

The Impact of Musculoskeletal Pain Distribution on Quality of Life among Secondary School Female Teachers

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Abstract

Background: Musculoskeletal disorders (MSDs) are a widely reported occupational health concern among school teachers, whose work combines prolonged standing, sustained sitting, repetitive board writing and reaching, and psychosocial demands. Female secondary school teachers form a particularly vulnerable group, and pain is frequently reported at more than one anatomical site. However, the relationship between the number/distribution of painful sites and health-related quality of life (HRQoL) has been less extensively studied than pain prevalence alone.

Objectives: To determine the distribution of musculoskeletal pain across anatomical regions using the Modified Nordic Questionnaire, to assess quality of life using the SF-12 questionnaire, and to examine the association between musculoskeletal pain distribution and quality of life among secondary school female teachers.

Methods: An analytical cross-sectional study was conducted among 123 female secondary school teachers (age 30-45 years, minimum two years of full-time experience) from schools in Pune city, selected by convenience sampling over six months. Musculoskeletal pain was assessed using the Modified Nordic Musculoskeletal Questionnaire, and HRQoL was assessed using the SF-12, yielding Physical Component Summary (PCS) and Mental Component Summary (MCS) scores. Participants were grouped by number of painful sites (no pain, one, two, three, or more than three sites). Spearman rank correlation and the Kruskal-Wallis test were used to examine associations.

Results: Musculoskeletal pain in at least one region was reported by 91 participants (74.0%). The low back (51.2%), upper back (36.6%) and neck (18.7%) were most frequently affected, and 63 participants (51.2%) reported pain at two or more sites. Mean PCS declined progressively from 55.23 (no pain) to 33.43 (>3 sites), and mean MCS declined from 57.39 to 44.09-44.84 across the same groups. Pain-site count showed a strong negative correlation with PCS (Spearman $\rho = -0.824$, $p < 0.001$) and a moderate negative correlation with MCS ($\rho = -0.603$, $p < 0.001$); Kruskal-Wallis testing confirmed significant between-group differences for both PCS ($H = 82.81$, $p < 0.001$) and MCS ($H = 45.47$, $p < 0.001$).

Conclusion: A wider distribution of musculoskeletal pain is significantly associated with poorer physical and mental health-related quality of life among secondary school female teachers, with the association being stronger for the physical component. Comprehensive physiotherapy screening for multisite pain, rather than assessment of a single symptomatic region, is warranted in this occupational group.

Keywords: Musculoskeletal pain, pain distribution, quality of life, SF-12, Modified Nordic Questionnaire, female teachers, occupational health

1. INTRODUCTION

Musculoskeletal disorders (MSDs) are an important occupational health concern comprising symptoms or disorders of the muscles, tendons, joints, ligaments and related structures, which may develop or worsen when occupational demands repeatedly exceed the capacity of the musculoskeletal system. Teaching is often perceived as a predominantly cognitive profession; however, routine classroom work also involves considerable physical exposure. Teachers commonly spend prolonged periods standing, repeatedly write on boards, reach with the upper limbs, bend or rotate the trunk while interacting with students, and remain seated for lesson planning, evaluation and administrative work. A systematic review has reported a high burden of self-reported MSDs among teachers, with the back, neck and upper limbs among the most frequently affected regions ^[7].

The occupational environment of secondary school teachers may intensify these exposures further, as a working day can include several consecutive classes, movement between classrooms, supervision, examination duties, correction of written work and administrative responsibilities. Repeated exposure without adequate variation or recovery may contribute to fatigue and discomfort involving the neck, shoulders, upper back, lower back, knees, ankles and upper limbs ^[1,2,6].

Female teachers form an important group for study because several investigations have reported a greater prevalence of musculoskeletal symptoms among women than men ^[5,7]. The observed difference is likely multifactorial, reflecting the interaction of occupational workload, anthropometric and physical-capacity factors, psychosocial demands and responsibilities outside the workplace, rather than a single biological explanation.

