. Exercise frequency and regular physical activity varied across the sample.

Table 3. Physical and Ergonomic Characteristics

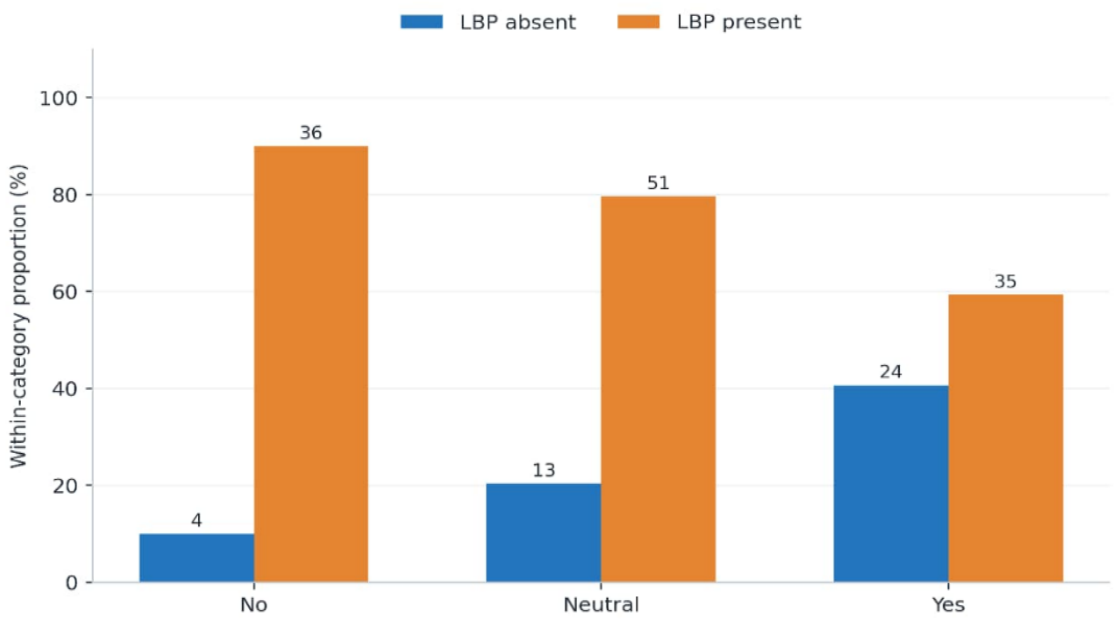
Variable	Category	n (%)
Forward bending	Never	4 (2.45)
	Rarely	31 (19.02)
	Sometimes	78 (47.85)
	Often	38 (23.31)
	Always	12 (7.36)
Stair climbing	Never	7 (4.29)
	Rarely	23 (14.11)
	Sometimes	45 (27.61)
	Often	55 (33.74)
	Always	33 (20.25)
Lifting or carrying	Never	22 (13.50)
	Rarely	40 (24.54)
	Sometimes	68 (41.72)
	Often	26 (15.95)
	Always	7 (4.29)
Overhead reaching	Never	10 (6.13)
	Rarely	36 (22.09)
	Sometimes	76 (46.63)
	Often	31 (19.02)
	Always	10 (6.13)
Spinal bending or twisting	Never	9 (5.52)
	Rarely	42 (25.77)
	Sometimes	71 (43.56)
	Often	32 (19.63)
	Always	9 (5.52)

