

# ASSOCIATION AMONG KNOWLEDGE, ATTITUDE, AND PRACTICE OF ERGONOMIC SITTING POSITION WITH SITTING POSTURE AND DURATION AMONG PRE-CLINICAL STUDENTS OF MBBS AT PESHAWAR

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## ABSTRACT

**Objective:** This study examined the association between knowledge, attitudes, and practices (KAP) related to ergonomic sitting position and posture, as well as sitting duration, among preclinical MBBS students in Peshawar, Pakistan.

**Materials and methods:** This cross-sectional study was conducted between February and July 2024 and enrolled 280 pre-clinical MBBS students from four medical institutions in Peshawar: Northwest School of Medicine, Rehman Medical College, Khyber Medical College, and Peshawar Institute of Medical Sciences. A validated structured questionnaire assessed KAP regarding ergonomic sitting. We analyzed data using SPSS version 27.0, applying descriptive statistics, Pearson's correlation, and multiple linear regression.

**Results:** Of 280 respondents (51.4% female; 47.9% male; mean age 19–21 years), 52.8% were second-year students. Statistically significant positive correlations were observed across all KAP domains. The strongest correlation was between attitude and practice ( $r = 0.305$ ,  $p < 0.01$ ). Multiple regression analysis showed that practice significantly predicted sitting posture ( $\beta = 0.233$ ,  $p < 0.01$ ;  $R^2 = 0.050$ ) and sitting duration ( $\beta = 0.579$ ,  $p < 0.01$ ;  $R^2 = 0.305$ ).

**Conclusion:** We observed significant positive correlations between KAP scores for ergonomic sitting among preclinical MBBS students. Practice was most strongly associated with attitude, and sitting posture and duration were significantly associated with practice. The results underscore the need for ergonomic education and posture awareness to promote healthy sitting among medical students.

**Keywords:** Ergonomics, KAP, Sitting posture and position, MBBS

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## INTRODUCTION

The interaction between people and system elements, applying principles and theories to improve human health and performance, is termed ergonomics.<sup>1</sup> To reduce risk factors for musculoskeletal disorders and increase productivity, ergonomic rules should be implemented.<sup>2</sup> A survey at the University of Valencia reported on the correct posture of dental students, and the authors concluded that almost 28% of the students maintained the correct posture.<sup>3</sup> A study at the University of Port Harcourt

Hospital, Nigeria, showed a strong and significant association between musculoskeletal disorders and ergonomic principles.<sup>4</sup> A Midwest university survey revealed that 49% of participants reported neck and head pain and several other problems attributed to not following ergonomic principles.<sup>5</sup>

A study conducted at a university of dentistry in Saudi Arabia concluded that dental students do not follow ergonomic rules and principles.<sup>6</sup> A recent study from VSPM dental college concluded that many students experienced pain during clinical activities and reported that adding an ergonomics course to their curriculum would be better for them.<sup>7</sup> A cross-sectional survey conducted in Pakistan found that males are at higher risk of having musculoskeletal disorders, but significant improvement was observed after following ergonomic rules and principles.<sup>8</sup> A study on

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South African dental students found a 52% response rate and a 68% mean knowledge score; while 53% applied ergonomic knowledge, musculoskeletal pain rose from 32% before dental school to 78% during, mainly in the back, neck, and shoulder.<sup>9</sup>

At a university in Saudi Arabia and J.P.M.C, only 28.67% of students had limited knowledge about ergonomics, while 82% claimed to know how to keep their bodies erect. Additionally, 85.33% believed that proper posture prevents musculoskeletal disorders (MSDs), whereas 14.67% considered it to improve their appearance.<sup>10</sup> Studies show that MSDs are a global challenge in both developed and developing nations.<sup>11</sup>

This study aims to explore the association between awareness, attitudes, and practices related to ergonomic rules among medical students in Peshawar, Pakistan. By understanding these simple, achievable points, we can develop strategies to reduce problems associated with not following proper ergonomic rules.

## MATERIALS AND METHODS

A cross-sectional study was conducted at Northwest School of Medicine, Rehman Medical College, Pak-International Medical College, and Khyber Medical College of Peshawar, Pakistan.

These are the largest medical institutes in Peshawar, and we collected data from these institutes from February 15, 2024, to July 25, 2024. For the sample size, we used the World Health Organization formula ( $N = Z^2PQ/d^2$ ) with a 95% confidence level, a 5% margin of error, and a population prevalence from previous literature. Using the WHO formula, we obtained a total sample size of 280.

Informed consent was obtained from preclinical MBBS first- and second-year students who participated in the study. Inclusion criteria included participation in regular study sessions or classroom activities, while exclusion criteria were musculoskeletal diseases or refusal to consent. Ethical approval was obtained from the Institutional Review Board of Allied Healthcare Pvt Ltd.

