

Prevalence of Musculoskeletal Discomfort Among Desk Workers: A CMDQ-Based Ergonomic Assessment

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Abstract: *Prolonged sitting is now a routine part of academic and professional life, often resulting in back discomfort, muscle stiffness, and long-term musculoskeletal problems. Desk workers frequently remain in static postures for extended periods, which can place continuous strain on the spine and surrounding muscles, causing discomfort in areas such as the neck, shoulders, lower back, and wrists. Each With an increasing number of individuals working in corporate environments, prolonged desk work has become increasingly common. This situation highlights the need for effective back support solutions that help maintain proper spinal alignment, reduce pressure on the lower back, and provide comfortable thermal support during long working hours. The study adopted a mixed-method research design involving 160 desk-based office workers selected through random sampling. Data were collected using a self-constructed questionnaire, a symptom and severity checklist, and the Cornell Modified Discomfort Questionnaire (CMDQ) to assess region-wise musculoskeletal discomfort. Each interview and questionnaire administration required approximately 20–25 minutes per participant, ensuring adequate time to record responses and assess discomfort patterns accurately. The CMDQ findings revealed a noticeable prevalence of musculoskeletal discomfort among desk workers, particularly in the lower back, neck, and shoulder regions. A significant proportion of participants reported experiencing moderate to frequent discomfort during prolonged working hours, which was commonly associated with sustained sitting postures, limited movement, and insufficient ergonomic support at the workstation. The results further highlight the growing ergonomic challenges faced by desk-based employees in the workplace environment.*

Keywords: Ergonomics, Prolonged Sitting, Musculoskeletal Discomfort, Lumbar Support, Cornell Modified Discomfort Questionnaire (CMDQ)

1. Introduction

The rapid transformation of modern workplaces into technology-driven and desk-oriented environments has significantly increased the amount of time individuals spend in seated postures during daily work activities. With the widespread dependence on computers, digital systems, and remote work practices, extended seated work has become a routine occupational behaviour across many professions. While seated work may appear physically less demanding, sustained static posture and inadequate ergonomic support place considerable stress on the musculoskeletal system, contributing to the development of discomfort and work-related musculoskeletal disorders (MSDs) (Lis, 2007).

Sedentary occupations have increasingly replaced physically active forms of work, resulting in prolonged periods of uninterrupted sitting among office employees, students, and other desk-based professionals. Studies have reported that many workers remain seated for more than eight hours a day, particularly in office and computer-based environments (Parry, 2013). Furthermore, computer users often maintain static postures for prolonged durations ranging from 6–12 hours daily, leading to continuous muscle loading and reduced movement variability (Cho, 2012). Such prolonged exposure to static seated positions has been strongly associated with discomfort in the neck, shoulders, upper back, and lower back regions.

Ergonomics plays an essential role in developing workplace environments and seating systems that are compatible with the anatomical, physiological, and biomechanical needs of individuals, thereby reducing physical stress during prolonged occupational activities (Rao, 2018). In desk-based work environments, inadequate ergonomic practices and prolonged static sitting postures can contribute to increased spinal loading, muscular imbalance, and postural strain, which may eventually lead to chronic musculoskeletal discomfort and lower back pain among workers (Rao, 2024). Consequently, ergonomic interventions have increasingly focused on improving seating design to support the natural alignment and curvature of the spine. Ergonomically designed backrests with effective lumbar support are considered important in evenly distributing body pressure, minimizing stress on the lumbar region, and enhancing comfort during prolonged sitting periods (Pereira & Rao, 2022).

Musculoskeletal disorders are among the most common occupational health problems affecting the modern workforce. MSDs involve pain or dysfunction in muscles, tendons, ligaments, joints, and supporting structures of the body, and their severity may range from temporary discomfort to chronic disabling conditions (Pheasant, 2006). Workplace factors such as poor posture, repetitive movements, insufficient lumbar support, improper workstation design, and prolonged seated exposure are widely recognized contributors to these conditions. Among

Volume 15 Issue 5, May 2026

Fully Refereed | Open Access | Double Blind Peer Reviewed Journal

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desk workers, inadequate ergonomic arrangements often lead to sustained spinal loading and muscular fatigue, thereby increasing the risk of postural strain and discomfort over time.

In recent years, increasing attention has been directed toward ergonomic assessment methods that help identify the prevalence and distribution of musculoskeletal discomfort among working populations. One such widely accepted tool is the Cornell Modified Discomfort Questionnaire (CMDQ), which enables systematic assessment of discomfort across different body regions and provides valuable insights into the severity and frequency of musculoskeletal symptoms (Alan Hedge, 1999). The CMDQ has been extensively used in occupational health and ergonomics research due to its reliability in evaluating work-related discomfort associated with sedentary desk work and repetitive tasks.