Musculoskeletal pain is not always restricted to a single anatomical location. Some individuals report localized or single-site pain, whereas others experience symptoms in two or more body regions concurrently. This distinction is clinically important because the number and distribution of painful sites may represent a broader measure of musculoskeletal burden than the presence of pain alone. As the number of painful regions increases, the cumulative effect may extend beyond local discomfort to reduced mobility, lower physical endurance, difficulty maintaining work postures and limitations in routine activities; in teachers, MSDs have been associated with impaired work ability, absenteeism and reduced job performance ^[4,5].

Quality of life (QoL) is a multidimensional concept reflecting an individual's perceived physical, psychological and social well-being. Musculoskeletal pain can affect QoL through several pathways, including restriction of physical activity, disturbed sleep, fatigue, reduced participation, emotional distress and difficulty performing occupational or household roles. Musculoskeletal problems have been associated with poorer quality of life, particularly in physical health domains, and a greater symptom burden has been linked with poorer physical and mental components of quality of life among teachers ^[3,4,5].

Despite substantial literature describing the prevalence of MSDs among teachers, fewer studies have specifically examined the distribution of pain across body regions and its relationship with quality of life in secondary school female teachers. The present study therefore assesses musculoskeletal pain distribution using the Modified Nordic Questionnaire and evaluates health-related quality of life using the

SF-12, to clarify whether increasing or multi-regional pain burden corresponds with poorer physical and mental health in this occupational group.

2. NEED OF THE STUDY

Secondary school teaching is physically more demanding than it may appear, with a routine working day repeatedly exposing teachers to prolonged standing, sustained sitting, board writing, reaching, forward bending, classroom movement and lengthy periods of evaluation work. The clinical concern is not merely whether pain is present, but how widely it is distributed: pain limited to one anatomical region may produce a localized functional problem, whereas pain involving several regions can simultaneously affect standing tolerance, walking, stair use, reaching, concentration, sleep and participation in daily activities. Evidence specifically linking the number and distribution of painful body regions with both physical and mental components of quality of life remains limited, particularly in the local secondary-school setting. Understanding this relationship can shift physiotherapy assessment from isolated symptom treatment toward comprehensive screening of multisite pain, functional limitations and occupational exposure, while guiding ergonomic education, movement breaks, individualized exercise programmes and early referral for teachers at greater risk of reduced quality of life.

3. AIM AND OBJECTIVES

Aim

To assess the musculoskeletal pain distribution and its impact on quality of life among secondary school female teachers.

Objectives

- To determine the distribution of musculoskeletal pain in various anatomical sites using the Modified Nordic Questionnaire
- To assess quality of life using the SF-12 Questionnaire
- To examine the association between musculoskeletal pain distribution and quality of life

4. MATERIALS AND METHODOLOGY

Study Design and Setting

An analytical cross-sectional study was conducted among female secondary school teachers working in schools in Pune city.

Sample

- Target population: Female secondary school teachers
- Sample size: 123 participants were included in the final analysis
- Sampling method: Convenience sampling
- Sampling duration: 6 months

Materials

- Written informed consent form
- Modified Nordic Musculoskeletal Questionnaire
- SF-12 Health Survey Questionnaire
- Pen and data recording sheets

Inclusion Criteria

1. Female teachers aged 30-45 years

2. Currently employed at a secondary school
3. Minimum of two years of full-time teaching experience

Exclusion Criteria

1. Pregnancy at the time of data collection
2. Recent fracture (within the preceding 6 months)

Outcome Measures

- Modified Nordic Musculoskeletal Questionnaire — for assessment of the presence and anatomical distribution of pain
- SF-12 Questionnaire — for assessment of health-related quality of life through Physical Component Summary (PCS) and Mental Component Summary (MCS) scores

