

*Original Article*

# Association Between Ergonomic Awareness and Neck/Shoulder Pain in IT Professionals

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## ABSTRACT

**Background:** IT professionals are exposed to prolonged computer use, sustained sitting, repetitive upper-limb activity, and static neck and shoulder postures, which may increase the risk of work-related musculoskeletal symptoms. Ergonomic awareness is a modifiable occupational factor that may influence posture, workstation adjustment, break behavior, and early symptom prevention. **Objective:** This study aimed to determine the association between ergonomic awareness and neck and shoulder pain among IT professionals. **Methods:** An analytical cross-sectional study was conducted among 181 IT professionals at the University of Lahore, Lahore, Pakistan, using non-probability convenience sampling. Neck and shoulder pain were assessed using the Modified Nordic Musculoskeletal Questionnaire, pain intensity was measured using the Numeric Pain Rating Scale, and ergonomic awareness was assessed using an ergonomic knowledge questionnaire. Data were analyzed using IBM SPSS Statistics version 29. Descriptive statistics and chi-square tests were applied, with  $p < 0.05$  considered statistically significant. **Results:** The mean age of participants was  $29.8 \pm 3.1$  years. Neck pain was reported by 96 participants (53.0%), while shoulder pain was reported by 79 participants (43.6%). Moderate-to-severe pain affected 56 participants (30.9%) for neck pain and 38 participants (21.0%) for shoulder pain. Low ergonomic awareness was observed in 96 participants (53.0%), moderate awareness in 55 (30.4%), and high awareness in 30 (16.6%). Ergonomic awareness was significantly associated with neck pain intensity ( $\chi^2 = 10.00$ ,  $p = 0.009$ , Cramer's  $V = 0.166$ ) and shoulder pain intensity ( $\chi^2 = 17.00$ ,  $p = 0.011$ , Cramer's  $V = 0.217$ ). **Conclusion:** Lower ergonomic awareness was significantly associated with greater neck and shoulder pain intensity among IT professionals. Workplace ergonomic education and workstation-based preventive strategies may help reduce musculoskeletal symptom burden in computer-intensive occupations. **Keywords:** Ergonomic awareness; IT professionals; musculoskeletal disorders; neck pain; shoulder pain; workplace ergonomics.

## INTRODUCTION

Work-related musculoskeletal disorders are a major occupational health concern because they contribute to pain, reduced work ability, absenteeism, impaired productivity, and increased healthcare burden among working populations. These disorders commonly affect body regions exposed to repetitive activity, static postures, awkward positioning, and prolonged occupational loading, particularly in jobs that require sustained computer use and limited physical variation during work hours (1). In modern office and information technology environments, computer-based work has become central to daily occupational performance, but this transition has also increased exposure to sedentary behavior, prolonged sitting, repetitive keyboard and mouse activity, sustained visual display terminal use, and insufficient postural variation during the working day (2,3). As a result, IT professionals represent an occupational group with frequent exposure to biomechanical and behavioral risk factors that may contribute to neck and shoulder symptoms.

Ergonomics provides a preventive framework for optimizing the interaction between workers, workstations, tools, tasks, and the work environment. In computer-based occupations, ergonomic principles are particularly relevant because workstation design, monitor height, chair support, desk arrangement, keyboard and mouse placement, sitting posture, break patterns, and awareness of safe working practices may influence musculoskeletal loading of the cervical spine and shoulder girdle. Poor ergonomic conditions can increase static muscle activity, sustained cervical flexion, shoulder elevation, forward head posture, and repetitive upper-limb strain, all of which may contribute to discomfort, fatigue, and pain among computer users (4,5). Conversely, adequate ergonomic awareness may encourage safer workstation adjustment, regular postural correction, appropriate rest breaks, and early recognition of risk behaviors, thereby reducing the likelihood or severity of work-related musculoskeletal symptoms.