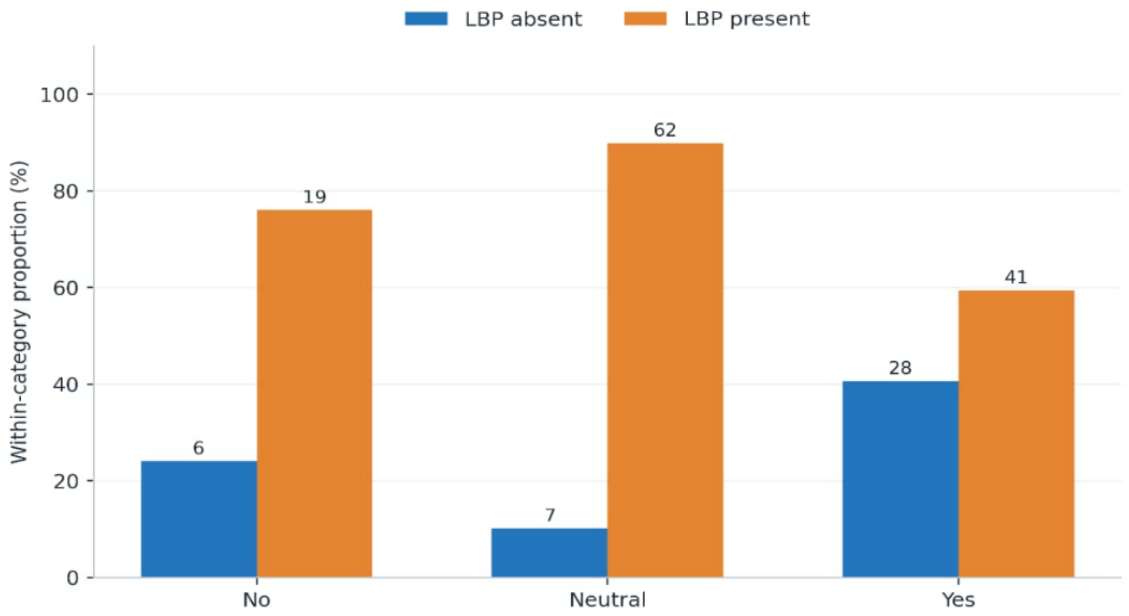


Interpretation: Forward bending, lifting or carrying, overhead reaching, and spinal bending or twisting were most frequently reported as occurring sometimes. Stair climbing was most frequently reported as occurring often.

Table 4. Workplace Characteristics

Variable	Category	n (%)
Classroom furniture suitability	No	40 (24.54)
	Neutral	64 (39.26)
	Yes	59 (36.20)
Ergonomic training	No	104 (63.80)
	Yes	59 (36.20)
Workplace support	No	41 (25.15)
	Neutral	49 (30.06)
	Yes	73 (44.79)
Work satisfaction	No	25 (15.34)
	Neutral	69 (42.33)
	Yes	69 (42.33)

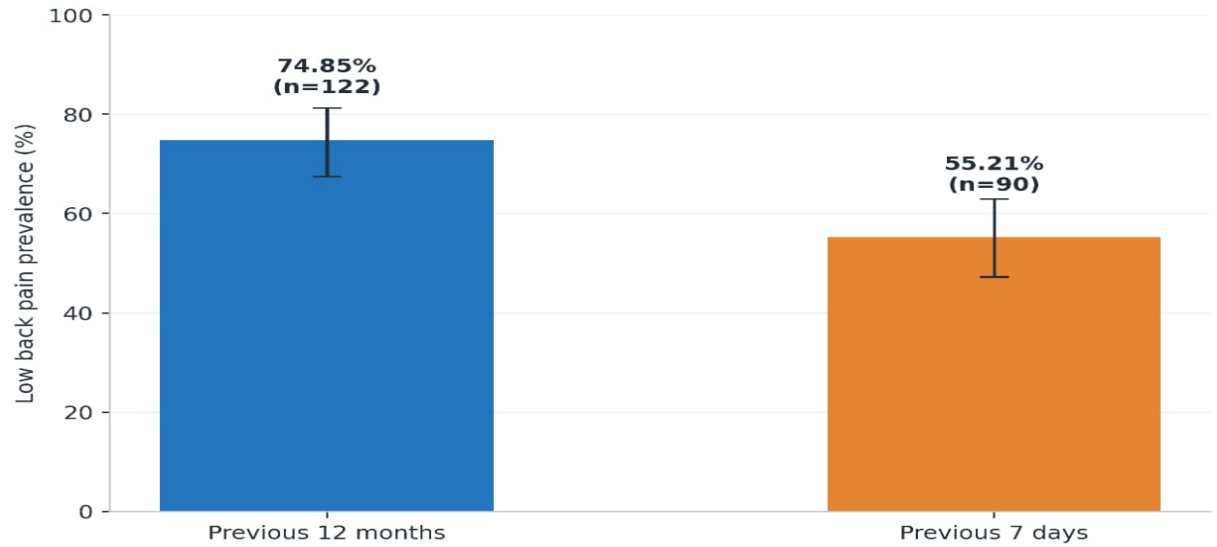




Interpretation: Most teachers had not received ergonomic training. Responses concerning furniture suitability, workplace support, and work satisfaction varied across participants.