5. PROCEDURE

- Ethical clearance was obtained from the Institutional Ethical Committee of Tilak Maharashtra Vidyapeeth, College of Physiotherapy, prior to data collection.
- Secondary schools in Pune city were approached, and eligible female teachers aged 30-45 years were screened according to the predefined inclusion and exclusion criteria.
- The aim, objectives and procedure of the study were explained to participants in understandable language.
- Written informed consent was obtained from each participant before enrolment.
- Demographic information was recorded, followed by administration of the Modified Nordic Musculoskeletal Questionnaire to identify the presence and anatomical distribution of musculoskeletal pain.
- The SF-12 questionnaire was administered to assess health-related quality of life (PCS and MCS scores).
- Data were collected using the pen-and-paper method; participants selected the response best representing their symptoms and health status.
- Completed questionnaires were checked for completeness; painful regions were coded, the number of painful anatomical sites was calculated, and participants were grouped according to pain distribution.
- Data were entered into a master sheet and analysed using appropriate descriptive and inferential statistical methods; findings were interpreted in relation to the study objectives.

6. STATISTICAL ANALYSIS

Continuous variables were summarized using mean and standard deviation where appropriate, while categorical variables were summarized using frequencies and percentages. The anatomical distribution of pain was described for the total sample; because a participant could report more than one painful region, regional percentages were not expected to sum to 100%. Pain-site count was treated as an ordered measure of musculoskeletal burden. Spearman rank correlation was used to examine the association between the number of painful sites and SF-12 PCS and MCS scores. The Kruskal-Wallis test was used to compare PCS and MCS across the five pain-distribution groups. Statistical significance was set at $p < 0.05$.

7. DATA ANALYSIS AND RESULTS

7.1 Sample Characteristics and Overall Pain Prevalence

A total of 123 secondary school female teachers were included in the final analysis. The mean age was 37.59 ± 4.65 years, with an age range of 30-45 years. Musculoskeletal pain in at least one anatomical region was reported by 91 participants (74.0%), while 32 (26.0%) reported no pain.

Variable	Result
Sample size	123
Age, mean $\pm$ SD	37.59 ± 4.65 years
Age range	30-45 years
Pain present	91 (74.0%)
No pain	32 (26.0%)

Table 1. Sample characteristics and overall pain prevalence

Overall Prevalence of Musculoskeletal Pain (n=123)

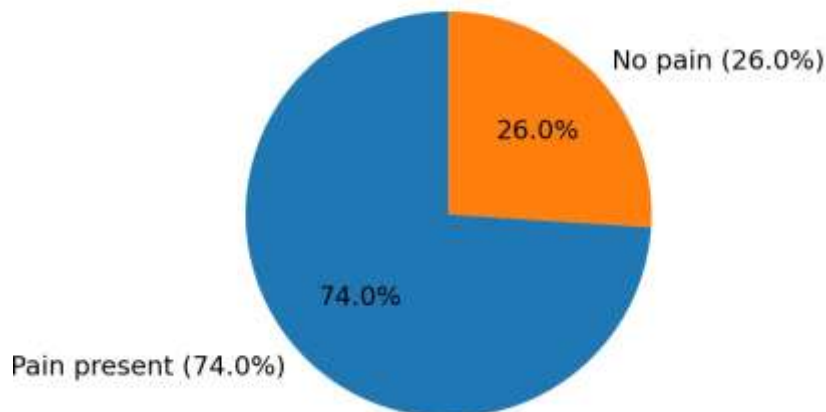


Figure 1: Overall Prevalence of Musculoskeletal Pain in the Study Sample

7.2 Distribution of Pain According to Anatomical Region

Pain was reported across multiple anatomical regions. As one participant could report pain at more than one site, regional percentages are calculated using the total sample (n = 123) and are therefore not expected to sum to 100%.