Previous literature has shown that musculoskeletal complaints are common among office and computer workers, with neck, shoulder, lower back, wrist, and hand symptoms frequently reported across different occupational settings (6,7). Systematic evidence also indicates that sedentary activity and prolonged computer use are associated with neck and shoulder disorders, particularly when combined with inadequate workstation design, poor posture, and repetitive work patterns (8). Studies among office-based workers have further demonstrated that ergonomic deficiencies, poor posture, and limited ergonomic knowledge may contribute to discomfort and reduced occupational performance (9,10). Although these findings support the importance of ergonomic risk reduction, much of the available evidence focuses either on general office workers, workstation deficiencies, or musculoskeletal prevalence, while fewer studies have specifically examined the relationship between ergonomic awareness and the intensity of neck and shoulder pain among IT professionals in local university-based settings.

This gap is important because ergonomic awareness is a modifiable factor. Unlike fixed demographic characteristics, awareness can be improved through training, workstation education, preventive counseling, and organizational health policies. If low ergonomic awareness is associated with higher neck and shoulder pain burden, then structured ergonomic education and workplace screening may offer a feasible preventive strategy for IT departments and similar computer-intensive workplaces. Establishing this association in IT professionals is therefore clinically and occupationally relevant because it can guide low-cost interventions aimed at reducing musculoskeletal symptoms before they progress into chronic work-related disorders.

The present study was conducted to determine the association between ergonomic awareness and neck and shoulder pain among IT professionals at the University of Lahore. The population of interest was full-time IT professionals with prolonged daily computer exposure; the exposure was level of ergonomic awareness; the outcomes were prevalence and intensity of neck and shoulder pain; and the study context was a university-based occupational setting. The objective of the study was to assess whether lower ergonomic awareness is significantly associated with greater prevalence and higher intensity of neck and shoulder pain among IT professionals.

## **MATERIALS AND METHODS**

This analytical cross-sectional study was conducted to assess the association between ergonomic awareness and neck and shoulder pain among IT professionals working at the University of Lahore, Lahore, Pakistan. A cross-sectional design was selected because the study aimed to measure ergonomic awareness and musculoskeletal symptoms at a single point in time and to examine whether differences in awareness level were associated with variation in neck and shoulder pain status and intensity. The study was completed over a four-month period after institutional approval of the research synopsis.

The study population consisted of male and female IT professionals aged 25 to 35 years who were working in a computer-based occupational role at the University of Lahore. Participants were selected

using a non-probability convenience sampling technique from the university's information technology work setting. Eligible participants were full-time IT professionals who used a computer for at least six hours per working day, were able to understand English, and provided consent to participate. Individuals were excluded if they had a diagnosed neurological disorder, previously diagnosed musculoskeletal disorder affecting the neck or shoulder, history of neck or shoulder surgery, previous trauma involving the neck or shoulder region, systemic disease likely to affect musculoskeletal pain reporting, or refusal to provide consent. A total of 181 eligible participants were included in the final analysis.

Data were collected through structured self-report assessment using three instruments. The Modified Nordic Musculoskeletal Questionnaire was used to identify the presence or absence of neck and shoulder pain. Pain intensity was assessed using the Numeric Pain Rating Scale, and responses were categorized into no pain, mild pain, moderate pain, and severe pain for both neck and shoulder regions. Ergonomic awareness was assessed using an ergonomic knowledge questionnaire, and participants were classified into low, moderate, and high ergonomic awareness categories according to their questionnaire responses. Demographic and occupational variables were also recorded, including age, sex, educational level, socioeconomic status, type of computer device used, work experience, daily working hours, and break pattern during work.

The primary exposure variable was ergonomic awareness level, categorized as low, moderate, or high. The primary outcome variables were neck pain and shoulder pain, each assessed both as a binary outcome and as an ordinal pain-intensity outcome. Neck pain and shoulder pain prevalence were defined as the proportion of participants reporting pain in the respective body region. Pain intensity was operationalized according to Numeric Pain Rating Scale category. Occupational variables, including working hours, device type, work experience, and break pattern, were treated as descriptive work-related characteristics relevant to interpretation of ergonomic exposure and musculoskeletal symptom burden.

Potential bias was addressed at the design and data-collection stages by applying uniform eligibility criteria, excluding participants with pre-existing neurological or musculoskeletal conditions that could independently explain neck or shoulder pain, using the same assessment tools for all participants, and collecting responses through a structured questionnaire format. Restricting the age range to 25–35 years also reduced age-related heterogeneity in musculoskeletal pain reporting. Data were reviewed for completeness before analysis, and only valid responses from eligible participants were included in the final dataset.