Table 5. Prevalence of Low Back Pain

Outcome	Yes, n	No, n	N	Prevalence (%)	95% CI
Low back pain in previous 12 months	122	41	163	74.85	67.46–81.31
Low back pain in previous 7 days	90	73	163	55.21	47.24–63.00
Activity limitation due to low back pain	86	77	163	52.76	44.80–60.62
Activity limitation among participants with 12-month low back pain	86	36	122	70.49	61.56–78.40



Interpretation: The 12-month prevalence of low back pain was 74.85%, while the 7-day prevalence was 55.21%. Among teachers reporting 12-month low back pain, 70.49% also reported activity limitation.

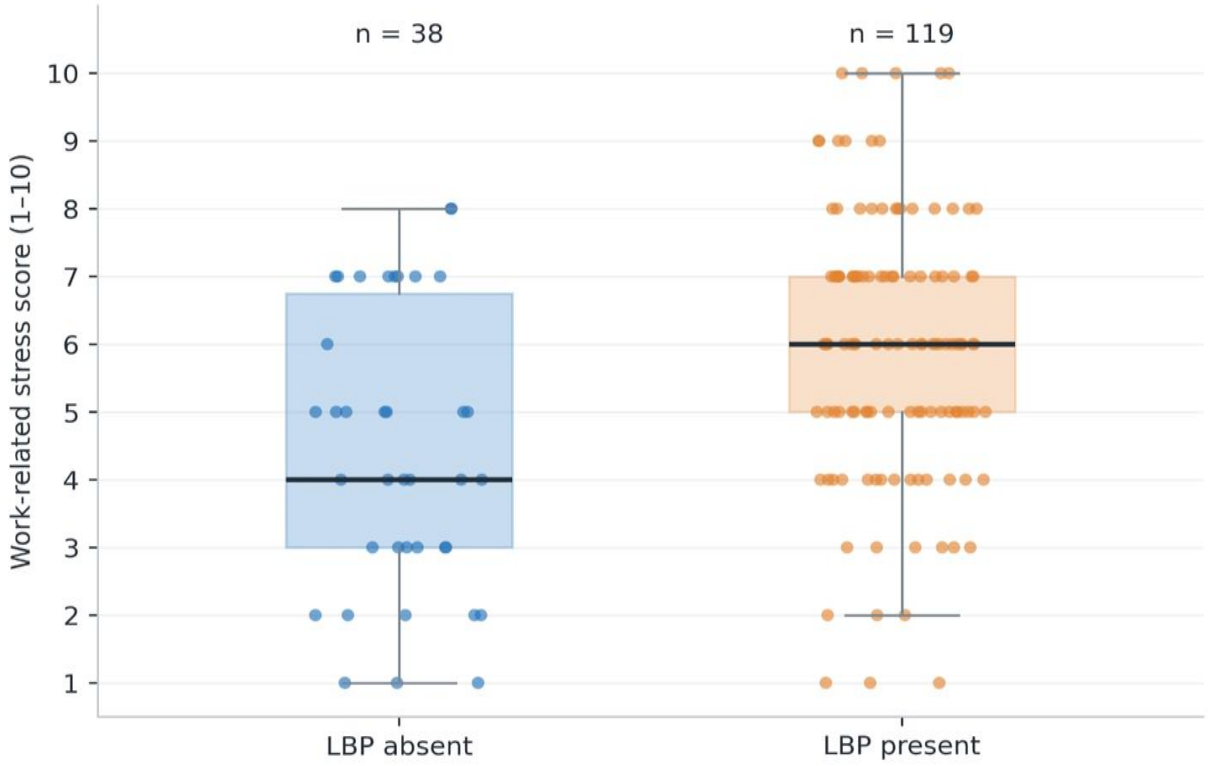
Table 6. Shapiro–Wilk Normality Test

Variable	LBP absent	LBP present	Test	Statistic	df	p	Holm-adjusted p	Effect size
Age (years)	36.78 (9.49)	35.45 (8.38)	Welch t	−0.799	62.3	0.427	0.855	g = −0.153
BMI (kg/m²)	23.76 (3.91)	25.06 (4.24)	Welch t	1.804	73.99	0.075	0.226	g = 0.311
Teaching experience (years)	8.00 (17.00)	6.50 (13.50)	Mann–Whitney U	2395	NR	0.686	0.855	r_rb = −0.042
Work-related stress	4.00 (3.75)	6.00 (2.00)	Mann–Whitney U	3137	NR	< .001	0.001	r_rb = 0.387

Interpretation: Age, teaching experience, and work-related stress showed evidence of departures from normality, whereas BMI did not. Welch t-tests and Mann–Whitney U tests were applied to the specified variables.