The approval reference number was 135/RC/NWSM2024. We collected data using a well-designed questionnaire and obtained verbal informed consent before data collection by explaining the research objectives. We used a nonprobability convenience sampling technique to recruit eligible preclinical MBBS students from the participating medical institutions. The questionnaire had two sections: the first covered demographics (gender, age, study year, and institute), and the second consisted of

questions on knowledge, attitude, and practice related to ergonomic principles.

The knowledge section included six true-or-false questions, all based on the Guttman Scale. The attitude section included six questions, and the scale used was a five-point Likert scale.

The practice section covered sitting duration, posture rating, sitting postures, use of tools and accessories during studying, pain and discomfort felt during and after studying, and the perceived impact of proper ergonomic practice on general well-being. Data were entered into SPSS version 27.0, cleaned, and analyzed without imputation.

Descriptive statistics were used to summarize demographic characteristics and study variables. Pearson's correlation coefficient was used to assess relationships among knowledge, attitude, sitting posture, and sitting duration. Multiple linear regression analysis was performed to examine the association of practice with sitting posture and sitting duration. Statistical significance was set at  $p < 0.05$ .

## RESULTS

Table 1: Comprehensive Demographic Characteristics of Study Participants. As detailed in Table 1, the study cohort comprised 280 preclinical MBBS students, and their personal and academic attributes were systematically cataloged to provide a robust contextual backdrop for our subsequent analyses of ergonomic knowledge, attitudes, and behaviors.

Gender distribution was nearly balanced: women constituted 51.4 percent ( $n = 144$ ) and men 47.9 percent ( $n = 134$ ), indicating minimal sex-based sampling bias. Age stratification showed that the largest single age group was 20-year-olds, accounting for 39.4 percent ( $n = 110$ ) of respondents, followed by those aged 19 years at 23.8 percent ( $n = 67$ ) and 21 years at 19.5 percent ( $n = 55$ ), with the remaining participants spanning adjacent age groups.

Institutional affiliation was similarly balanced: Northwest School of Medicine contributed the highest proportion of students (35.5 percent,  $n = 99$ ), closely followed by Rehman Medical College at 21.6 percent ( $n = 61$ ), Pak International Medical College at 21.3 percent ( $n = 60$ ), and Khyber Medical College at 20.9 percent ( $n = 59$ ).

In terms of academic progression, 52.8 percent ( $n = 148$ ) were enrolled in their second year of preclinical training, while 46.5 percent ( $n = 130$ ) were first-year students, with a small fraction in other categories. This detailed demographic breakdown clarifies the sample's

composition and supports the generalizability of our findings on ergonomic sitting practices across subgroups within the preclinical MBBS population.

**Proficiency in Ergonomic Sitting Knowledge:** To quantify students' conceptual grasp of ergonomically sound sitting, we administered a six-item true-or-false instrument, with each correct response earning one point, for a maximum possible score of six.

Analysis of the aggregated data yielded a mean knowledge score of 3.16 (SD = 1.16), with the median and mode both at 3.00. This central tendency near the midpoint suggests that, on average, preclinical MBBS students have only a moderate level of familiarity with the principles of proper ergonomic seating. This finding underscores the need to reinforce foundational ergonomics content in the early medical curriculum to shift this baseline understanding toward stronger competency.

**Disposition Toward Ergonomic Sitting Practices:** Attitudinal orientations were assessed using six declarative statements rated on a 5-point Likert scale (1 = "strongly disagree" to 5 = "strongly agree"), yielding total scores ranging from 6 to 30. Participants achieved an overall mean attitude score of 24.60 (SD = 3.95), with the median at 25.00 and the most frequent score (mode) at 24.00.

These elevated central values indicate a predominantly favorable outlook on the importance and benefits of ergonomic seating among students, reflecting readiness, at least in principle, to embrace posture-improving behaviors despite only moderate theoretical knowledge.

**Actual Engagement in Ergonomic Sitting Behaviors:** When evaluating real-world application of ergonomic principles, considerable variability emerged across several dimensions:

**Daily Sitting Duration:** Nearly half of the cohort (n = 138; 49.3%) reported sitting for fewer than eight hours per day, whereas a slightly larger segment (n = 142; 50.7%) sat for more than eight hours of continuous sitting during study or classroom activities.

**Positional Adjustments During Study:** A majority (n = 223; 79.6%) reported consciously altering their seating posture at intervals, whereas 56 students (20.0%) maintained a fixed position throughout prolonged sessions.

**Frequency of Correct Posture Adoption:** When asked how often they deliberately assumed an ergonomic seating arrangement, 136 students (48.6%) admitted they "never" did so, 31 (11.1%) reported doing so "infrequently," 50 (17.9%) adopted it "occasionally," and only 13 stu-

dents (4.6%) indicated they "always" maintained proper alignment.