Data were analyzed using IBM SPSS Statistics version 29. Continuous variables were summarized using mean and standard deviation, while categorical variables were summarized using frequencies and percentages. The prevalence of neck pain, shoulder pain, ergonomic awareness categories, pain-intensity categories, and occupational characteristics was reported descriptively. The chi-square test of independence was used to examine the association between ergonomic awareness level and neck pain intensity and between ergonomic awareness level and shoulder pain intensity. Statistical significance was set at  $p < 0.05$ . The number of valid cases included in association testing was 181. Findings were interpreted in relation to the cross-sectional design, and no causal inference was made from the observed associations. Ethical principles for human participant research were followed throughout the study. Participants were informed about the purpose of the study, participation was voluntary, and consent was obtained before data collection. Confidentiality of participant responses was maintained, and the data were used only for research analysis. Data integrity was supported by structured data collection, uniform coding of categorical variables, and analysis of the final dataset using a single statistical software platform.

## RESULTS

A total of 181 IT professionals were included in the analysis. The mean age of participants was  $29.8 \pm 3.1$  years, with an age range of 25 to 35 years. The sample included a slightly higher proportion of female

participants than male participants, with females representing 55% of the study population and males representing 45%. Educational distribution was almost balanced, as 51% of participants had bachelor-level education and 49% had master-level education. Most participants belonged to the middle socioeconomic group, accounting for 55% of the sample, followed by low socioeconomic status in 27% and high socioeconomic status in 18%. Regarding occupational characteristics, 43% of participants used desktop computers, 36% used laptops, and 21% used both devices. Work experience was distributed between 1–3 years in 41% and 4–6 years in 59% of participants. Daily occupational computer exposure was reported as less than 6 hours in 19%, 6–8 hours in 44%, and 8–10 hours in 37% of participants. Break-taking patterns showed that 45% of participants took one break per working day, 43% took two breaks, and 12% took three breaks.

**Table 1. Demographic and Occupational Characteristics of IT Professionals (N = 181)**

Variable	Category	Frequency	Percentage
Age	Mean ± SD	29.8 ± 3.1 years	—
Age range	Minimum–maximum	25–35 years	—
Gender	Male	81	45%
Gender	Female	100	55%
Educational level	Bachelor's degree	92	51%
	Master's degree	89	49%
Socioeconomic status	Low	49	27%
	Middle	100	55%
	High	32	18%
Device used	Desktop	78	43%
	Laptop	65	36%
	Both desktop and laptop	38	21%
Work experience	1–3 years	74	41%
	4–6 years	107	59%
Daily working hours	Less than 6 hours	34	19%
	6–8 hours	80	44%
	8–10 hours	67	37%
Break pattern	One break per day	81	45%
	Two breaks per day	78	43%
	Three breaks per day	22	12%

Neck pain was reported by 96 participants, representing 53% of the total sample, while 85 participants, representing 47%, reported no neck pain. Shoulder pain was reported by 79 participants, corresponding to 44% of the sample, whereas 102 participants, corresponding to 56%, reported no shoulder pain. These findings indicate that neck pain was more prevalent than shoulder pain among IT professionals in this study, with an absolute difference of 9 percentage points between the two symptom regions.

**Table 2. Prevalence of Neck and Shoulder Pain Among IT Professionals (N = 181)**

Pain Region	Response	Frequency	Percentage
Neck pain	Yes	96	53%
	No	85	47%
Shoulder pain	Yes	79	44%
	No	102	56%

Pain-intensity distribution showed that 85 participants (47%) had no neck pain, 40 participants (22%) had mild neck pain, 36 participants (20%) had moderate neck pain, and 20 participants (11%) had severe neck pain. For shoulder pain, 102 participants (56%) reported no pain, 41 participants (23%) reported mild pain, 31 participants (17%) reported moderate pain, and 7 participants (4%) reported severe pain. Moderate-to-severe symptoms were more common for the neck than the shoulder, with 56 participants (31%) reporting moderate or severe neck pain compared with 38 participants (21%) reporting moderate or severe shoulder pain. Ergonomic awareness was low in 96 participants, representing 53% of the sample. Moderate ergonomic awareness was observed in 55 participants, representing 30%, while high ergonomic awareness was reported in 30 participants, representing 17%. Therefore, more than half of the IT professionals had low ergonomic awareness, and fewer than one-fifth demonstrated high

awareness. This distribution suggests a substantial gap in ergonomic knowledge within the study population.