Table 7. Comparison of Continuous Characteristics by Low Back Pain Status

Variable	LBP absent, W	LBP absent, p	LBP present, W	LBP present, p
Age (years)	0.885	< .001	0.9044	< .001
BMI (kg/m²)	0.9603	0.161	0.9878	0.348
Teaching experience (years)	0.8846	< .001	0.8847	< .001
Work-related stress	0.9335	0.026	0.97	0.009



Interpretation: Work-related stress was higher among teachers reporting low back pain, with a positive rank-biserial association. No statistically significant group difference was detected for age, BMI, or teaching experience after Holm correction.

Table 8. Association of Demographic and Occupational Factors With Low Back Pain

Variable	N	Test	Statistic	df	p	Holm-adjusted p	Cramér's V
Gender	163	Fisher Monte Carlo	5.85	2	0.056	0.621	0.189
Marital status	163	Fisher Monte Carlo	1.383	2	0.381	1	0.092
Sleep duration	161	Fisher Monte Carlo	5.21	4	0.262	1	0.18
Teaching hours per day	163	Fisher Monte Carlo	7.377	3	0.042	0.499	0.213
Standing duration	163	Fisher Monte Carlo	0.465	3	0.89	1	0.053
Sitting duration	163	Fisher Monte Carlo	1.364	3	0.788	1	0.091

Interpretation: No demographic or occupational categorical factor showed statistically significant evidence of association with 12-month low back pain after Holm adjustment.

Table 9. Association of Ergonomic, Lifestyle, and Workplace Factors with Low Back Pain

Variable	N	Test	Statistic	df	p	Holm-adjusted p	Cramér's V
Forward bending	163	Fisher Monte Carlo	5.02	4	0.217	1	0.175
Stair climbing	163	Fisher Monte Carlo	11.166	4	0.026	0.362	0.262
Lifting or carrying	163	Fisher Monte Carlo	3.674	4	0.463	1	0.15
Overhead reaching	163	Fisher Monte Carlo	4.015	4	0.362	1	0.157
Spinal bending or twisting	163	Fisher Monte Carlo	4.298	4	0.337	1	0.162
Exercise frequency	163	Fisher Monte Carlo	10.239	4	0.037	0.476	0.251
Classroom furniture suitability	163	Pearson chi-square	13.228	2	0.001	0.021	0.285
Ergonomic training	163	Pearson chi-square	0.658	1	0.417	1	0.064
Workplace support	163	Pearson chi-square	7.695	2	0.021	0.32	0.217
Work satisfaction	163	Pearson chi-square	16.995	2	< .001	0.003	0.323
Regular physical activity	163	Pearson chi-square	2.823	1	0.093	0.929	0.132

Interpretation: Classroom furniture suitability and work satisfaction were associated with low back pain after Holm correction, with Cramér's V values of 0.285 and 0.323, respectively. The remaining ergonomic, lifestyle, and workplace factors did not retain statistical significance after correction.

Table 10. Univariable Logistic Regression

Interpretation: Higher work-related stress was associated with greater odds of low back pain (OR = 1.444), with statistical evidence retained after Holm adjustment. Age, BMI, and teaching experience did not show statistically significant univariable associations after adjustment.