As sedentary occupational patterns continue to increase globally, understanding the prevalence and distribution of musculoskeletal discomfort among desk workers has become increasingly important. Identifying major discomfort areas and workplace-related ergonomic risk factors may contribute toward improved ergonomic practices, healthier workstation design, and prevention of occupational musculoskeletal strain. Therefore, the present study was undertaken to assess musculoskeletal and postural discomfort among desk workers using the Cornell Modified Discomfort Questionnaire (CMDQ) and to examine the ergonomic factors associated with prolonged desk-based work.

2. Review of Literature and Rationale

The growing dependence on computer-based and desk-oriented occupations has significantly transformed modern work environments, resulting in prolonged sedentary behaviour among employees. With the increasing use of digital technologies, office workers now spend substantial portions of their working hours in seated positions while performing repetitive computer-related tasks. Such extended seated work patterns have raised serious concerns regarding musculoskeletal health and postural well-being, particularly among desk workers exposed to static postures for extended durations. Research has consistently shown that prolonged sitting contributes to discomfort in various body regions, especially the neck, shoulders, upper back, and lower back.

Several studies have identified sedentary desk work as a major occupational risk factor associated with musculoskeletal disorders (MSDs). Cho, Hwang, and Cherg (2012) reported that office employees spend a significant portion of their workday using computers while maintaining relatively static postures. Their study highlighted that repetitive computer work and limited movement contribute to muscle fatigue, postural imbalance, and increased physical stress on the musculoskeletal system (Cho, 2012). Similarly, Parry and Straker (2013) emphasized that sedentary behaviour has become a major public health concern in office environments, with many workers remaining seated for more than eight hours daily (Parry, 2013). extended seated work reduces muscle activation and increases spinal loading, gradually leading to discomfort, fatigue, and reduced physical well-being.

Poor sitting posture has also been recognized as a significant ergonomic risk factor contributing to work-related MSDs. Lis et al. (2007) observed a strong association between prolonged sitting and occupational low back pain, particularly among individuals working in non-neutral seated postures (Lis, 2007). Static seated positions maintained over long durations increase pressure on the lumbar spine, alter spinal alignment, and contribute to muscular fatigue and chronic discomfort. Their findings reinforced the importance of maintaining proper posture and ergonomic support during seated work.

The design and arrangement of workstations further influence musculoskeletal health among desk workers. Improperly designed workstations, including unsuitable chair dimensions, poor monitor positioning, inadequate desk height, and lack of lumbar support, can significantly contribute to musculoskeletal strain and repetitive stress injuries (Pheasant, 2006). Their research highlighted that workstation design should be aligned with anthropometric and biomechanical principles to reduce physical stress and improve occupational comfort.

Additional workplace-specific ergonomic studies have further demonstrated the prevalence of postural and musculoskeletal problems in sedentary occupations. The study, ergonomic risk factors among bank clerks, identified several workstation-related ergonomic concerns including improper seating posture, inadequate workstation dimensions, repetitive tasks, and prolonged sitting duration (Naik & Rao, 2022). The researchers reported that many bank employees experienced discomfort in the neck, shoulders, wrists, and lower back due to poorly designed workstations and static work patterns. Their findings emphasized the importance of ergonomic assessments in identifying occupational risk factors and improving workstation design. Another study, perception of discomfort caused by work environment factors among bank clerks revealed that environmental and ergonomic conditions such as prolonged sitting, repetitive movements, insufficient back support, and improper workstation layout contributed significantly to musculoskeletal discomfort and fatigue among employees (Waghmare & Rao, 2022). The researchers concluded that poor ergonomic conditions negatively affect both physical comfort and work efficiency.

Several prevalence studies have also confirmed that musculoskeletal discomfort is highly common among office employees. Work-related musculoskeletal symptoms frequently affect the neck, shoulders, and lower back regions among office workers (Janwantanakul, 2008). Likewise, Rempel and Teschke (2006) found that prolonged computer use significantly increased the prevalence of neck and shoulder discomfort among employees engaged in desk-based work (Rempel, 2006).

Reliable assessment tools are essential for identifying discomfort patterns and evaluating occupational ergonomic risks. Hedge (1999) introduced the Cornell Musculoskeletal Discomfort Questionnaire (CMDQ) as a standardized ergonomic assessment tool used to evaluate the frequency and severity of discomfort across different body regions. The CMDQ has been widely adopted in ergonomics and occupational health research due to its effectiveness in

identifying posture-related discomfort among sedentary workers (Alan Hedge, 1999).

