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Original Article

Awareness of Ergonomics in Medical University Teachers of Karachi

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ABSTRACT

Background: Medical university teachers may experience prolonged sitting, computer use, repetitive activities, and sustained postures, making awareness of ergonomic principles relevant to occupational health. Objective: To assess ergonomics awareness among medical university teachers in Karachi and determine its association with age, gender, educational qualification, and teaching experience. Methods: A descriptive cross-sectional survey included 289 teachers recruited through non-probability convenience sampling from medical universities in Karachi. Awareness was assessed using a pilot-tested semi-structured questionnaire with a 20-point score classified as poor, fair, or good. Internal consistency was acceptable (Cronbach's alpha=0.715). Data were analysed using descriptive statistics, Pearson's chi-square tests, and crude odds ratios with 95% confidence intervals. Results: Poor awareness was identified in 162 participants (56.1%), fair awareness in 127 (43.9%), and good awareness in none. Poor awareness was more frequent among females than males (62.2% versus 42.0%). Gender was associated with awareness level (χ^2=10.082, p=0.0015), with females having greater crude odds of poor awareness (OR=2.27, 95% CI: 1.36–3.78). Awareness was not significantly associated with age (p=0.6915), educational qualification (p=0.1961), or teaching experience (p=0.2891). Conclusion: Poor ergonomics awareness was common among the participating medical university teachers. The gender association requires cautious interpretation because the analysis was unadjusted. Medical universities should evaluate faculty ergonomics-education needs using validated assessment methods. Keywords: Ergonomics; Awareness; Medical Faculty; Occupational Health; Workstation; Musculoskeletal Disorders.

INTRODUCTION

Ergonomics is the scientific discipline concerned with understanding interactions between individuals and the components of their working environment and applying this knowledge to improve human well-being and overall system performance. In occupational settings, ergonomic principles inform the design and arrangement of workstations, equipment, tasks, and environmental conditions so that these elements correspond to users' physical and functional capabilities (1,2). Appropriate ergonomic design may reduce unnecessary physical strain, improve comfort, and support safe and efficient performance during work-related activities.

Prolonged sitting, repetitive movements, sustained computer use, and awkward or static postures are recognized occupational factors associated with musculoskeletal discomfort and work-related musculoskeletal disorders (3–5). Medical university teachers may be particularly exposed to these factors because their responsibilities commonly involve preparing and delivering lectures, marking

assessments, conducting research, using computers, supervising students, and completing administrative work. Repeated or prolonged exposure to poorly arranged workstations may increase strain on the neck, shoulders, back, upper limbs, and other musculoskeletal regions. Awareness of ergonomic principles is therefore important because it enables workers to identify potentially harmful workplace arrangements and adopt appropriate workstation and postural practices.

Previous studies have reported variable levels of ergonomic awareness and musculoskeletal problems among educators. Back pain and work-related physical demands have been documented among teachers, highlighting the importance of appropriate working habits and regular physical-activity breaks (6). A study conducted among schoolteachers during online teaching found that many participants lacked sufficient awareness of ergonomic workstation principles and did not consistently apply them while working (7). In contrast, schoolteachers in Karachi demonstrated comparatively favourable awareness and practices regarding school ergonomics (8). Nevertheless, another study involving college teachers in Karachi reported a considerable burden of work-related musculoskeletal disorders, particularly involving the neck, shoulders, lower back, and knees (9). These differences may reflect variation in study populations, working environments, measurement instruments, and definitions of ergonomic awareness.

Evidence from healthcare professionals is similarly inconsistent. Limited ergonomic knowledge has been associated with musculoskeletal complaints among nurses, although knowledge does not necessarily translate into appropriate workplace practice (10). Studies involving physiotherapists, biomedical scientists, doctors, radiology personnel, and dentists have reported substantial variation in ergonomic knowledge and application across occupational groups (11–15). Some studies have identified associations between ergonomic knowledge and demographic or professional characteristics, including gender, whereas others have found no association with educational level or professional experience (11,12). These inconsistent findings indicate that occupational and demographic correlates of ergonomic awareness may differ across professional and institutional contexts.