Table 11. Adjusted Logistic Regression for Demographic Factors

Predictor	N	OR	95% CI	LR χ^2	p	Holm-adjusted p
Age (years)	163	0.983	0.944–1.023	0.719	0.397	0.671
BMI (kg/m²)	163	1.08	0.989–1.179	3.03	0.082	0.245
Teaching experience (years)	163	0.979	0.938–1.022	0.928	0.335	0.671
Work-related stress	157	1.444	1.188–1.756	15.39	< .001	< .001

Predictor	B	SE	Adjusted OR	95% CI	p
Age (years)	–0.039	0.023	0.962	0.920–1.006	0.093
Male (reference: Female)	–0.768	0.388	0.464	0.217–0.992	0.048
BMI (kg/m²)	0.127	0.052	1.136	1.026–1.257	0.014

Interpretation: Higher BMI was associated with increased odds of low back pain, while male gender was associated with lower odds relative to female gender. Age did not show statistically significant evidence of an adjusted association.

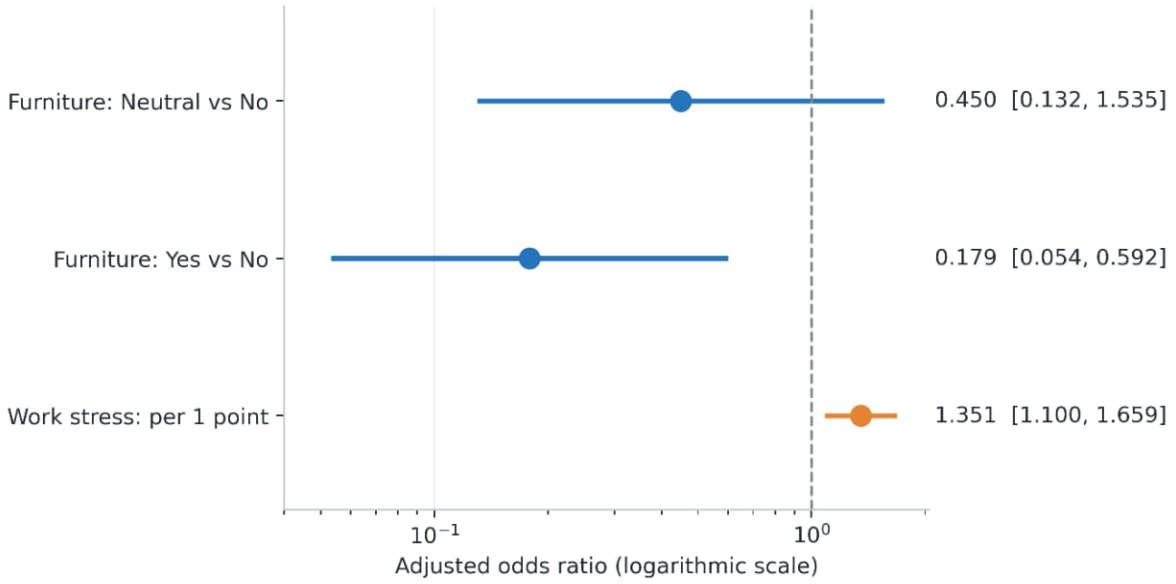
Table 12. Adjusted Logistic Regression for Teaching Experience

Predictor	B	SE	Adjusted OR	95% CI	p
Teaching experience (years)	−0.038	0.024	0.963	0.919–1.009	0.114
Male (reference: Female)	−0.748	0.387	0.473	0.222–1.010	0.053
BMI (kg/m²)	0.118	0.05	1.126	1.021–1.241	0.018

Interpretation: BMI remained positively associated with low back pain in the alternative model. Teaching experience did not demonstrate a statistically significant adjusted association.

Table 13. Adjusted Logistic Regression for Workplace and Lifestyle Factors

Predictor and category	B	SE	Adjusted OR	95% CI	p
Classroom furniture suitability					
Neutral vs No	−0.798	0.626	0.45	0.132–1.535	0.202
Yes vs No	−1.722	0.611	0.179	0.054–0.592	0.005
Workplace support					
Neutral vs No	0.196	0.583	1.216	0.388–3.816	0.737
Yes vs No	−0.782	0.499	0.457	0.172–1.218	0.117
Work satisfaction					
Neutral vs No	1.078	0.631	2.938	0.853–10.123	0.088
Yes vs No	−0.635	0.546	0.53	0.182–1.543	0.244
Exercise frequency					
Rarely vs Never	0.391	0.724	1.479	0.357–6.117	0.589
Sometimes vs Never	−0.760	0.654	0.467	0.130–1.684	0.245
Often vs Never	−0.803	0.747	0.448	0.104–1.935	0.282
Daily vs Never	−1.471	0.798	0.23	0.048–1.098	0.065
Work-related stress (per point)	0.301	0.105	1.351	1.100–1.659	0.004



Interpretation: Perceived suitability of classroom furniture was associated with lower odds of low back pain compared with unsuitable furniture. Higher work-related stress was associated with greater odds of low back pain. Individual category comparisons should be considered alongside the overall predictor tests in Table 14.