Although previous studies have explored individual ergonomic risk factors, few studies have comprehensively examined the prevalence and distribution of musculoskeletal and postural problems among desk workers using CMDQ-based ergonomic assessments. Therefore, the present study aims to evaluate musculoskeletal and postural discomfort among desk workers and contribute toward the development of ergonomically optimized workplace environments that promote comfort, reduce strain, and improve occupational well-being.

3. Aim & Specific Objectives

The study aims to assess the prevalence and distribution of musculoskeletal and postural discomfort among desk workers due to extended seated work and static working postures using the Cornell Modified Discomfort Questionnaire (CMDQ). The specific objectives were: (i) To identify the common musculoskeletal and postural discomfort experienced by desk workers during prolonged seated work. (ii) To evaluate the prevalence and distribution of discomfort across different body regions using the Cornell Modified Discomfort Questionnaire (CMDQ). (iii) To examine the ergonomic risk factors contributing to musculoskeletal discomfort among desk workers. (iv) To analyse the relationship between prolonged sitting duration, static posture, and reported musculoskeletal complaints. (v) To suggest evidence-based ergonomic interventions and workplace modifications for reducing occupational musculoskeletal strain.

4. Research Methodology

A mixed-method research design was adopted incorporating both quantitative and qualitative approaches to obtain a comprehensive understanding of musculoskeletal and postural problems among desk-based workers. The use of a mixed-method approach enabled the researcher to examine measurable patterns of discomfort while also exploring the personal experiences, perceptions, and workplace challenges faced by employees engaged in prolonged sedentary work.

The study sample consisted of 160 desk-based employees working in corporate organizations, offices, and multinational companies (MNCs). Participants were selected because their job roles primarily involved sedentary desk work, continuous computer use, and relatively static working postures for extended durations. A random sampling technique was used to minimize selection bias and improve the representativeness of the sample. The participants represented different age groups, genders, occupations, and work modes, thereby providing a broader understanding of workplace-related musculoskeletal discomfort among desk workers.

Specific inclusion and exclusion criteria were established to maintain the relevance and reliability of the study findings. Individuals who regularly performed desk-based or computer-oriented tasks for prolonged hours were included in the research. However, individuals with severe

musculoskeletal disorders, recent spinal surgeries, major orthopedic conditions, or medical complications unrelated to occupational posture were excluded to avoid distortion of the findings.

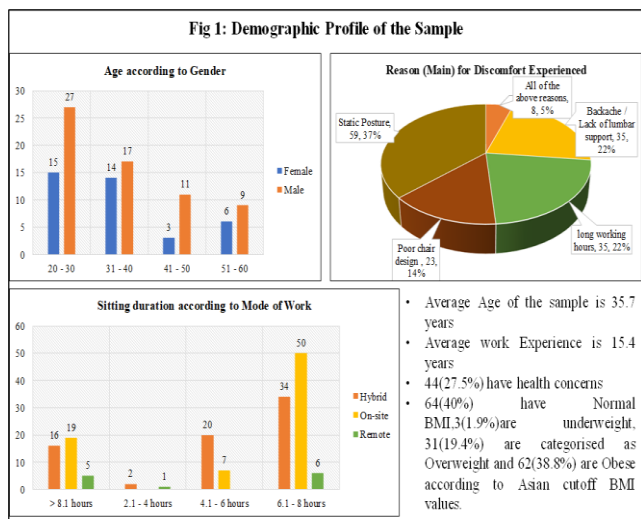
Ethical considerations were carefully maintained throughout the study. Participants were informed about the purpose and objectives of the research before data collection. Informed consent was obtained from all respondents, and confidentiality of personal information was assured. Participation in the study was entirely voluntary, and the collected data were used solely for academic and research purposes.

Data collection was carried out using multiple assessment tools to obtain both subjective and objective information regarding musculoskeletal discomfort. A structured questionnaire was developed to gather data related to demographic details, sitting duration, work patterns, workstation setup, posture habits, and awareness of ergonomic practices. The questionnaire also included items related to common symptoms such as neck pain, shoulder stiffness, upper back discomfort, and lower back pain frequently experienced by desk workers. To strengthen the ergonomic assessment, the Cornell Modified Discomfort Questionnaire (CMDQ) was administered. The CMDQ is a standardized and validated ergonomic tool widely used to assess the frequency, severity, and impact of musculoskeletal discomfort across different body regions in occupational settings. In addition, brief structured interviews were conducted to understand participants' perceptions regarding workplace posture and ergonomic challenges.

