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Work-Related Musculoskeletal Disorders Among University Faculty in Kolkata: An Institutional-Based Cross-Sectional Study

Gaijilung Dangmei[1], Golam Hembram[3], Glory Dangmei[4], Md Washif Saikh[3], Ayesha Siddiquee[3], Sanhita Sengupta[1,2*]

[1]Assistant Professor, Department of Allied Health Sciences, Brainware University, Barasat, Kolkata, 700125, West Bengal, India
[2]PhD Scholar, Department of Physiotherapy, Teerthanker Mahaveer University, Moradabad, Uttar Pradesh, 244102
[3]Student of Bachelor of Physiotherapy, Department of Allied Health Sciences, Brainware University, Barasat, Kolkata, 700125, West Bengal, India
[4]Assistant Professor, Department of Physiotherapy, Aditya College of Physiotherapy, & Health Sciences, A.M.C Road D Block, Bordoloi Avenue, Aditya Diagnostic and Hospitals Campus, Assam, 786005, India

Corresponding Author: Sanhita Sengupta, sas.ah@brainwareuniversity.ac.in

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Abstract

Background: Musculoskeletal disorders (MSDs) are a major occupational health issue among university faculty due to prolonged sitting, repetitive tasks, and poor ergonomics. Understanding their prevalence and associated factors is essential for targeted intervention.
Objective: To assess the prevalence, anatomical distribution, and gender-based associations of MSDs among university faculty members in Kolkata.
Methods: A cross-sectional study was conducted using a structured questionnaire administered to 300 university faculty members, of whom 240 responded (response rate: 80%). The questionnaire collected data on demographic variables, MSD symptoms over the past 12 months and 4 weeks, and work-related factors such as sitting and computer use. Descriptive statistics were used to analyze prevalence, and Pearson's chi-square test assessed gender-based associations.
Results: A total of 75.8% of respondents experienced MSD symptoms over the previous year, with 53.3% reporting symptoms in the past month. The most affected regions were the neck (28.8%), lower back (24.2%), shoulders (13.8%), and upper back (12.5%). Average daily sitting and computer use times were 4.8 and 3.5 hours, respectively. Chi-square analysis revealed no significant gender association for most anatomical regions, except for hip/thigh pain ($p = 0.015$). Upper back ($p = 0.076$) and wrist/hand pain ($p = 0.071$) showed borderline statistical associations.
Conclusion: There is a high prevalence of MSDs among university faculty in Kolkata, especially in the neck and lower back regions. Although most gender differences were not statistically significant, the findings highlight the need for ergonomic education and preventive measures within academic institutions.

1.INTRODUCTION

Musculoskeletal disorders (MSDs) are injuries or pain affecting the body's joints, ligaments, muscles, nerves, tendons, and blood vessels in the limbs, neck, and back. These conditions can cause discomfort and pain. When these injuries occur at work, they are called work-related musculoskeletal disorders (WMSDs) [1]. MSD symptoms can range from mild to severe and may include pain, swelling, numbness, tingling, and restricted joint movement [2]. WMSDs are primarily associated with three key contributing factors. The first includes physical characteristics such as awkward postures, repetitive motions, heavy lifting, and exposure to cold. The second involves psychological factors like work pace, employee control, monotony, scheduling, task demands, colleague support, and job security. The third consists of individual factors related to age, gender, job activities, sports participation, household responsibilities, leisure activities, and prior musculoskeletal issues [3].