Medical university teachers contribute to the education and professional development of future healthcare practitioners, yet evidence concerning their awareness of ergonomics in Karachi remains limited. Understanding their level of awareness may help identify educational and institutional needs related to workplace ergonomics. Therefore, this study aimed to assess the level of ergonomics awareness among medical university teachers in Karachi and determine whether awareness was associated with age, gender, educational qualification, and teaching experience.

MATERIALS AND METHODS

A descriptive cross-sectional survey was conducted among teachers working in medical universities in Karachi, Pakistan. The overall research project was completed over one year, within which participant recruitment and data collection were conducted over six months. The target population comprised medical university teaching personnel aged 30–60 years who had worked in their respective academic positions for at least one year. Eligible participants included lecturers, senior lecturers, assistant professors, associate professors, professors, and senior registrars with teaching responsibilities. Visiting faculty members, demonstrators, teachers holding BSPT or DPT qualifications, and individuals with congenital deformities were excluded.

Participants were recruited through non-probability convenience sampling from accessible medical universities in Karachi. Faculty members who met the eligibility criteria were invited to participate voluntarily. The minimum required sample was calculated using Epi Info software at a 95% confidence level and a 5% margin of error, using an expected prevalence derived from a previous study of ergonomics awareness among medical laboratory scientists (16). The resulting target sample was 289 participants, all of whom were included in the final analysis.

Data were collected using a pilot-tested, semi-structured questionnaire comprising demographic and ergonomics-awareness components. The demographic component recorded the participant's university, age, gender, academic designation, educational qualification, teaching field, and duration of teaching experience. Age was categorized as 30–45 or 46–60 years. Teaching experience was classified as 1–5, 6–10, 11–15, 16–20, or more than 20 years. Educational qualifications were grouped as bachelor's degree, master's degree, PhD or doctorate, and FCPS.

The second component contained questions assessing general awareness of ergonomics, sources of ergonomic information, and knowledge of recommended workstation characteristics and working practices. These included chair height and adjustability, backrest and armrest characteristics, desk and monitor positioning, legroom, visual angle, placement of frequently used equipment, screen distance, elbow position, work-break duration and frequency, sitting posture, and exercises performed during work intervals. Twenty knowledge items contributed to the awareness score. Each correct response was assigned one point, while an incorrect or "do not know" response was assigned zero points, producing a total score ranging from 0 to 20. Scores of 0–6 were classified as poor awareness, scores of 7–13 as fair awareness, and scores of 14–20 as good awareness. The internal consistency of the awareness component was acceptable, with a Cronbach's alpha of 0.715; the reliability analysis included 23 applicable questionnaire items.

A pilot assessment was conducted before the main survey to evaluate the questionnaire's clarity and internal consistency. The same questionnaire, administration procedure, and scoring criteria were applied to all participants. Institutional affiliations that were not specified by participants were treated as missing rather than as a separate university category.

Participation was voluntary. Participants received information about the purpose of the study before completing the questionnaire and provided informed consent. Personal information collected through the survey was kept confidential and was used solely for research purposes.

Data were analysed using IBM SPSS Statistics version 24.0. Categorical variables were summarized as frequencies and percentages. The distribution of poor, fair, and good ergonomics-awareness scores was calculated for the overall sample. Unadjusted associations between awareness category and age group, gender, educational qualification, and teaching experience were evaluated using Pearson's chi-square test. All tests were two-sided, and a p-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 289 medical university teachers were included in the analysis. Most participants were aged 30–45 years (68.9%), and approximately two-thirds were female (69.6%). Senior lecturers constituted the largest designation group (40.8%), followed by assistant professors (27.0%). The most frequently reported qualification was a PhD or other doctoral degree (31.1%). A total of 125 participants (43.3%) had 1–5 years of teaching experience, whereas 49 (17.0%) had more than 20 years of experience.