Pain Region	n	% of Sample
Low back	63	51.2%
Upper back	45	36.6%
Neck	23	18.7%
Ankles/Feet	20	16.3%
Hips/Thighs	18	14.6%
Shoulders	16	13.0%

Pain Region	n	% of Sample
Knees	16	13.0%
Wrists/Hands	3	2.4%
Elbows	1	0.8%

Table 2. Frequency of pain reported in each anatomical region

7.3 Distribution According to Number of Painful Sites

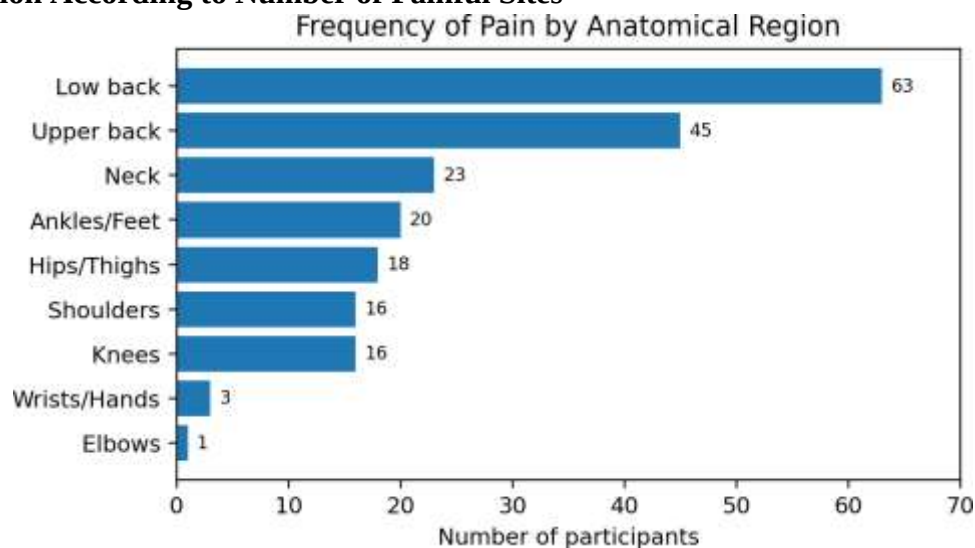


Figure 2: Frequency of Pain Reported in Each Anatomical Region

To examine pain distribution as a graded burden, participants were classified as having no pain, one-site pain, two-site pain, three-site pain, or pain in more than three anatomical sites.

Pain-Distribution Group	n	%
No pain	32	26.0%
One site	28	22.8%
Two sites	29	23.6%
Three sites	21	17.1%
>3 sites	13	10.6%

Table 3. Distribution of participants by number of painful anatomical sites

Overall, 63 participants (51.2%) reported pain at two or more sites, demonstrating a substantial multisite pain burden within the sample.

7.4 SF-12 Physical and Mental Component Scores Across Pain Groups

The overall mean Physical Component Summary (PCS) score was 46.89 ± 8.62 , and the overall mean Mental Component Summary (MCS) score was 51.37 ± 7.80 .

Pain Group	N	PCS Mean $\pm$ SD	MCS Mean $\pm$ SD
No pain	32	55.23 $\pm$ 2.21	57.39 $\pm$ 3.32
One site	28	50.38 $\pm$ 4.86	53.76 $\pm$ 5.98
Two sites	29	45.50 $\pm$ 4.87	50.62 $\pm$ 7.61
Three sites	21	39.79 $\pm$ 7.00	44.09 $\pm$ 7.44
>3 sites	13	33.43 $\pm$ 6.99	44.84 $\pm$ 5.66

Table 4. Mean PCS and MCS scores across pain-distribution groups

A progressive reduction in mean PCS was observed with increasing number of painful regions. Mean MCS also tended to be lower in groups with greater pain distribution, although the pattern was less strictly graded than for PCS.