WMSDs are prevalent among various populations around the world. Krishnan et al (2021) investigated the prevalence of WMSDs among nurses working in Malaysia. They found a high prevalence of 97.3% mostly affecting the lower back and ankle [4]. Zher et al (2023) conducted a study on police personnel of Sabah's West Coast district. They found that 34.81% of people had MSDs [5]. Suganthirababu et al. (2021) conducted a study in India to assess

the prevalence of WMSDs among dentists, physiotherapists, and surgeons. They found a high prevalence of over 70% [6]. Rickert et al. (2021) studied the prevalence of musculoskeletal disorders in dental professionals in Germany, finding that 92.6% of dentists reported musculoskeletal complaints [7]. Halkai KR et al (2022) investigated the prevalence of WMSDs among dentists in India. Dentists showed the greatest prevalence of WMSDs, especially in the back (both upper and lower), hands and wrists, shoulders, and neck [8]. Jacquier-Bret et al. investigated the prevalence of WMSDs among healthcare professionals in France and found that over 75% of all health professionals reported very high rates of musculoskeletal disorders [9]. In their study, Parto et al. explored the incidence of musculoskeletal disorders among Canadian higher education students. They found that the prevalence of MSDs in the lower back and neck regions ranged from 59% to 67% over the past year and from 43% to 49% within the past week [10]. Sheth et al. conducted a study on the prevalence of WMSDs among metropolitan bus transit drivers in India, finding that the prevalence is 49.2% [11]. A study by Biswas et al. focused on the occurrence of MSDs among carpenters in West Bengal, India. They found that the prevalence of MSDs was notably high, reaching 93.3%. The lower back was identified as the most affected area, followed by the waist, shoulder, neck, wrist, head, and knee [12]. Teachers are most frequently affected by WMSDs. The high prevalence of WMSDs among teachers can be attributed to their diverse daily tasks and duties, which are performed repeatedly for extended hours without sufficient rest intervals.

In a study Fahmi et al (2022) evaluated the prevalence of WMSDs in teachers in Egypt. A prevalence rate of 66.77% for WMSDs was self-reported by teachers within the last 12 months [13]. Ojukwu et al. (2021) found a high prevalence of WMSDs among teachers, with 70.2% affected [14]. In their 2021 study, Suganthirababu et al. explored how widespread WMSDs were among Indian healthcare professionals, specifically dentists, physiotherapists, and surgeons. In this study, the 12-month prevalence of WMSDs in any body region among the CAMS faculty members was 55% [15]. In 2022, Tesfaye et al. explored the incidence of work-related upper limb disorders among academic staff at Ethiopian universities. The prevalence of these disorders in the last 12 months was 59.14% [16].

Teachers often face risk factors such as prolonged static postures and extended use of electronic devices (laptops & computers) to meet job demands. In India, research conducted on college teachers reported a high occurrence of work WMSDs, with the neck and knees being the most commonly affected regions. To the best of our knowledge, no studies have been carried out to assess the prevalence of WMSDs among university faculty members in Kolkata.

The study aimed to determine the prevalence of WMSDs among university faculty in Kolkata using the Extended Nordic Musculoskeletal Questionnaire (NMQ-E).

2. MATERIALS AND METHODS

The study was an institution-based cross-sectional study conducted at Brainware University, Kolkata, involving faculty members from various departments. The sample size estimation was performed using this formula:

$$n = [z^2 * p * (1 - p) / e^2] / [1 + (z^2 * p * (1 - p) / (e^2 * N))],$$

where z = 1.96, p = 0.5, N = 1500, and e = 0.05. The final sample size was approximately 306. Participants were recruited using convenience sampling. Faculty aged 25 to 60 years with at least one year of teaching experience were included, while those on sick or maternity leave or with a history of prior accidents or musculoskeletal injuries were excluded. Participant responses were collected using the Extended Nordic Musculoskeletal Questionnaire (NMQ-E) and a self-report survey. The original Nordic Questionnaire by Kuorinka et al. [17] was extended in the NMQ-E to assess point, 12-month, and lifetime prevalence of musculoskeletal symptoms (Appendix 1) [18], their severity, and impact on daily activities. It also included treatment-related questions such as hospitalization and covered nine body regions within a short administration time [19]. Ethical approval was obtained from the Institutional Ethical Committee of Brainware University before the study began. All participants were informed about the purpose and procedure of the study and provided written informed consent. Participants joined the study voluntarily, with full protection of their privacy and confidentiality. A total of 300 faculty members were approached, of whom 240 returned the completed questionnaires. Data collection involved the NMQ-E and a self-administered questionnaire, which included demographic details and work-related information. The NMQ-E, a concise one-page tool, took about 10–15 minutes to complete and consisted of 11 questions covering 9 body regions, generating 99 data points. It included 63 binary (yes/no) items aimed at identifying musculoskeletal complaints across specific anatomical areas. A body map (Figure 1) was provided to assist participants in indicating pain locations. The study focused on musculoskeletal symptoms in the neck, shoulders, upper back, elbows, wrists and hands, lower back, hips and thighs, knees, and ankles and feet [19].