Table 1. Demographic and Professional Characteristics of Participants

Characteristic	Category	n	%
Age group, years	30–45	199	68.9
	46–60	90	31.1
Gender	Male	88	30.4
	Female	201	69.6
Academic designation	Professor	38	13.1
	Assistant professor	78	27.0
	Associate professor	50	17.3
	Senior lecturer	118	40.8
	Senior registrar	5	1.7
Educational qualification	Bachelor's degree	80	27.7
	Master's degree	78	27.0

Characteristic	Category	n	%
	PhD/doctorate	90	31.1
	FCPS	41	14.2
Teaching field	MBBS	101	34.9
	BDS	43	14.9
	MBBS and BDS	49	17.0
	MBBS, BDS, and DPT	54	18.7
	Pharm-D	4	1.4
	BDS, MBBS, DPT, and Pharm-D	24	8.3
	Other fields	14	4.8
Teaching experience, years	1–5	125	43.3
	6–10	36	12.5
	11–15	58	20.1
	16–20	21	7.3
	>20	49	17.0
University affiliation	Ziauddin University	59	20.4
	Jinnah Sindh Medical University	58	20.1
	Jinnah Medical and Dental College	38	13.1
	Bahria University Medical and Dental College	21	7.3
	Dow University of Health Sciences	19	6.6
	Sohail University	13	4.5
	Sir Syed University	13	4.5
	DOW	10	3.5
	United Medical and Dental College	7	2.4
	RUTHFPAU	2	0.7
	Jinnah Postgraduate Medical Centre	1	0.3
	Not reported	48	16.6

Data are presented as frequency and percentage of the total sample, N=289. Teaching fields are presented as the mutually exclusive combinations reported in the source data. Institutional abbreviations should be verified against the original dataset before publication. FCPS: Fellowship of the College of Physicians and Surgeons; MBBS: Bachelor of Medicine, Bachelor of Surgery; BDS: Bachelor of Dental Surgery; DPT: Doctor of Physical Therapy. More than half of the participants had poor ergonomics awareness. Of the 289 participants, 162 (56.1%) were classified as having poor awareness and 127 (43.9%) as having fair awareness. No participant achieved a score within the good-awareness category. Consequently, subsequent association analyses compared participants with poor and fair awareness.

Table 2. Distribution of Ergonomics-Awareness Levels

Awareness level	Score range	n	%	95% CI
Poor	0–6	162	56.1	50.3–61.7
Fair	7–13	127	43.9	38.3–49.7
Good	14–20	0	0.0	0.0–1.3

Percentages were calculated using N=289. Confidence intervals are 95% Wilson confidence intervals for proportions.

The proportion of participants with poor awareness was similar across the two age groups. Poor awareness was observed in 110 of 199 participants aged 30–45 years (55.3%) and 52 of 90 participants aged 46–60 years (57.8%). There was no evidence of an association between age group and ergonomics-awareness category (χ^2=0.157, df=1, p=0.6915). Participants aged 46–60 years had odds of poor awareness comparable to those aged 30–45 years (crude odds ratio [OR]=1.11, 95% CI: 0.67–1.83).

A larger proportion of female participants had poor awareness than male participants. Poor awareness was identified in 125 of 201 females (62.2%) compared with 37 of 88 males (42.0%). Gender was associated with ergonomics-awareness category (χ^2=10.082, df=1, p=0.0015). The crude odds of poor rather than fair awareness were 2.27 times higher among females than males (95% CI: 1.36–3.78). Percentages were calculated within each participant category. Odds ratios represent the crude odds of poor rather than fair awareness. The first category within each characteristic was the reference category. Associations were evaluated using Pearson's chi-square test. OR: odds ratio; CI: confidence interval.