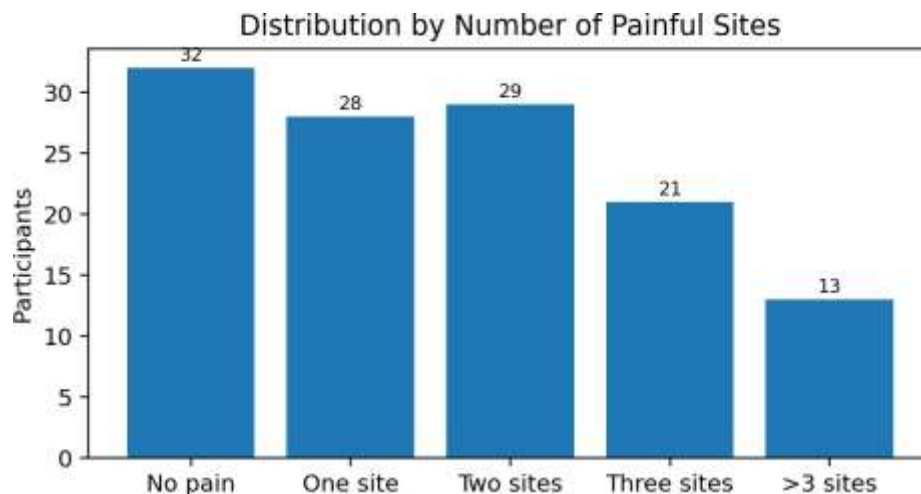


Figure 3: Distribution of Participants According to Number of Painful Sites

7.5 Association Between Pain Distribution and Quality of Life

As pain-site count is an ordered measure and group distributions may not meet parametric assumptions, Spearman rank correlation and the Kruskal-Wallis test were used for inferential comparison.

Analysis	Statistic	p value	Interpretation
Pain-site count vs PCS	$\rho = -0.824$	<0.001	Strong negative association
Pain-site count vs MCS	$\rho = -0.603$	<0.001	Moderate negative association
PCS across 5 pain groups	H = 82.81	<0.001	Significant group difference
MCS across 5 pain groups	H = 45.47	<0.001	Significant group difference

Table 5. Association between pain distribution and SF-12 component scores

The negative coefficients indicate that participants reporting pain in a larger number of anatomical regions generally had lower physical and mental quality-of-life scores. As the design was cross-sectional, these findings demonstrate association and do not establish causation.

8. RESULTS

A total of 123 secondary school female teachers aged 30-45 years (mean age 37.59 ± 4.65 years) were included. Musculoskeletal pain in at least one anatomical region was reported by 91 participants (74.0%), while 32 (26.0%) reported no pain. The low back was the most frequently affected region (51.2%), followed by the upper back (36.6%), neck (18.7%), ankles/feet (16.3%), hips/thighs (14.6%), shoulders (13.0%), knees (13.0%), wrists/hands (2.4%) and elbows (0.8%). Overall, 63 participants (51.2%) reported pain at two or more anatomical sites.

The overall mean SF-12 PCS score was 46.89 ± 8.62 and the overall mean MCS score was 51.37 ± 7.80 , both declining progressively as the number of painful regions increased. Pain-site count showed a strong negative association with PCS (Spearman $\rho = -0.824$, $p < 0.001$) and a moderate negative association with MCS ($\rho = -0.603$, $p < 0.001$). Kruskal-Wallis testing demonstrated significant differences across the five pain-distribution groups for both PCS ($H = 82.81$, $p < 0.001$) and MCS ($H = 45.47$, $p < 0.001$). Teachers with a greater number of painful anatomical regions therefore demonstrated poorer physical and mental health-related quality of life, with the association being stronger and more consistently graded for the physical component.

9. DISCUSSION

The present analytical cross-sectional study assessed musculoskeletal pain distribution and health-related quality of life among 123 secondary school female teachers aged 30-45 years. Musculoskeletal pain was reported by 74.0% of participants, with the low back the most commonly affected region (51.2%), followed by the upper back (36.6%) and neck (18.7%). More than half of the participants reported pain in two or more anatomical regions, showing that multisite pain was common in this population.

The predominance of spinal symptoms is comparable with previous teacher-based research. Darwish and Al-Zuhair reported a high prevalence of musculoskeletal pain among secondary school female teachers, with low back pain being particularly common [1]. Fahmy et al. similarly identified the neck, low back, knees and shoulders as commonly affected regions [5], while Erick and Smith, in their systematic review, reported frequent involvement of the low back, neck and shoulders among teachers generally [7]. Prolonged standing, sustained sitting, board writing, repeated reaching, bending and desk work may contribute to this cumulative musculoskeletal loading during the teaching day.