**Table 3. Intensity of Neck and Shoulder Pain Among IT Professionals (N = 181)**

Pain Region	Intensity Category	Frequency	Percentage
Neck pain	No pain	85	47%
	Mild pain	40	22%
	Moderate pain	36	20%
	Severe pain	20	11%
Shoulder pain	No pain	102	56%
	Mild pain	41	23%
	Moderate pain	31	17%
	Severe pain	7	4%

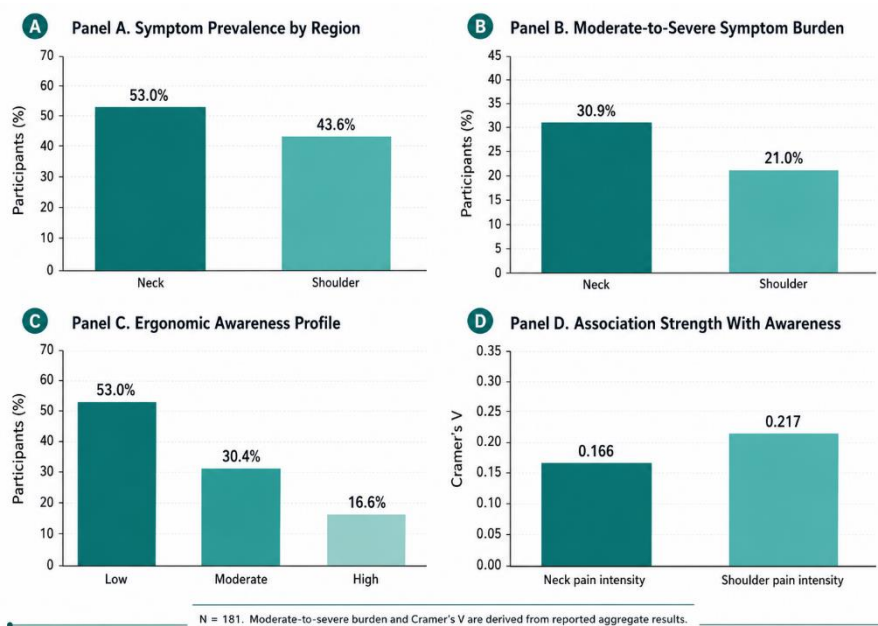
**Table 4. Ergonomic Awareness Level Among IT Professionals (N = 181)**

Ergonomic Awareness Level	Frequency	Percentage
Low ergonomic awareness	96	53%
Moderate ergonomic awareness	55	30%
High ergonomic awareness	30	17%
<b>Total</b>	<b>181</b>	<b>100%</b>

A statistically significant association was reported between ergonomic awareness and neck pain intensity, with a chi-square value of 10.00 and  $p = 0.009$ . The calculated Cramer’s V was 0.166, suggesting a small association between ergonomic awareness level and neck pain intensity. A statistically significant association was also reported between ergonomic awareness and shoulder pain intensity, with a chi-square value of 17.00 and  $p = 0.011$ . The calculated Cramer’s V was 0.217, indicating a small-to-moderate association. These findings suggest that lower ergonomic awareness was associated with greater musculoskeletal symptom burden in the neck and shoulder regions; however, the interpretation should remain non-causal because of the cross-sectional design.