The collected quantitative data were analyzed using descriptive statistical methods such as frequencies and percentages to identify the prevalence and distribution of musculoskeletal discomfort. Qualitative responses were analyzed thematically to identify recurring workplace-related concerns and postural issues among desk workers. Together, the findings provided a comprehensive ergonomic assessment of musculoskeletal and postural problems associated with prolonged desk-based work.

5. Results

Demographic Profile of the Sample: The demographic profile of the participants was analyzed based on age, gender, sitting duration, mode of work, and the commonly reported causes of discomfort associated with prolonged desk-based work. 160 desk workers participated in the study. The age-wise distribution showed that the majority of participants belonged to the 20–30 years age group [42(26.3%)], followed by the 31–40 years group [31(19.4%)]. Participants aged 41–50 years accounted for 14(8.8%), while those in the 51–60 years category accounted for 15(9.4%). Male participants represented a larger proportion across all age groups compared to female participants. Among the 20–30 years category, males accounted for 27(16.9%) and females for 15(9.4%). Similarly, in the 31–40 years group, males accounted for 17(10.6%) and females for 14(8.8%).



The findings related to sitting duration according to work mode revealed that the majority of participants reported sitting for 6.1–8 hours daily, particularly among on-site workers [50(31.3%)] and hybrid workers [34(21.3%)]. Remote workers in the same sitting duration category accounted for 6(3.8%).

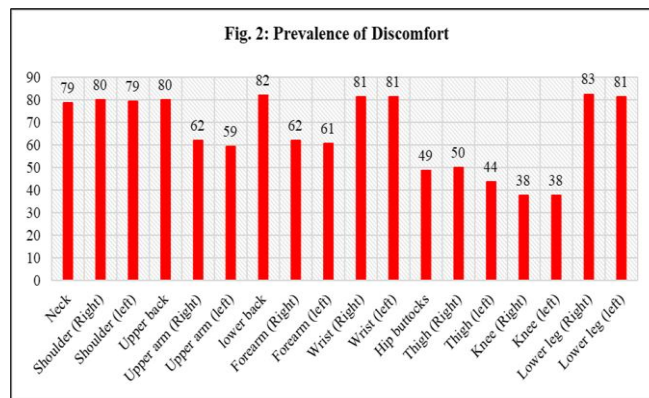
Participants reporting sitting durations exceeding 8 hours included on-site workers [19(11.9%)], hybrid workers [16(10.0%)], and remote workers [5(3.1%)]. Comparatively fewer respondents reported sitting durations between 2.1–4 hours.

Analysis of discomfort-related factors indicated that static posture was the most commonly reported cause of discomfort among participants, accounting for 59(36.9%) responses. This was followed by long working hours [35(21.9%)] and backache/lack of lumbar support [35(21.9%)]. Poor chair design accounted for 23(14.4%) responses, while only 8(5.0%) participants reported experiencing all the listed discomfort factors simultaneously.

Common Postural and Musculoskeletal Discomforts Experienced: The CMDQ analysis (Fig 2) clearly demonstrates a high prevalence of postural and musculoskeletal discomfort among desk workers due to prolonged sitting. Discomfort was most pronounced in the lower legs (right: 83%; left: 81%) and lower back (82%), highlighting these areas as the most frequently affected during extended working hours. Significant discomfort was also observed in the wrists (right: 81%; left: 81%), upper back (80%), shoulders (right: 80%; left: 79%), and neck (79%), reflecting the combined effects of sustained sitting posture, repetitive keyboard and mouse use, and forward head positioning. Moderate levels of discomfort were reported in the upper arms (right: 62%; left: 59%) and forearms (right: 62%; left: 61%), suggesting muscular strain from continuous computer-related tasks. Discomfort in the hip/buttock’s region (49%) and thighs (right: 50%; left: 44%) was comparatively moderate, while the knees (right: 38%; left: 38%) reported relatively lower prevalence.