Table 14. Adjusted Associations of Workplace and Lifestyle Factors

Predictor	N	LR χ^2	df	p	Holm-adjusted p
Classroom furniture suitability	162	10.674	2	0.005	0.014
Workplace support	162	5.308	2	0.07	0.103
Work satisfaction	162	14.708	2	< .001	0.003
Exercise frequency	162	9.423	4	0.051	0.103
Work-related stress	156	8.983	1	0.003	0.011

Interpretation: Classroom furniture suitability, work satisfaction, and work-related stress retained statistically significant associations with low back pain following demographic adjustment and Holm correction. Workplace support and exercise frequency did not retain statistical significance.

RESULTS

A total of **163 primary school teachers** were included in the study. All participants had complete data for the primary low back pain outcome.

The mean age of participants was **35.79 ± 8.66 years**, and the mean BMI was **24.73 ± 4.19 kg/m²**. The study included 107 females (65.64%) and 55 males (33.74%).

The **12-month prevalence of low back pain was 74.85% (122/163)**, while the 7-day prevalence was **55.21% (90/163)**.

Among the 122 participants reporting low back pain, 86 (70.49%) experienced activity limitation due to low back pain during the previous 12 months.

No statistically significant association was found between low back pain and age, teaching experience or marital status.

BMI was higher among participants with low back pain, but the unadjusted comparison was not statistically significant (p = .075).

Daily teaching duration showed an initial association with low back pain (p = .042), but it was not significant after multiple-comparison adjustment.

No significant adjusted associations were found between low back pain and standing duration, sitting duration, sleep duration or the physical ergonomic activities examined.

Classroom furniture suitability showed a significant association with low back pain (adjusted Holm p = .014). Teachers who considered their classroom furniture suitable had lower odds of reporting low back pain.

Work satisfaction was significantly associated with low back pain, and this association remained significant after adjustment (Holm p = .003).

Work-related stress was significantly higher among teachers reporting low back pain. Each one-point increase in stress score was associated with higher odds of low back pain (adjusted OR = 1.351, p = .004).

In multivariable analysis, BMI was positively associated with low back pain (adjusted OR = 1.136, p = .014), while male gender was associated with lower odds compared with female gender (adjusted OR = 0.464, p = .048).

Age and teaching experience did not show statistically significant associations with low back pain in the adjusted regression models.

Workplace support, exercise frequency, previous ergonomic training and regular physical activity outside work did not demonstrate statistically significant adjusted associations with low back pain.

DISCUSSION

The study aimed to determine the prevalence of low back pain and identify associated factors among primary school teachers. Data were collected using a structured online questionnaire through Google Forms. The Nordic Musculoskeletal Questionnaire was used to assess the prevalence of low back pain among teachers. A separate questionnaire covering factors associated with low back pain gathered information on demographic and personal characteristics, occupational factors, physical ergonomics, classroom environment, lifestyle and psychosocial factors. The questionnaire included questions selected from previously published research articles relevant to the objectives of the study. The questionnaire was available in English and Marathi to make participation easier for teachers comfortable with either language.

The findings indicate that low back pain is a common musculoskeletal problem among primary school teachers. The 12-month prevalence of low back pain was 74.85% and the 7-day prevalence was 55.21%. In addition to experiencing pain, 70.49% of teachers with low back pain in the previous 12 months reported that their daily activities were affected. This suggests that low back pain may interfere with teachers' routine activities and their ability to carry out their professional responsibilities comfortably.

These findings are in agreement with previous studies conducted among primary school teachers, which have also reported a high prevalence of low back pain in this occupational group [2,4,5]. In particular, the 12-month prevalence in the present study is very close to the 74.8% reported among primary school teachers in Mekele City, Ethiopia [2], and higher than the 51.5% reported in Borama City, Somaliland [5]. Other studies have identified the lower back as one of the most commonly affected body regions among teachers [3]. Differences in the prevalence reported across studies may be related to variations in study populations, geographical locations, working conditions and occupational demands, and the findings of the present study further highlight low back pain as an important occupational health concern amongst primary school teachers.