**Table 5. Association Between Ergonomic Awareness and Neck/Shoulder Pain Intensity Among IT Professionals**

Outcome Variable	Exposure Variable	Statistical Test	Test Value	N	Cramer’s V	p-value
Neck pain intensity	Ergonomic awareness level	Chi-square test	$\chi^2 = 10.00$	181	0.166	0.009
Shoulder pain intensity	Ergonomic awareness level	Chi-square test	$\chi^2 = 17.00$	181	0.217	0.011



**Figure 1 Ergonomic Awareness and Neck/Shoulder Pain Burden in IT Professionals** Figure 1 demonstrates that neck pain produced the greater musculoskeletal burden among IT professionals, with any neck pain reported by 96 of 181 participants (53.0%)

*compared with shoulder pain in 79 participants (43.6%). Moderate-to-severe symptom burden was also higher for the neck region, affecting 56 participants (30.9%), whereas moderate-to-severe shoulder pain was reported by 38 participants (21.0%). Ergonomic awareness was predominantly low, with 96 participants (53.0%) classified in the low-awareness category, while only 30 participants (16.6%) demonstrated high ergonomic awareness. The reported association between ergonomic awareness and pain intensity was statistically significant for both regions, with a small association for neck pain intensity (Cramer's  $V = 0.166$ ;  $p = 0.009$ ) and a small-to-moderate association for shoulder pain intensity (Cramer's  $V = 0.217$ ;  $p = 0.011$ ), indicating that ergonomic awareness was meaningfully related to musculoskeletal symptom severity in this occupational sample.*

Overall, neck pain was more frequent and more severe than shoulder pain among the IT professionals. Neck pain affected 96 of 181 participants (53%), and 56 participants (31%) reported moderate-to-severe neck pain. Shoulder pain affected 79 of 181 participants (44%), and 38 participants (21%) reported moderate-to-severe shoulder pain. Ergonomic awareness was predominantly low, affecting 96 participants (53%), while only 30 participants (17%) had high awareness. The association analysis indicated statistically significant relationships between ergonomic awareness and both neck pain intensity ( $p = 0.009$ ) and shoulder pain intensity ( $p = 0.011$ ), with effect sizes suggesting that awareness level had a measurable but modest relationship with musculoskeletal symptom intensity in this sample.

## DISCUSSION

The present study examined the association between ergonomic awareness and neck and shoulder pain among IT professionals working in a university-based occupational setting. The principal finding was that musculoskeletal symptoms were common in this computer-intensive professional group, with neck pain reported by 96 of 181 participants (53.0%) and shoulder pain reported by 79 participants (43.6%). Symptom severity was also clinically relevant, as moderate-to-severe neck pain was present in 56 participants (30.9%), while moderate-to-severe shoulder pain was present in 38 participants (21.0%). Ergonomic awareness was predominantly low, affecting 96 participants (53.0%), whereas only 30 participants (16.6%) demonstrated high ergonomic awareness. The reported association analysis showed statistically significant relationships between ergonomic awareness and both neck pain intensity ( $\chi^2 = 10.00$ ,  $p = 0.009$ , Cramer's  $V = 0.166$ ) and shoulder pain intensity ( $\chi^2 = 17.00$ ,  $p = 0.011$ , Cramer's  $V = 0.217$ ). These findings indicate that lower ergonomic awareness was associated with greater neck and shoulder pain burden, although the cross-sectional design does not allow causal interpretation.

The high prevalence of neck and shoulder pain observed in this study is consistent with the broader occupational health literature showing that work-related musculoskeletal disorders are common among individuals engaged in prolonged computer-based work. Computer users are exposed to sustained sitting, repeated keyboard and mouse activity, static cervical posture, forward head positioning, and prolonged visual display terminal use, all of which may contribute to increased loading of the cervical and shoulder regions. Prior systematic evidence has identified work-related musculoskeletal disorders as a major source of disability and productivity loss among working populations, while studies among computer users have similarly reported frequent symptoms involving the neck, shoulder, wrist, hand, and lower back regions (11,12). The present findings extend this evidence by showing that neck and shoulder symptoms are not only prevalent among IT professionals but also appear to vary meaningfully according to ergonomic awareness level.

The stronger burden of neck symptoms compared with shoulder symptoms may reflect the biomechanical demands of prolonged screen-based work. Sustained monitor viewing, inadequate screen height, forward head posture, and static cervical loading can increase muscular demand in the cervical extensor and upper trapezius regions. In contrast, shoulder pain may be more strongly influenced by mouse use, keyboard placement, arm support, and shoulder elevation during work. The finding that 30.9% of participants had moderate-to-severe neck pain compared with 21.0% for shoulder pain suggests that the cervical region may be particularly vulnerable in this population. This pattern is compatible with previous evidence linking sedentary activity and computer-based work with neck and shoulder disorders, particularly when workstation design and posture are suboptimal (13).