Prevalence of Musculoskeletal Discomfort: The CMDQ-based assessment (Fig. 2) revealed a high prevalence of musculoskeletal discomfort among desk workers across

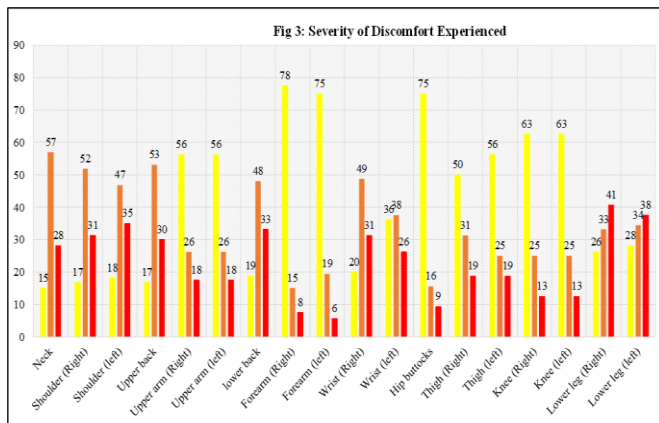
multiple body regions. The lower limbs and lower back emerged as the most affected areas among the participants. Discomfort in the right lower leg was reported by 83(51.9%), while discomfort in the lower back was reported by 82(51.3%). Similarly, discomfort in the left wrist [81(50.6%)], right wrist [81(50.6%)], and left lower leg [81(50.6%)] was also highly prevalent.



Upper body discomfort was commonly observed among participants engaged in prolonged desk-based work. Discomfort in the right shoulder [80(50.0%)], upper back [80(50.0%)], neck [79(49.4%)], and left shoulder [79(49.4%)] was frequently reported. Participants also experienced discomfort in the right upper arm [62(38.8%)], right forearm [62(38.8%)], and left forearm [61(38.1%)].

Lower extremity discomfort was additionally observed in the thighs and knees. Discomfort in the right thigh [50(31.3%)] and hip/buttock region [49(30.6%)] was moderately prevalent, whereas the left thigh [44(27.5%)], right knee [38(23.8%)], and left knee [38(23.8%)] showed comparatively lower prevalence rates.

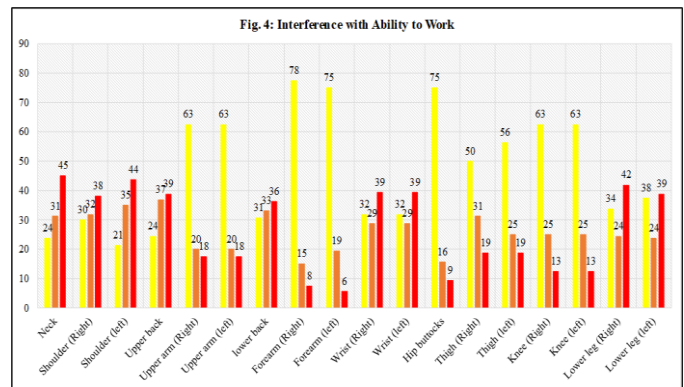
Fig. 3 revealed varying levels of musculoskeletal discomfort severity among desk workers across different body regions. The findings indicated that mild discomfort was highly prevalent in areas associated with prolonged static sitting and repetitive upper limb activity. The highest levels of mild discomfort were reported in the right forearm [78(48.8%)], followed by the left forearm [75(46.9%)] and hip/buttock region [75(46.9%)]. Mild discomfort was also commonly observed in the knees [63(39.4%) each for right and left], upper arms [56(35.0%) each], and thigh regions [56(35.0%) for left thigh and 50(31.3%) for right thigh]. Moderate discomfort was predominantly reported in the upper body and spinal regions. The neck [57(35.6%)], upper back [53(33.1%)], right shoulder [52(32.5%)], and right wrist [49(30.6%)] showed comparatively higher levels of moderate discomfort. Moderate discomfort in the lower back was also observed among 48(30.0%) participants, indicating significant spinal strain associated with prolonged seated work. Severe discomfort was comparatively lower in frequency but remained notable in specific body regions. The highest severe discomfort levels were reported in the right lower leg [41(25.6%)], left lower leg [38(23.8%)], left shoulder [35(21.9%)], and lower back [33(20.6%)]. Severe discomfort in the wrists and neck further suggests the impact of repetitive computer-based tasks and prolonged static postures on musculoskeletal health.



The findings on discomfort severity indicate that prolonged desk-based work contributes to widespread musculoskeletal strain ranging from mild fatigue to severe discomfort. Upper body regions associated with computer use and lower body regions affected by prolonged sitting showed substantial discomfort severity, highlighting the need for ergonomic interventions, posture correction strategies, and regular movement breaks to reduce occupational musculoskeletal stress.

Impact of Musculoskeletal Discomfort on Work Performance: The findings revealed that musculoskeletal discomfort had a noticeable impact on the participants' ability to perform daily work activities (Fig. 4). The CMDQ assessment demonstrated varying levels of work interference across different body regions, indicating that prolonged desk-based work affects both physical comfort and occupational efficiency.