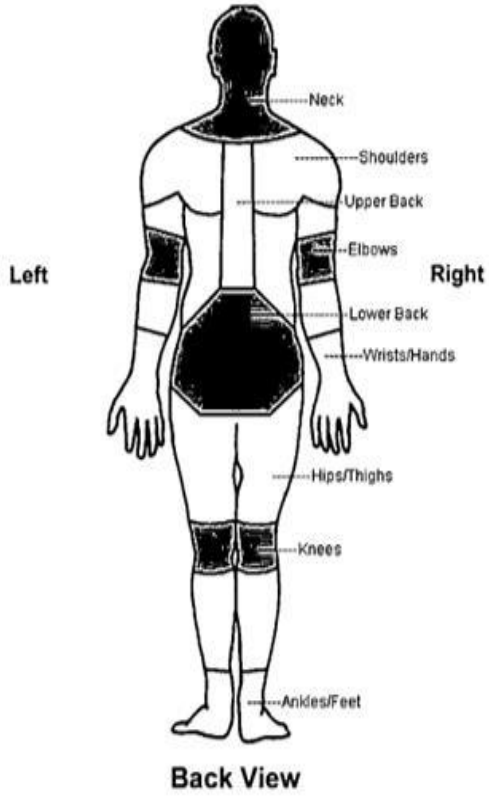

Figure 1: Body chart of Extended Nordic Musculoskeletal

3. STATISTICAL ANALYSIS

Statistical analysis, both descriptive and inferential, was performed on data collected from 240 faculty members. Mean and standard deviation were calculated for continuous variables (age, teaching experience, sitting duration, computer usage), while frequencies and percentages were used for categorical variables (gender, MSD region involvement). The prevalence of musculoskeletal disorders across body regions was illustrated using a pie chart. To examine associations between MSD involvement and factors such as age group, gender, teaching experience, sitting duration, and computer usage, Pearson's Chi-square test was conducted. A p-value of <0.05 was considered statistically significant. Results were presented using tables and bar diagrams.

4. RESULT

Descriptive Statistics

A total of 240 faculty members representing various departments took part in the study, with their demographic and work-related characteristics outlined in Table 1.

Table 1: Descriptive Statistics of Quantitative Variables

Variable	Mean	SD
Age (years)	32.11	5.55
Teaching Experience	5.06	4.48
Sitting Hours/Day	4.80	0.59
Computer Use Hours/Day	3.52	0.54

The mean age of the participants was 32.11 ± 5.55 years, indicating a relatively young working population. The average teaching experience was 5.06 ± 4.48 years, suggesting most participants were in the early to mid-stages of their professional careers. The average sitting duration due to work was 4.80 ± 0.59 hours per day, and the computer/laptop usage duration was 3.52 ± 0.54 hours per day. These data reflect substantial daily exposure to sedentary posture and screen time, which are potential contributors to musculoskeletal stress.

Regarding gender distribution, 56.67% of participants were female, and 43.33% were male, indicating a modest female predominance in the teaching population.

Prevalence of Musculoskeletal Disorders

The study revealed a high occurrence of musculoskeletal disorders (MSDs), involving multiple areas of the body.