Poor awareness was present in 60.0% of participants with a bachelor's degree, 60.3% of those with a master's degree, 46.7% of those with a PhD or doctorate, and 61.0% of FCPS-qualified participants. Although participants with a PhD or doctorate had a lower observed proportion of poor awareness than the other qualification groups, the overall association between educational qualification and awareness category was not statistically significant (χ^2=4.688, df=3, p=0.1961).

Table 3. Associations of Age and Gender With Ergonomics-Awareness Level

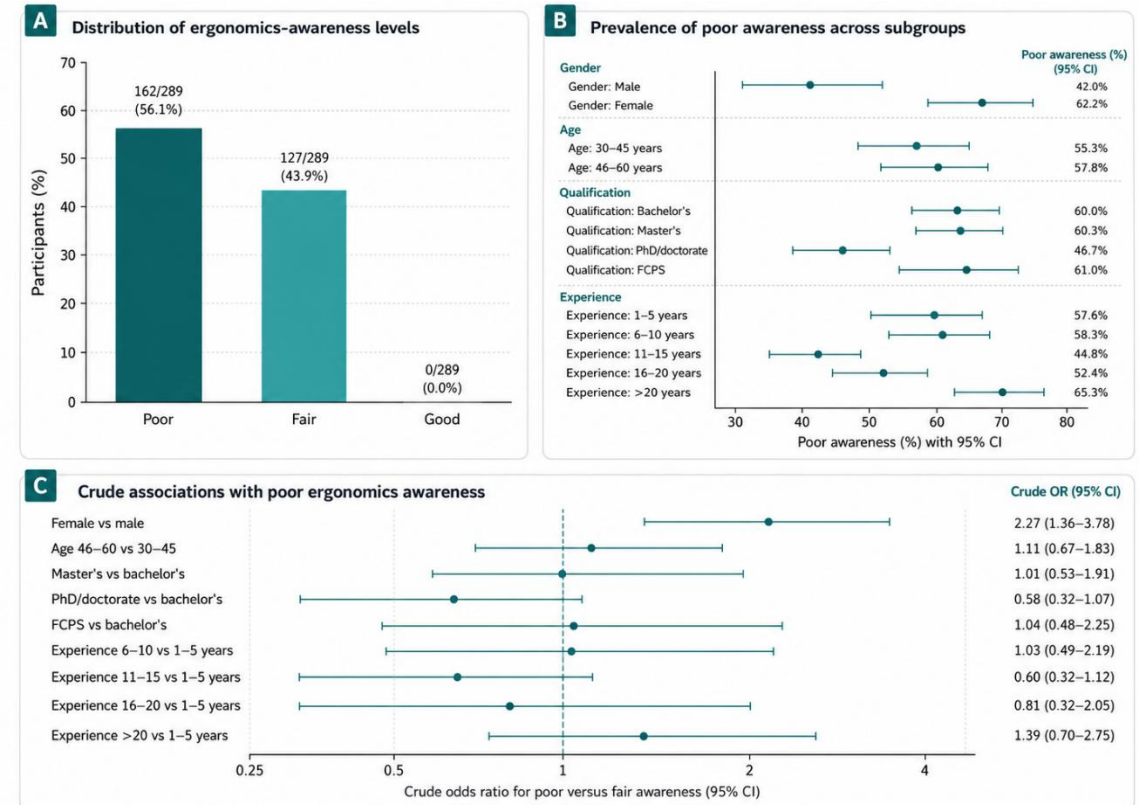
Characteristic	Category	Total n	Poor awareness, n (%)	Fair awareness, n (%)	Crude OR (95% CI)	χ^2 (df)	p-value
Age group, years	30–45	199	110 (55.3)	89 (44.7)	1.00	0.157 (1)	0.6915
	46–60	90	52 (57.8)	38 (42.2)	1.11 (0.67–1.83)	—	—
Gender	Male	88	37 (42.0)	51 (58.0)	1.00	10.082 (1)	0.0015
	Female	201	125 (62.2)	76 (37.8)	2.27 (1.36–3.78)	—	—

The proportion with poor awareness ranged from 44.8% among participants with 11–15 years of teaching experience to 65.3% among those with more than 20 years of experience. However, teaching experience was not significantly associated with ergonomics-awareness category (χ^2=4.982, df=4, p=0.2891).