**Self-Assessment of Posture Quality:** Participants were asked to evaluate their habitual sitting posture, yielding the following distribution: 105 students (37.5%) rated it "good," 89 (31.8%) rated it "fair," 48 (17.1%) rated it "poor," 18 (6.4%) rated it "excellent," and 20 (7.1%) rated it "very poor."

**Perceived Importance of Ergonomic Sitting:** A total of 136 students (48.6%) "agreed" and 92 (32.9%) "strongly agreed" that maintaining an ergonomic sitting position is critical to their well-being. Conversely, 12 (4.3%) "strongly disagreed," 2 (0.7%) "disagreed," and 38 (13.6%) remained neutral.

These practice-related findings reveal a substantial gap between positive attitudinal dispositions and consistent implementation of ergonomic behaviors, signaling the need for targeted strategies such as structured breaks, posture reminders, and ergonomic workstation adjustments to translate intent into action.

**Relation Among Knowledge, sitting posture and Sitting duration:**

**Interrelationships among Knowledge, Sitting Duration, and Posture:** Pearson correlation coefficients were calculated to examine associations among ergonomic knowledge levels, total sitting time, and self-rated posture quality. Results showed a statistically significant positive correlation between knowledge and posture quality ( $r = 0.278$ ,  $p = 0.005$ ), indicating that students with greater conceptual understanding tended to report healthier seating alignments.

Similarly, knowledge correlated positively with sitting duration ( $r = 0.314$ ,  $p = 0.001$ ), suggesting that those more informed about ergonomics were more mindful of and possibly more capable of modulating the length of their seated intervals. Collectively, these data suggest that improving students' ergonomic knowledge may yield dual benefits: better posture and greater ability to manage sitting time effectively.

**Interrelationship of Ergonomic Attitude with Sitting Duration and Postural Alignment:** The extent to which students' attitudes toward ergonomics influenced both the quality of their sitting posture and the length of their seated intervals was examined using Pearson's correlation analysis. A statistically significant, positive association emerged between ergonomic attitude scores and postural quality ( $r = 0.289$ ,  $p = 0.004$ ), indicating that individuals with more affirmative beliefs about the value of correct seating

| Variables     | Description | Frequency | Percent | Cumulative Percent |
|---------------|-------------|-----------|---------|--------------------|
| Gender        | Male        | 135       | 47.9    | 48.2               |
|               | Female      | 145       | 51.4    | 100.0              |
|               | Total       | 280       | 99.3    |                    |
| Age           | 18          | 15        | 5.3     | 5.4                |
|               | 19          | 67        | 23.8    | 29.3               |
|               | 20          | 111       | 39.4    | 68.9               |
|               | 21          | 55        | 19.5    | 88.6               |
|               | 22          | 25        | 8.9     | 97.5               |
|               | 23          | 7         | 2.5     | 100.0              |
|               | Total       | 280       | 99.3    |                    |
| Institute     | NWSM        | 100       | 35.5    | 35.7               |
|               | RMC         | 61        | 21.6    | 57.5               |
|               | PIMC        | 60        | 21.3    | 78.9               |
|               | KMC         | 59        | 20.9    | 100.0              |
|               | Total       | 280       | 99.3    |                    |
| Year of Study | 1st year    | 131       | 46.5    | 46.8               |
|               | 2nd year    | 149       | 52.8    | 100.0              |
|               | Total       | 280       | 99.3    |                    |

Fig 1: Demographic Profile of the Respondents

Table 2: Correlation of Knowledge, with Sitting Duration, and Sitting Posture

| Variables              | Knowledge Score      | Sitting Duration     | Sitting Posture      |
|------------------------|----------------------|----------------------|----------------------|
| Knowledge Score        | 1                    | 0.314<br>(p = 0.001) | 0.278<br>(p = 0.005) |
| Sitting Duration (Q7a) | 0.314<br>(p = 0.001) | 1                    | 0.031<br>(p = 0.601) |
| Sitting Posture (Q7c)  | 0.278<br>(p = 0.005) | 0.031<br>(p = 0.601) | 1                    |

Table 3: Correlation of Attitude with Sitting Duration, and Sitting Posture

| Variables        | Attitude Score       | Sitting Duration     | Sitting Posture      |
|------------------|----------------------|----------------------|----------------------|
| Attitude Score   | 1                    | 0.312<br>(p = 0.002) | 0.289<br>(p = 0.004) |
| Sitting Duration | 0.312<br>(p = 0.002) | 1                    | 0.031<br>(p = 0.601) |
| Sitting Posture  | 0.289<br>(p = 0.004) | 0.031<br>(p = 0.601) | 1                    |

alignment were more likely to adopt anatomically sound positions, such as maintaining a neutral spine and evenly distributing body weight. In parallel, attitude also showed a meaningful positive correlation with sitting duration ( $r = 0.312$ ,  $p = 0.002$ ), suggesting that students with stronger pro-ergonomic mindsets were better at self-regulating their overall seated time, whether through timely breaks, micro-adjustments in position, or conscious monitoring of continuous sitting spans. These findings underscore the pivotal role of affective and evaluative components in translating ergonomic principles into tangible behaviors. They suggest that educational interventions that strengthen students' attitudes by highlighting the personal and professional benefits of sustained musculoskeletal health may improve postural practices and promote more deliberate management of sedentary periods.