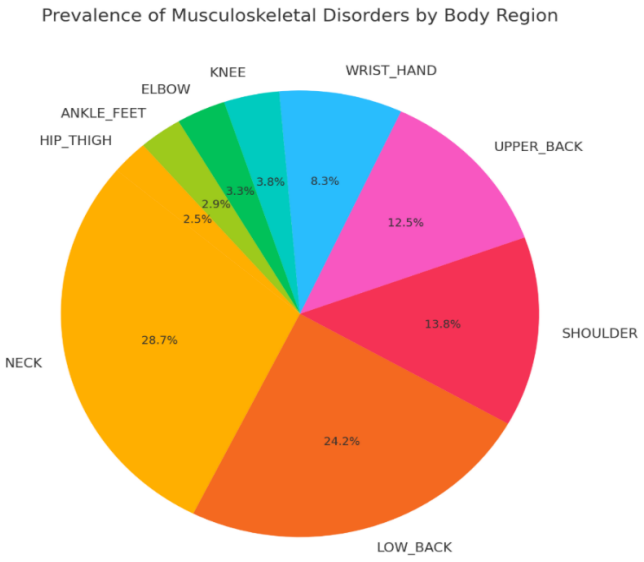

Figure 2: Pie Chart Depicting Distribution of MSDs by Body Region

Figure 2 is illustrating that the most frequently reported region was the neck, with 69 participants (28.7%) reporting discomfort. Subsequently, 24.2% of participants (n=58) experienced low back pain, while 13.8% (n=33) reported shoulder pain and 12.5% (n=30) had upper back pain. Less commonly affected areas included the wrist/hand (8.3%), knee (3.8%), elbow (3.3%), ankle/feet (2.9%), and hip/thigh (2.5%). Prevalence of MSD by region is summarized in Table 2.

Table 2: Prevalence of Musculoskeletal Disorders by Region

Region	Frequency	Percentage
Neck	69	28.7%
Low Back	58	24.2%
Shoulder	33	13.8%
Upper Back	30	12.5%
Wrist/Hand	20	8.3%
Knee	9	3.8%
Elbow	8	3.3%
Ankle/Feet	7	2.9%
Hip/Thigh	6	2.5%

These results indicate that postural stress from prolonged sitting and screen time may predominantly affect the cervical and lumbar spine.

Chi-square tests were conducted to examine the relationship between MSD involvement and demographic/occupational factors, including age group, gender, teaching experience, computer/laptop use, and sitting duration (Table 3).

Chi-Square Association Tests

Table 3: Chi-Square Test Results

Factor	Region	Chi² Value	p-value	Significant
Gender	Hip/Thigh	5.85	0.0155	Yes
Teaching Experience	Wrist/Hand	9.90	0.0071	Yes

Out of all tested combinations, the following significant associations were observed:

1. Gender and Hip/Thigh Pain

A significant association was found between gender and pain in the hip/thigh region ($x^2 = 5.85$, $p = 0.0155$). This suggests that gender differences may influence susceptibility to MSDs in this area, possibly due to anatomical, hormonal, or occupational behavior differences.

2. Teaching Experience and Wrist/Hand Pain

There was a significant association between years of teaching experience and wrist/hand pain ($x^2 = 9.90$, $p = 0.0071$). This finding indicates that prolonged engagement in activities such as writing, typing, and using teaching aids may contribute to upper limb strain over time. Summary of Significant Chi-Square Test Results are shown in Table 3.

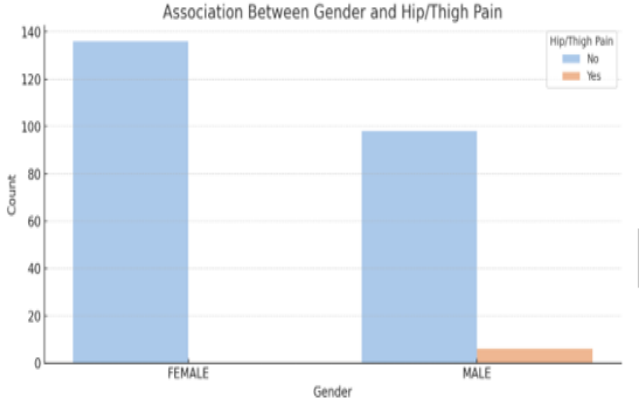

Figure 3

Figure 3: Gender vs. Hip/Thigh Pain

Figure 3 illustrates that gender is significantly associated with hip/thigh pain, potentially indicating gender-related susceptibility. A visibly higher proportion of one gender reports hip/thigh pain, confirming the statistical significance ($p = 0.0155$).