Higher levels of mild interference were observed predominantly in the forearms, hip/buttock region, thighs, and knees. The greatest mild interference with work ability was reported in the right forearm [78(48.8%)], followed by the left forearm [75(46.9%)] and hip/buttock region [75(46.9%)]. Mild interference was also frequently reported in the right and left knees [63(39.4%) each], upper arms [63(39.4%) each], and left thigh [56(35.0%)]. These findings suggest that extended seated work and repetitive upper limb activity contribute to continuous low-level discomfort that affects work performance over time. Moderate interference with work ability was more prominent in areas associated with posture maintenance and repetitive computer use. The neck [31(19.4%)], left shoulder [35(21.9%)], upper back [37(23.1%)], and lower back [33(20.6%)] showed comparatively higher moderate interference levels. Wrist discomfort also demonstrated notable interference, particularly in the right wrist [32(20.0%)] and left wrist [29(18.1%)], indicating the ergonomic strain associated with repetitive keyboard and mouse usage. Severe interference with work ability was comparatively lower but remained substantial in certain body regions. The highest severe interference was reported in the neck [45(28.1%)], left shoulder [44(27.5%)], upper back [39(24.4%)], wrists [39(24.4%) each], and lower legs [42(26.3%) right; 39(24.4%) left]. These findings indicate that persistent discomfort can significantly affect concentration, posture maintenance, physical endurance, and overall work productivity.



The results thus demonstrate that musculoskeletal discomfort among desk workers not only affects physical well-being but also interferes with occupational functioning and work efficiency. The findings reinforce the importance of ergonomic interventions, posture correction, workstation optimization, and regular movement breaks in minimizing work-related musculoskeletal strain and improving employee productivity and comfort.

Ergonomic Risk Factors Contributing to Postural Strain and Musculoskeletal Discomfort: The findings of the present CMDQ-based ergonomic assessment identified several important ergonomic risk factors contributing to postural strain and musculoskeletal discomfort among desk workers. These factors were strongly associated with prolonged sedentary work patterns, poor workstation ergonomics, and repetitive computer-based activities.

One of the most significant risk factors identified was extended seated work duration. A majority of participants reported sitting continuously for more than 6–8 hours daily, particularly among on-site and hybrid workers. Extended sitting leads to reduced muscle activation, increased spinal loading, restricted circulation, and muscular fatigue, thereby contributing to discomfort in the lower back, neck, shoulders, and lower limbs.

Another major contributor was the maintenance of static posture for prolonged periods. Static sitting emerged as the most commonly reported discomfort-related factor among participants. Sustained seated positions without adequate movement increase mechanical stress on the spine and surrounding muscles, leading to postural imbalance, stiffness, and fatigue. The high prevalence of neck, upper back, and lower back discomfort observed in the study further supports the influence of prolonged static posture on musculoskeletal health.

Inadequate lumbar support and poor chair ergonomics were also identified as significant risk factors. Many participants reported discomfort associated with lack of lumbar support and poor chair design. Inappropriate seating arrangements can alter spinal alignment, increase pressure on the lumbar region, and contribute to muscular strain during extended seated work. Poorly designed chairs may also fail to support neutral posture, thereby increasing the risk of chronic discomfort.

The study additionally highlighted the role of repetitive upper limb activities, particularly prolonged keyboard and mouse

usage. High levels of discomfort in the wrists, forearms, shoulders, and upper arms indicate that repetitive computer tasks contribute significantly to muscular fatigue and strain in the upper extremities. Improper workstation setup, including unsuitable desk height, monitor positioning, and unsupported arm posture, may further aggravate these symptoms.

Long working hours and inadequate movement breaks also emerged as important occupational risk factors. Continuous work without sufficient postural variation or physical activity can increase cumulative musculoskeletal strain and reduce recovery opportunities for muscles and joints.

The findings further suggest that hybrid and remote work environments may increase ergonomic risks due to the use of non-standard or inadequately designed workstations at home. Limited access to ergonomically optimized furniture and work setups may contribute to poor posture and discomfort among desk workers.

The study thus demonstrates that musculoskeletal discomfort among desk workers is multifactorial in nature and influenced by prolonged sitting, static posture, poor ergonomic support, repetitive movements, and inadequate workstation design. These findings emphasize the need for ergonomic awareness, improved workstation design, posture correction strategies, and regular movement interventions to reduce occupational musculoskeletal strain and improve workplace well-being.