Among the demographic factors, body mass index showed an association with low back pain in the present study. Teachers with low back pain had a higher mean BMI (25.06 kg/m²) than those without (23.76 kg/m²). Although this difference was not significant in the unadjusted comparison (p = .075), higher BMI was significantly associated with low back pain after adjustment for age and gender (adjusted OR = 1.136, 95% CI 1.026–1.257). This indicates that body weight may have some influence on lower back health. Higher body weight may increase the mechanical load on the spine, particularly when combined with prolonged postures and repetitive activities during the working day. Similar findings have been reported in previous studies, which identified BMI as a factor associated with low back pain among primary school teachers [2,5]. However, age and teaching experience did not show a significant association with low back pain in the present study. This suggests that low back pain among teachers may not be explained by ageing or years of professional experience alone. Other individual and workplace-related factors may also contribute to the problem.

Female teachers reported a higher prevalence of low back pain (79.44%) than male teachers (67.27%). However, the overall association between gender and low back pain was not statistically significant in the categorical analysis (p = .056) and did not remain significant after Holm correction. In the adjusted regression model, male gender was associated with lower odds of low back pain (adjusted OR = 0.464, 95% CI 0.217–0.992, p = .048), but this finding was borderline, with a confidence interval close to 1, and should be interpreted with caution. A higher prevalence among female teachers has also been reported in an earlier study by Almansour et al. [25], which may be related to differences in physical, hormonal and domestic workload, although these factors were not assessed in the present study. As the sample contained fewer male teachers, further studies with a more balanced gender distribution are needed to confirm this finding.

Teachers are required to perform several physical activities throughout the working day, including prolonged standing and sitting, forward bending, lifting or carrying materials, reaching overhead and climbing stairs. These activities are often unavoidable parts of their daily responsibilities and may increase the physical demands placed on the lower back. Repeated movements and maintaining the same posture for extended periods may contribute to mechanical stress on the muscles and other structures of the lower back [4,6]. Previous studies have also highlighted the role of occupational activities, including prolonged postures, lifting and repetitive movements, in the development of musculoskeletal problems amongst teachers [13,14,19]. However, in the present study, the duration of standing and sitting, along with the frequency of most individual physical activities, did not show a significant association with low back pain. Teaching hours per day (p = .042) and stair-

climbing frequency (p = .026) showed unadjusted associations, but neither remained significant after Holm correction. This indicates that the development of low back pain may be influenced by a combination of occupational demands, working postures and opportunities for rest rather than by a single activity.

The suitability of classroom furniture was another important finding of the present study. Low back pain was reported by 90.00% of teachers who considered their classroom furniture unsuitable, compared with 59.32% of those who considered it suitable, and the association remained significant after adjustment for age, gender and BMI (adjusted OR = 0.179, 95% CI 0.054–0.592). Inappropriate furniture may make it difficult to maintain comfortable postures and may increase the need for repeated bending or awkward positions while interacting with students and performing classroom activities. Previous research has also emphasised the importance of workplace ergonomics and suitable working conditions in reducing musculoskeletal problems amongst teachers [3,18,24]. These findings highlight the need for appropriate classroom furniture and a comfortable working environment. Work satisfaction was also associated with low back pain overall (Holm-adjusted p = .003), although the pattern was not straightforward: prevalence was highest among teachers who gave neutral responses (89.86%) and lowest among satisfied teachers (59.42%), and none of the individual category comparisons was significant. This suggests that teachers' overall experience and satisfaction with their workplace may have a role in their musculoskeletal health, although this finding should be interpreted cautiously. Similar findings related to job satisfaction and low back pain have been reported in previous research [2,5].

Work-related stress was also found to be associated with low back pain in the present study. Teachers who reported higher levels of work-related stress also tended to report more low back pain. The median stress score was higher among teachers with low back pain than among those without (6.00 vs 4.00), and each one-point increase in stress was associated with higher odds of low back pain after adjustment (adjusted OR = 1.351, 95% CI 1.100–1.659). Apart from teaching, their responsibilities include lesson preparation, managing students, completing administrative tasks and meeting academic expectations. Managing these responsibilities may contribute to both physical and mental fatigue. Previous studies have also reported associations between psychosocial factors, such as workplace stress and job dissatisfaction, and low back pain among teachers [2,5,22]. These findings suggest that low back pain should not be viewed only as a result of physical demands, as psychological and workplace-related factors may also play a role.