Table 4. Associations of Educational Qualification and Teaching Experience With Ergonomics-Awareness Level

Characteristic	Category	Total n	Poor awareness, n (%)	Fair awareness, n (%)	χ^2 (df)	p-value
Educational qualification	Bachelor's degree	80	48 (60.0)	32 (40.0)	4.688 (3)	0.1961
	Master's degree	78	47 (60.3)	31 (39.7)	—	—
	PhD/doctorate	90	42 (46.7)	48 (53.3)	—	—
	FCPS	41	25 (61.0)	16 (39.0)	—	—
Teaching experience, years	1–5	125	72 (57.6)	53 (42.4)	4.982 (4)	0.2891
	6–10	36	21 (58.3)	15 (41.7)	—	—
	11–15	58	26 (44.8)	32 (55.2)	—	—
	16–20	21	11 (52.4)	10 (47.6)	—	—
	>20	49	32 (65.3)	17 (34.7)	—	—

Percentages were calculated within each qualification or teaching-experience category. Associations were evaluated using Pearson's chi-square test.



The figure 1 shows that 56.1% of medical university teachers had poor ergonomics awareness, 43.9% had fair awareness, and none achieved good awareness. Poor awareness was more prevalent among females than males (62.2% vs 42.0%), with females having

significantly higher crude odds of poor awareness (OR 2.27, 95% CI 1.36–3.78). No clear associations were observed for age, qualification, or teaching experience because their confidence intervals crossed the null value.

Overall, poor ergonomics awareness was common among the participating medical university teachers, with no participants reaching the good-awareness category. Gender was the only measured characteristic significantly associated with awareness category: females had a higher proportion and greater crude odds of poor awareness than males. Age, educational qualification, and teaching experience were not significantly associated with ergonomics-awareness level.

DISCUSSION

This study found that inadequate ergonomics awareness was common among medical university teachers in Karachi. More than half of the participants had poor awareness, while the remainder had fair awareness, and none achieved the predefined good-awareness category. Gender was associated with awareness level in the unadjusted analysis: 62.2% of female participants had poor awareness compared with 42.0% of male participants, and females had approximately twice the crude odds of poor rather than fair awareness. In contrast, awareness level was not significantly associated with age, educational qualification, or teaching experience.

The overall findings indicate that professional and academic experience alone may not ensure adequate understanding of ergonomic principles. The high frequency of poor awareness is broadly consistent with findings among schoolteachers undertaking online teaching, many of whom lacked sufficient knowledge of appropriate ergonomic arrangements and did not consistently apply ergonomic principles during work (7). Limited ergonomic awareness has also been reported among nurses, medical laboratory personnel, and employees from varied occupational settings (10,16,17). Similarly, technical staff members have demonstrated a need for additional ergonomics education and workplace training (18). These observations suggest that ergonomic knowledge may remain inadequate across occupations involving prolonged sitting, computer use, repetitive tasks, and sustained postures.

Not all previous evidence is consistent with the present findings. Schoolteachers in Karachi have previously demonstrated comparatively favourable awareness and application of school-ergonomics principles (8), while a study among doctors reported generally good ergonomic knowledge despite inadequate practical application (13). Differences between studies may reflect variation in occupational responsibilities, institutional environments, participant selection, questionnaire content, score thresholds, and the distinction between theoretical knowledge and actual workplace practice. The absence of any participant in the good-awareness category in the present study may therefore indicate both a substantial educational need and the influence of the instrument's scoring thresholds. Comparisons with studies using different measurement systems should consequently be interpreted cautiously.