6. Discussion

The demographic profile of the participants strongly supports the objectives of the present study, as the sample represented individuals highly exposed to prolonged desk-based work and sedentary occupational behaviour. The predominance of participants within the 20–30 years age group indicates that musculoskeletal and postural discomfort is increasingly becoming a lifestyle- and occupation-related concern among younger adults engaged in prolonged computer-based work. This suggests that posture-related problems are no longer restricted to older populations but are emerging early due to sedentary work patterns. The inclusion of both male and female participants improved the representativeness of the study and enabled broader understanding of workplace-related musculoskeletal discomfort across different demographic groups. The findings also revealed that a large proportion of participants, particularly on-site and hybrid workers, remained seated for more than six hours daily. Prolonged sitting is a major ergonomic risk factor that contributes to reduced muscle activity, increased spinal loading, muscular fatigue, and postural strain. Similar work patterns were observed by Cho et al. (Cho, 2012), who noted that office employees spend a large portion of their workday maintaining relatively static postures, which can gradually lead to postural fatigue and muscular strain. Static posture emerged as the most commonly reported cause of discomfort, followed by long working hours and lack of lumbar support. Poor chair design also contributed considerably to discomfort among participants. These findings highlight the important role of workstation ergonomics and seating design in influencing musculoskeletal health and validate the relevance of the selected sample for CMDQ-based ergonomic

assessment of desk workers. The findings indicate that prolonged desk-based work is strongly associated with widespread musculoskeletal discomfort affecting multiple body regions. The high prevalence of lower back discomfort among participants highlights the significant impact of sedentary desk work and static posture on spinal loading and lumbar strain. Continuous seated work with limited movement and inadequate ergonomic support can increase muscular fatigue and mechanical stress on the lower back, thereby contributing to discomfort and postural imbalance.

The high prevalence of discomfort in the wrists, shoulders, neck, and upper back suggests that repetitive computer-related tasks and prolonged keyboard and mouse usage may significantly contribute to upper body strain. Sustained forward head posture, improper monitor positioning, and unsupported upper limb movements are likely contributing ergonomic risk factors associated with these symptoms. Lower limb discomfort, particularly in the lower legs and thighs, may be associated with sedentary desk work durations leading to restricted blood circulation, reduced muscle activation, and static loading of the lower extremities. The occurrence of discomfort in both upper and lower body regions demonstrates that musculoskeletal strain among desk workers is not localized to a single area but affects the body comprehensively due to prolonged sedentary work patterns. These results are in line with previous studies that identified the neck, shoulders, and lower back as the most frequently affected body regions among office workers (Janwantanakul, 2008) (Rempel, 2006). Overall, the CMDQ findings highlight the widespread prevalence of musculoskeletal and postural discomfort among desk workers and reinforce the importance of ergonomic interventions, improved workstation design, posture awareness, and regular movement breaks in reducing occupational musculoskeletal strain and promoting workplace well-being.

The severity analysis further showed that pain intensity was greatest in the neck, shoulders, upper back, and lower back regions. This finding is consistent with the work of Lis et al. (Lis, 2007), who reported that maintaining poor sitting posture for extended periods can significantly increase spinal loading and musculoskeletal strain. In addition, long periods of sitting reduce muscle activity and blood circulation, which may gradually contribute to increased fatigue and discomfort (Parry, 2013). Importantly, the findings also suggest that musculoskeletal discomfort does not only exist but can affect the ability of employees to perform their work effectively. Discomfort in the neck, shoulders, wrists, and lower back showed noticeable interference with work performance. As emphasized by Stephen Pheasant and Colin Haslegrave (Pheasant, 2006), poorly designed workstations and inadequate ergonomic support can contribute significantly to such occupational strain.

Overall, the findings highlight the importance of improving ergonomic awareness, workstation design, and posture management in order to reduce musculoskeletal discomfort and promote healthier and more supportive work environments for desk-based employees.

7. Evidence-Based Ergonomic Interventions, Workplace Modifications and Design Recommendations

1) Adjustable Ergonomic Seating

- Provide ergonomically designed chairs with adjustable seat height, lumbar support, armrests, and backrest inclination.
- Ensure chairs promote neutral spinal alignment and reduce excessive pressure on the lumbar region.
- Encourage the use of dynamic seating mechanisms that allow posture variation during work.

2) Workstation Optimization

- Position computer monitors at eye level to reduce neck flexion and forward head posture.
- Maintain appropriate keyboard and mouse placement to reduce wrist and shoulder strain.
- Ensure desk height supports neutral elbow positioning and comfortable arm support.
- Provide footrests where required to maintain proper lower limb posture and circulation.