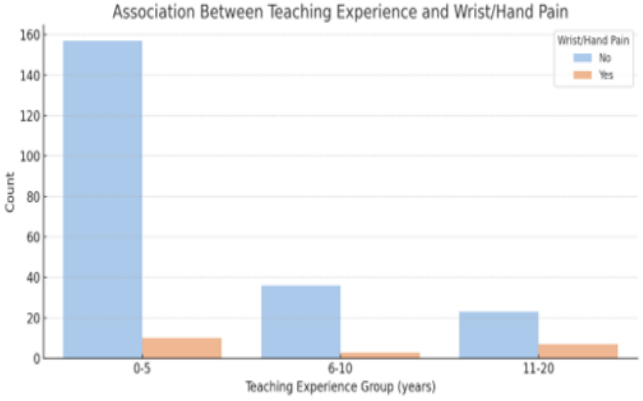

Figure 4

Figure 4: Teaching Experience vs. Wrist/Hand Pain

Figure 4 illustrates teaching experience is significantly associated with wrist/hand discomfort, likely due to cumulative occupational strain. Teachers with more experience tend to report a greater incidence of wrist/hand pain, consistent with the significant association ($p = 0.0071$).

No statistically significant associations were observed between MSDs and other factors such as age group, computer usage duration, or sitting duration for other regions, although trends suggested possible occupational influences that warrant further exploration in larger samples.

Comparison of Neck and Low Back Disorder Prevalence

Among 240 university faculties, neck pain (28.7%) and low back pain (24.2%) were the most reported musculoskeletal complaints, affecting 69 and 58 participants, respectively. The slightly higher prevalence of neck pain may result from sustained forward head posture, prolonged static sitting, and inadequate ergonomic support during teaching or computer use.

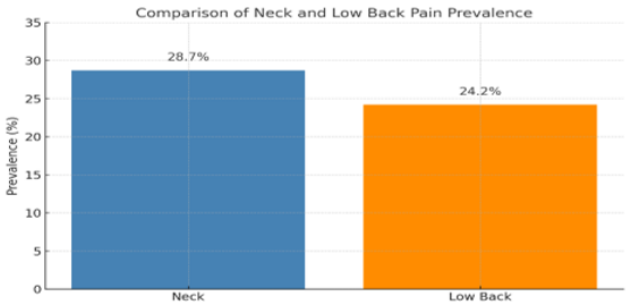

Figure 5

Figure 5: Comparison of Neck and Low Back Pain Prevalence

Figure 5 illustrates a bar chart comparison, clearly showing the marginally greater frequency of neck pain over low back pain.

5. DISCUSSION

Work-related Musculoskeletal disorders (WMSDs) are increasingly recognized as significant occupational hazards, especially in sedentary professions such as academia. This institutional-based cross-sectional study among university faculty in Kolkata provides critical insight into the burden, distribution, and associated demographic and work-related factors influencing musculoskeletal disorder (MSD) prevalence.

The findings demonstrate a high overall prevalence of WMSDs, with 75.8% of respondents reporting musculoskeletal pain in the past 12 months, and 53.3% experiencing pain in the past 4 weeks. The most commonly affected anatomical regions included the neck (28.8%), lower back (24.2%), shoulders (13.8%), and upper back (12.5%). These findings are consistent with studies conducted among office and academic workers globally. For instance, Abd-Elshafy et al. (2020) reported that 71.3% of Egyptian university professors experienced musculoskeletal symptoms, with the neck and lower back most affected [20]. Similarly, a study among Saudi faculty by Aldera et al. (2022) found that 73% of participants had at least one MSD symptom in the last 12 months, aligning closely with our findings [21].