A major finding of the present study was the progressive reduction in physical quality of life with increasing pain distribution. Mean PCS was 55.23 in the no-pain group, 50.38 with one painful site, 45.50 with two sites, 39.79 with three sites and 33.43 with more than three sites. Pain-site count showed a strong negative correlation with PCS ($\rho = -0.824$, $p < 0.001$), and PCS differed significantly across pain-distribution groups ($H = 82.81$, $p < 0.001$), indicating that a wider distribution of pain is associated with poorer physical health-related quality of life.

Mental health-related quality of life also showed an inverse association with pain distribution. Mean MCS was highest in the no-pain group (57.39) and generally lower in pain groups, with a moderate negative correlation ($\rho = -0.603$, $p < 0.001$) and significant between-group differences ($H = 45.47$, $p < 0.001$). The

mental component did not decrease as uniformly as the physical component, suggesting that emotional well-being may additionally be influenced by coping ability, work stress, sleep and social support.

These findings are consistent with Vega-Fernandez et al., who reported a high prevalence of MSDs in teachers and better quality of life among teachers without MSDs [4], and with Fahmy et al., who demonstrated adverse physical and emotional effects of work-related MSDs [5]. Lavanya et al. similarly reported poorer health-related quality of life in teacher groups with greater health burden, particularly in physical health domains [3]. These comparisons support the observation that musculoskeletal symptoms may influence overall health status rather than remaining an isolated local complaint.

From a physiotherapy perspective, the findings support screening for the number and distribution of painful regions rather than focusing only on the most symptomatic site. Assessment of posture, movement patterns, strength, flexibility, endurance and work-related functional limitations may be particularly valuable when multisite pain is present. Ergonomic counselling, regular postural variation, planned movement breaks and individualized exercise programmes may help address occupational demands. As the study was cross-sectional, the findings indicate association and do not establish causation; however, the strong relationship between pain-site burden and PCS, and the significant association with MCS, highlight the clinical relevance of multisite pain in secondary school female teachers.

10. CONCLUSION

The present study demonstrated a significant inverse association between musculoskeletal pain distribution and health-related quality of life among secondary school female teachers aged 30-45 years. Teachers with no pain, or pain limited to fewer anatomical regions, generally had better SF-12 Physical Component Summary and Mental Component Summary scores than teachers with a wider distribution of pain. The relationship was strongest for physical quality of life, with a progressive decline in mean PCS as the number of painful regions increased; mental quality of life also tended to be lower with increasing pain burden. Low back and upper back pain were the most frequently reported symptoms, and more than half of the sample reported pain at two or more anatomical sites. These findings highlight the importance of assessing multisite pain rather than focusing only on a single symptomatic region, and support comprehensive physiotherapy screening, ergonomic education and early preventive intervention for teachers with pain distributed across multiple body regions.

11. LIMITATIONS

- Cross-sectional study design limits interpretation of cause-and-effect relationships.
- Convenience sampling from schools in Pune city may limit generalizability to teachers from other regions.
- Only female secondary school teachers aged 30-45 years were included; findings may not represent male teachers, other age groups or teachers at other educational levels.
- Musculoskeletal pain and quality of life were assessed using self-reported questionnaires and may be influenced by recall or response bias.
- Pain intensity, pain duration and clinical severity were not quantified in detail.

12. FUTURE SCOPE

- Future studies can include larger samples from multiple schools and different geographical regions.

- Longitudinal studies can examine whether increasing pain distribution predicts later reduction in quality of life.
- Male teachers, wider age groups, and teachers from primary, secondary and higher education can be included for comparison.
- Occupational and ergonomic exposures such as prolonged standing, sitting, board work, computer use and workload can be quantified.
- Future research can combine questionnaires with pain intensity, disability, posture, strength, flexibility, endurance and functional assessment.
- Intervention studies can evaluate ergonomic education, movement breaks and individualized strengthening, flexibility and endurance programmes.
- Psychosocial and lifestyle factors such as stress, sleep, physical activity and recovery can be studied in relation to multisite pain and quality of life.