## DISCUSSION

The present analysis revealed a significant, positive interrelationship among ergonomic knowledge, attitudinal disposition, and practical application, with cognitive understanding showing the strongest link to actual behavior. These results mirror findings from earlier investigations demonstrating that increased awareness of ergonomic principles, coupled with favorable attitudes, enhances posture-related practices among dental students and practicing clinicians.<sup>12</sup> However, several studies have also reported that—even when awareness levels are high—the consistent translation of ergonomic theory into routine practice among students remains suboptimal. This suggests that situational or behavioral determinants may exert a more powerful influence on postural habits during prolonged sitting.<sup>13</sup>

These findings echo a broader body of literature underscoring the importance of ergonomics across workplace settings.<sup>14</sup> For example, librarians working in a scientifically designed ergonomic space in Southern Nigeria report greater job satisfaction and reduced musculoskeletal distress.<sup>15</sup> Similarly, comprehensive ergonomic knowledge among dental professionals is associated with less work-related discomfort and fewer accidents.<sup>16</sup> Correspondingly, studies of younger populations have identified sitting posture and schoolbag weight as risk factors for musculoskeletal pain in schoolchildren, suggesting that such education should begin at an early age.<sup>17</sup> In dental curricula, deficiencies in knowledge, attitude, and practice have been reported; enhanced learning is likely to prevent future health sequelae among undergraduate students.<sup>18</sup> A similar study among medical students found that despite positive changes in self-reported posture, actual posture-correction behavior changed minimally.<sup>19</sup>

Collectively, these results point to the importance of specifically training attitudes and intentions in relation to ergonomic needs but also highlight the difficulty of initiating positive changes in ergonomics-related behavior. Although pedagogical support measures are crucial, they must be accompanied by structural and environmental adaptations, e.g., adjustable furniture, frequent activity breaks, and workspace ergonomics assessments, to promote long-term sitting practices and structural fitness.

The current study has limitations, including reliance on self-reports, which may be prone to recall or social-desirability bias, and the cross-sectional design, which precludes determining cause and effect. Similar methodological limitations were noted in prior work; there is an urgent need to conduct longitudinal research that

can measure long-term changes in behavior resulting from ergonomic training.

More research is needed that goes beyond knowledge-attitude-practice surveys and investigates the effects of specific environmental factors (such as ergonomic workstation design), the individual's health condition, and the effectiveness of designed training programs in maintaining sustainable postural correction and preventing musculoskeletal injury.

## CONCLUSION

This study found positive correlations among the knowledge, attitudes, and practices of preclinical medical students, with the strongest correlation between knowledge and practice. However, familiarity with proper posture and positive attitudes do not necessarily translate into ergonomic sitting behavior, as sitting behavior also depends on individual habits and learning situations.

To effectively reduce musculoskeletal disorders in this population, educational measures should be paired with practical changes in the learning environment. A longitudinal study is recommended to evaluate the long-term effects of combined educational and environmental interventions on ergonomic behavior and musculoskeletal health.

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#### Authors Contribution:

Following authors have made substantial contributions to the manuscript as under

| Authors   | Conceived & designed the analysis | Collected the data | Contributed data or analysis tools | Performed the analysis | Wrote the paper | Other contribution |
|-----------|-----------------------------------|--------------------|------------------------------------|------------------------|-----------------|--------------------|
| Qazi N    | ✓                                 | ✓                  | ✗                                  | ✗                      | ✓               | ✗                  |
| Khalid AA | ✓                                 | ✗                  | ✓                                  | ✓                      | ✓               | ✗                  |
| Khan WU   | ✓                                 | ✓                  | ✗                                  | ✗                      | ✗               | ✓                  |
| Anadil    | ✓                                 | ✗                  | ✓                                  | ✓                      | ✓               | ✗                  |
| Jasmeen   | ✓                                 | ✓                  | ✗                                  | ✗                      | ✓               | ✗                  |
| Naeem A   | ✓                                 | ✗                  | ✓                                  | ✓                      | ✓               | ✗                  |
| Khalid BA | ✓                                 | ✓                  | ✗                                  | ✗                      | ✗               | ✓                  |

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

#### Ethical Approval:

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