Gender was the only measured characteristic significantly associated with awareness category. The proportion with poor awareness was 20.2 percentage points higher among females than males, and the crude odds of poor awareness were 2.27 times higher among females. A study of biomedical scientists similarly reported an association between gender and ergonomics knowledge (12). However, research among dental students found no significant association between gender and ergonomic knowledge (19), illustrating that demographic patterns are not consistent across populations. Computer-related symptoms and poor workstation ergonomics have also been reported more frequently among female bank employees, although that study evaluated clinical symptoms and workstation factors rather than awareness alone (20). The present finding should therefore be treated as an unadjusted association rather than evidence that gender independently determines ergonomics awareness. Differences in designation, teaching field, institution, occupational exposure, access to training, and other unmeasured factors may have contributed to the observed relationship.

Age was not significantly associated with awareness level, indicating that older participants did not demonstrate materially different awareness from younger participants. Educational qualification was also unrelated to awareness category, although participants with a PhD or doctorate had a numerically lower proportion of poor awareness than the other qualification groups. The lack of a statistically significant association suggests that advanced academic qualifications may not necessarily include training in workplace ergonomics. Similar findings have been reported among physiotherapists, for whom ergonomic knowledge was not significantly associated with educational level or years of professional practice (11). Teaching experience was likewise not associated with awareness in the present study. Although poor awareness was most frequent among participants with more than 20 years of experience and least frequent among those with 11–15 years of experience, the overall differences could have occurred by chance and should not be interpreted as a consistent experience-related trend.

The findings support consideration of structured ergonomics education for medical university faculty. Educational initiatives could address workstation arrangement, chair and desk adjustment, monitor positioning, sustained posture, equipment placement, scheduled breaks, and appropriate movement during prolonged academic work. Evidence from dental students indicates that targeted informational sessions can improve ergonomics knowledge scores (21). Nevertheless, the present study did not evaluate an educational intervention, workstation conditions, ergonomic practices, or musculoskeletal symptoms. It therefore cannot establish that training would reduce injuries or improve occupational performance. Future studies should evaluate whether educational programmes produce sustained improvements in knowledge, behaviour, workstation configuration, and musculoskeletal outcomes. Research among nursing personnel also indicates that awareness should be considered together with workplace practices and musculoskeletal health rather than as an isolated outcome (22).

This study included 289 teachers from multiple medical institutions and examined several demographic and professional correlates of ergonomics awareness. The reported contingency-table totals were internally consistent, and the main associations could be reproduced from the available aggregate data. However, several limitations should be considered. The non-probability sampling method may have introduced selection bias and limits the representativeness of the sample. The number of eligible teachers approached, the response rate, and the characteristics of non-participants were not available, preventing assessment of non-response bias. The cross-sectional design establishes associations at a single point in time and cannot determine temporal or causal relationships.

Awareness was assessed using a self-administered questionnaire, making the findings susceptible to recall, interpretation, and social-desirability bias. Although the instrument demonstrated acceptable internal consistency, its psychometric evidence was otherwise limited, and the awareness cut-offs were not externally validated in the study population. No participant reached the good-awareness category, which may reflect genuinely limited knowledge but may also have been influenced by the difficulty, content, or classification thresholds of the instrument. The analyses were unadjusted, so the observed gender association may have been affected by measured or unmeasured confounding. University affiliation was unreported for 48 participants, and the available data did not support institution-specific analyses. Finally, the study was conducted in Karachi and may not be generalizable to medical university teachers in other geographical, cultural, or institutional settings.

CONCLUSION

Poor ergonomics awareness was common among medical university teachers in Karachi, and no participant achieved the predefined good-awareness category. Female participants had a higher proportion and greater crude odds of poor awareness than male participants, while age, educational qualification, and teaching experience were not significantly associated with awareness level. These findings indicate a need for medical universities to evaluate faculty ergonomics education and workplace-support requirements using validated assessment methods. Prospective and intervention-

based studies are needed to determine whether targeted ergonomics education improves knowledge, workplace practices, and occupational health outcomes.

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