Low back pain was reported by 85.71% of teachers who never exercised, compared with 52.94% of those who exercised daily. However, exercise frequency did not remain a significant factor after adjustment for demographic factors and Holm correction. Similarly, workplace support and previous ergonomic training did not show a consistent independent association with low back pain in the present study. However, this does not mean that physical activity, ergonomic awareness or workplace support are unimportant for teachers' health. Previous research has highlighted the benefits of regular physical activity and preventive measures in maintaining musculoskeletal health [2,10,16]. Their relationship with low back pain may vary depending on individual circumstances and other associated factors.

Overall, the findings of the present study indicate that low back pain among primary school teachers is a multifactorial problem associated with individual, occupational, ergonomic and psychosocial factors. In particular, the findings highlight the importance of suitable classroom furniture, a comfortable working environment and effective stress management. Improving awareness about spinal health and encouraging appropriate preventive measures may help reduce the burden of musculoskeletal problems among teachers. Physiotherapy-based interventions focusing on posture education, ergonomic modifications, physical activity and back care awareness may also be useful in promoting teachers' musculoskeletal health and helping them perform their daily professional activities more comfortably.

CONCLUSION

The present study found a high prevalence of low back pain among primary school teachers, with 74.85% reporting low back pain during the previous 12 months. The findings highlight that low back pain is a common problem among teachers and may affect their ability to perform daily and occupational activities.

The study identified BMI, classroom furniture suitability, work satisfaction and work-related stress as important factors associated with low back pain. Teachers who reported higher BMI and greater work-related stress were more likely to experience low back pain, while perceived suitability of classroom furniture was associated with lower odds of reporting pain. Work satisfaction also showed a significant association with low back pain.

Overall, the findings suggest that low back pain among primary school teachers is associated with a combination of individual, workplace and psychosocial factors. Therefore, improving classroom ergonomics, promoting healthy lifestyle habits and addressing workplace stress may help reduce the burden of low back pain among teachers. Greater awareness, early identification and appropriate preventive measures are important for maintaining teachers' musculoskeletal health and work-related well-being.

CLINICAL IMPLICATIONS

1.Physiotherapists should promote early identification of low back pain among primary school teachers to prevent symptoms from affecting their daily activities and work performance.

2.Ergonomic education should be provided to teachers, focusing on maintaining comfortable postures while sitting, standing, writing on boards and interacting with children.

3.Schools should be encouraged to provide suitable classroom furniture that supports comfortable sitting and reduces unnecessary bending and awkward postures.

4.Physiotherapy programmes may include back muscle strengthening, core stability exercises, flexibility training and exercises to improve overall physical endurance.

5.Teachers should be educated about the importance of taking short movement breaks and avoiding prolonged static postures during working hours.

6.Since work-related stress was associated with low back pain, schools should also consider measures that promote a supportive working environment and better stress management.

LIMITATIONS OF THE STUDY

1.The study was conducted using a cross-sectional design, so it cannot establish a cause-and-effect relationship between low back pain and the identified factors.

2.The study was limited to a specific population and geographical setting in Maharashtra. Therefore, the findings may not represent teachers from all regions or types of schools.

3.The study focused on questionnaire-based assessment and did not include a detailed physical examination or clinical assessment of participants with low back pain.

4.Teachers who were not reachable online or chose not to respond may be underrepresented, which may introduce selection bias.

FUTURE SCOPE OF THE STUDY

1.Longitudinal studies can be conducted to understand how low back pain develops over time and how occupational factors influence its progression.

2.Future research can include a detailed clinical assessment of teachers with low back pain to understand their pain severity, functional limitations, posture and physical fitness.

3.Intervention-based studies can evaluate the effectiveness of physiotherapy programs involving core strengthening, back muscle strengthening, flexibility exercises and ergonomic education.

4.Further studies can explore the role of workplace stress, job satisfaction, sleep quality and workplace support in the development and persistence of low back pain

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