Ergonomic awareness emerged as an important occupational factor in the present study. More than half of the participants had low ergonomic awareness, and this group contributed substantially to the overall burden of neck and shoulder symptoms. Although awareness alone may not guarantee correct ergonomic behavior, it is a necessary first step in risk recognition, workstation adjustment, postural correction, and adoption of preventive strategies. IT professionals with greater ergonomic awareness may be more likely to adjust monitor height, maintain appropriate chair and desk alignment, position the keyboard and mouse properly, take regular breaks, and recognize early symptoms before they progress. These mechanisms may explain the observed inverse pattern between awareness level and musculoskeletal symptom intensity. However, because the study did not directly measure workstation design, posture, or compliance with ergonomic recommendations, the observed associations should be interpreted as evidence of relationship rather than proof of mechanism.

The findings are also consistent with studies showing that inadequate ergonomic practices and poor workstation conditions are associated with musculoskeletal complaints among office and computer workers. Research among office desk workers has emphasized that ergonomic assessment is essential for identifying workplace risk factors, while studies of computer workstation deficiencies have reported associations with musculoskeletal and visual symptoms among computer users (14,15). Similarly, evidence from remotely working information technology professionals has highlighted the relevance of ergonomic awareness in computer-based occupational settings, especially when workers spend prolonged periods at workstations without optimal ergonomic support (16). In this context, the current findings reinforce the practical importance of ergonomic education as a low-cost preventive strategy for IT professionals.

The effect sizes observed in the present study were small for neck pain intensity and small-to-moderate for shoulder pain intensity. This suggests that ergonomic awareness is relevant but is unlikely to be the only determinant of musculoskeletal symptoms. Neck and shoulder pain among IT professionals may also be influenced by workstation layout, physical activity level, psychosocial stress, job demands, sleep quality, prior pain history, break frequency, workload, body mass index, and individual health behaviors. Therefore, ergonomic awareness should be viewed as one component of a broader occupational health framework. Future interventions should combine ergonomic education with workstation assessment, organizational break policies, postural training, stretching programs, and periodic musculoskeletal screening.

The clinical and occupational implications of this study are important. Since a substantial proportion of IT professionals reported low ergonomic awareness and clinically meaningful pain intensity, workplace-based ergonomic training may be justified. Regular educational sessions could focus on correct monitor height, chair adjustment, lumbar and arm support, keyboard and mouse placement, visual display distance, neutral neck posture, and the importance of microbreaks. Organizations may also benefit from periodic ergonomic audits to identify workstation-level risks and from policies that encourage active breaks during prolonged computer work. Such strategies may help reduce symptom burden, improve comfort, and support productivity among IT professionals.

This study has several limitations. The cross-sectional design limits causal inference because ergonomic awareness and pain were measured at the same time. The use of non-probability convenience sampling from a single university setting may limit generalizability to IT professionals working in other institutions, corporate environments, or remote settings. Data were self-reported, which may introduce recall bias and response bias. The study did not include direct observational workstation assessment, objective posture analysis, physical activity measurement, psychosocial variables, or detailed lifestyle factors, all of which may influence neck and shoulder pain. In addition, the ergonomic awareness questionnaire should be described further in terms of scoring, reliability, validity, and cut-off criteria in future reporting. Despite these limitations, the study provides useful preliminary evidence that

ergonomic awareness is significantly associated with neck and shoulder pain intensity among IT professionals.

## CONCLUSION

This study concluded that neck and shoulder pain were common among IT professionals, with neck pain affecting 53.0% and shoulder pain affecting 43.6% of participants. More than half of the participants had low ergonomic awareness, and ergonomic awareness was significantly associated with both neck pain intensity and shoulder pain intensity. The findings suggest that lower ergonomic awareness is linked with greater musculoskeletal symptom burden in computer-based occupational settings. Although causal conclusions cannot be drawn from the cross-sectional design, the results support the need for structured ergonomic education, workstation assessment, regular breaks, and preventive workplace strategies to reduce neck and shoulder discomfort among IT professionals.

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