Participants reported a mean sitting duration of 4.8 hours/day and computer use of 3.5 hours/day, both of which contribute to static postural load and repetitive strain. Although these durations may not seem excessive, when coupled with poor posture or limited movement, they are sufficient to cause chronic strain. Literature supports this association: Alsiddiky et al. (2020) found that sitting more than 4 hours per day significantly increased the risk of developing lower back and neck pain among desk workers [22]. A study by Shariat et al. (2018) also emphasized the impact of static postures maintained beyond 2–3 hours on muscle fatigue and discomfort in the upper body [23].

The mean age of participants was 32.1 years, and the average teaching experience was 5.1 years. While this relatively young demographic might suggest lower MSD risks, the data indicate a concerning early onset of symptoms. This may signal that preventive ergonomic practices are not adequately implemented even among younger professionals. Supporting this, Mohan et al. (2020) observed that younger university teachers with less than 10 years of experience showed higher reports of shoulder and neck strain, which they attributed to lack of ergonomic training early in careers [24].

The chi-square analysis showed no significant gender association with neck ($p = 0.33$), shoulder ($p = 0.94$), or most other MSDs. Upper back ($p = 0.076$) and wrist/hand pain ($p = 0.071$) showed borderline associations. Only hip/thigh pain was significantly associated with gender ($p = 0.015$). These results suggest that gender is not a strong predictor of MSDs for most body regions in this cohort, except for the hip/thigh, where a statistically significant association was found. This might be influenced by anatomical or biomechanical differences, or potentially due to differences in occupational and domestic role burdens between male and female faculty. Lee et al. (2020) reported that women were more likely to develop hip and lower limb MSDs, often associated with extended standing or walking outside of occupational contexts [25]. Similarly, Elgamal et al. (2021) suggested that cultural role expectations might amplify physical burdens on women, influencing MSD patterns [26].

The high incidence of upper body MSDs, particularly in the neck and upper/lower back, highlights the ergonomic mismatch in academic settings. These regions are prone to cumulative stress injuries resulting from forward head posture, rounded shoulders, and fixed gaze at monitor levels, especially if the monitor is below eye level. Fernandes et al. (2022) emphasized that university staff who did not follow ergonomic desk setup guidelines were 1.7 times more likely to report neck or back pain [27].

The borderline association of wrist/hand pain with gender could be reflective of variations in keyboard/mouse usage style or equipment fit. According to Ghasemi et al. (2021), improper wrist support and non-adjustable chairs led to a 2.5-fold increase in carpal tunnel symptoms among university clerical and academic staff [28].

Lower limb involvement (hip/thigh: 2.5%; knee: 3.8%; ankle/feet: 2.9%) was relatively low, aligning with other studies where static sitting posture limited biomechanical load on the lower extremities. However, these figures should not be underestimated. Studies show that inadequate seating (hard surfaces, poor thigh support) may still lead to hip discomfort over time [29].

6. CONCLUSION

This study confirms a high prevalence of musculoskeletal disorders (MSDs) among university faculty in Kolkata, with the neck (28.7%), back (24.2%), and shoulders (13.8%) most affected. Work-related factors, including prolonged sitting and computer use, significantly contribute to this burden. While most gender-based associations were non-significant, a notable relationship with hip/thigh pain was observed. These findings emphasize the critical need for proactive ergonomic and institutional interventions to safeguard the occupational health of faculty members. This study has several limitations. First, data were self-reported, which may introduce recall and reporting bias. The lack of objective ergonomic assessment limits precision in identifying workplace-related risk factors. Additionally, important confounders such as BMI, physical activity, and stress levels were not included. The study's single-institution setting may limit generalizability, and subgroup analyses may be underpowered due to the sample size.

7. FUTURE SCOPE

Future research should adopt longitudinal designs to track musculoskeletal disorder (MSD) progression over time. Incorporating ergonomic assessments, psychosocial variables, and objective measures (e.g., posture monitoring) would strengthen findings. Larger, multicenter studies across diverse institutions are needed for broader applicability. Intervention trials testing ergonomic and wellness programs could also inform institutional policies to reduce MSD burden among faculty.

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