13. CLINICAL IMPLICATIONS

- Routine physiotherapy screening of teachers should include the number and distribution of painful anatomical regions, not only the most symptomatic site.
- Teachers with multisite pain may benefit from whole-body assessment of posture, movement patterns, muscle strength, flexibility, endurance and work-related functional limitations.
- Ergonomic counselling should address prolonged standing, sustained sitting, board-writing posture, desk work, movement between classes and regular postural variation.
- Planned movement breaks and individualized mobility, strengthening, flexibility and endurance programmes may improve tolerance to occupational demands.
- Lower PCS and MCS scores with wider pain distribution may help identify teachers who need earlier preventive or rehabilitative attention.
- School-based physiotherapy awareness programmes may encourage early reporting, self-management and timely referral.

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15. REFERENCES

1. Al-Zarea BK. Musculoskeletal pain disorders among secondary school Saudi female teachers. Pain Research and Treatment. 2013;2013:878570.
2. Javed K, Safdar S, Shahid M. Prevalence and pattern of musculoskeletal pain disorders and related factors among female school teachers in Peshawar. Pakistan Journal of Medical and Health Sciences. 2021;15(8):1923-1927.
3. Lavanya M, Pradeep MVM, Anantharaman VV, Saranya S, Manoharan M. Health related quality of life among private school teachers in Chengalpattu district, Tamil Nadu, India – a cross sectional study. National Journal of Community Medicine. 2024;15(11):889-895.
4. Vega-Fernandez G, Olave E, Lizana PA. Musculoskeletal disorders and quality of life in Chilean teachers: a cross-sectional study. Frontiers in Public Health. 2022;10:810036.

5. Fahmy VF, Momen MAMT, Mostafa NS, Elawady MY. Prevalence, risk factors and quality of life impact of work-related musculoskeletal disorders among school teachers in Cairo, Egypt. BMC Public Health. 2022;22:2257.
6. Althomali OW, Amin J, Alghamdi W, Shaik DH. Musculoskeletal disorders among secondary schoolteachers in Hail, Saudi Arabia: a cross-sectional survey. International Journal of Environmental Research and Public Health. 2021;18:6632.
7. Erick PN, Smith DR. A systematic review of musculoskeletal disorders among school teachers. BMC Musculoskeletal Disorders. 2011;12:260.
8. Yue P, Liu F, Li L. Neck/shoulder pain and low back pain among school teachers in China: prevalence and risk factors. BMC Public Health. 2012;12:789.
9. Samad NIA, Abdullah H, Moin S, Tamrin SBM, Hashim Z. Prevalence of low back pain and its risk factors among school teachers. American Journal of Applied Sciences. 2010;7(5):634-639.
10. Metri KG, et al. Impact of workplace yoga on pain, mental health, sleep quality, and quality of life in female teachers with chronic musculoskeletal pain. Work. 2023;76(2):521-531.
11. Chong EYL, Chan AHS. Subjective health complaints of teachers from primary and secondary schools in Hong Kong. International Journal of Occupational Safety and Ergonomics. 2010;16(1):23-39.
12. Korkmaz NC, Cavlak U, Telci EA. Musculoskeletal pain, associated risk factors and coping strategies in school teachers. Scientific Research and Essays. 2011;6(3):649-657.
13. Woolf AD, Pfleger B. Burden of major musculoskeletal conditions. Bulletin of the World Health Organization. 2003;81(9):646-656.
14. Hoy D, Brooks P, Blyth F, Buchbinder R. The epidemiology of low back pain. Best Practice and Research Clinical Rheumatology. 2010;24(6):769-781.
15. Picavet HSJ, Schouten JSAG. Musculoskeletal pain in the Netherlands: prevalences, consequences and risk groups. Pain. 2003;102(1-2):167-178.
16. World Health Organization. WHO guidelines on physical activity and sedentary behaviour. Geneva: World Health Organization; 2020.