3) Scheduled Movement Breaks

- Encourage short movement or stretching breaks every 30–60 minutes during prolonged seated exposure tasks.
- Promote standing, walking, or posture-changing activities to reduce static muscular loading.
- Introduce sit-stand workstations where feasible to reduce continuous seated exposure.

4) Posture Awareness and Ergonomic Training

- Conduct ergonomic awareness programs to educate employees regarding proper sitting posture and workstation setup.
- Train workers on maintaining neutral posture, reducing slouching, and minimizing prolonged static positioning.
- Encourage self-monitoring of posture habits during computer work.

5) Stretching and Workplace Exercise Programs

- Introduce workplace stretching routines targeting the neck, shoulders, wrists, lower back, and lower limbs.
- Encourage simple mobility exercises during work hours to reduce muscle stiffness and improve circulation.
- Promote occupational wellness programs focusing on musculoskeletal health.

6) Hybrid and Remote Work Ergonomic Support

- Provide ergonomic guidance and workstation setup recommendations for employees working from home.
- Encourage the use of ergonomic chairs, laptop stands, and external keyboards in remote work environments.
- Develop low-cost ergonomic intervention kits for hybrid workers.

7) Reduction of Repetitive Strain

- Encourage periodic changes in hand positioning and work patterns during prolonged computer use.
- Introduce ergonomic keyboards, mouse supports, and wrist rests to minimize repetitive upper limb strain.
- Rotate repetitive tasks where possible to reduce continuous muscular loading.

8) Workplace Environmental Improvements

- Ensure adequate lighting to reduce awkward viewing posture and eye strain.
- Maintain comfortable thermal conditions and ventilation to improve physical comfort during prolonged work.
- Reduce environmental stressors that may contribute to muscular tension and fatigue.

9) Regular Ergonomic Assessments

- Conduct periodic ergonomic evaluations using standardized tools such as CMDQ to identify discomfort trends early.
- Monitor workstation risks and employee discomfort patterns to implement timely ergonomic interventions.
- Use assessment findings to guide evidence-based workplace modifications and seating improvements.

8. Conclusion

The present study demonstrates a substantial prevalence of musculoskeletal discomfort among desk workers, particularly affecting the lower back, neck, shoulders, wrists, upper back, and lower limbs. Prolonged sitting, static posture, repetitive computer-related activities, inadequate lumbar support, and poor workstation ergonomics were identified as major contributing factors associated with occupational musculoskeletal strain. The findings further indicate that musculoskeletal discomfort not only affects physical well-being but also interferes with employee comfort and work performance. The study emphasizes the importance of ergonomic interventions, workstation optimization, posture education, and regular movement breaks in reducing occupational musculoskeletal discomfort and promoting healthier workplace practices. The CMDQ-based ergonomic assessment used in the present study may contribute valuable insights for organizations, ergonomists, and workplace planners in developing evidence-based strategies aimed at improving employee comfort, posture, productivity, and occupational well-being.

9. Scope of the Study

The present study focuses on examining the prevalence, severity, and distribution of musculoskeletal and postural discomfort among individuals engaged in desk-based occupations involving prolonged sitting and continuous computer use. The study specifically investigates discomfort affecting body regions such as the neck, shoulders, back, wrists, and lower limbs that are commonly associated with sedentary work patterns and static postures. Using the Cornell Modified Discomfort Questionnaire (CMDQ), the research evaluates how prolonged desk work influences physical comfort, posture, and work efficiency among employees. The study further explores ergonomic risk factors related to workstation design, sitting duration, and repetitive work activities. The findings are expected to support organizations, ergonomists, and workplace planners in developing evidence-based ergonomic interventions, improving workstation design, and promoting healthier workplace practices that enhance employee comfort, posture, productivity, and overall occupational well-being.

10. Limitation

The present study has certain limitations that should be considered while interpreting the findings. The data were primarily based on self-reported responses, which may be influenced by individual perception, recall bias, and subjective interpretation of discomfort. The study sample was limited to desk-based employees from selected organizations and may therefore restrict the generalizability of the findings to broader occupational populations. In addition, the research focused mainly on prolonged sitting-related discomfort and did not include direct ergonomic measurements, biomechanical analysis, or observational workstation assessments. Factors such as physical activity levels, psychosocial stress, lifestyle habits, and pre-existing minor health conditions were also not examined in detail, which may have influenced the reported musculoskeletal discomfort.

Author Statement

- The author expresses sincere gratitude to the college and all participants for their valuable cooperation and support throughout the study. Their responses and insights significantly contributed to understanding user needs and developing the conceptual ergonomic heated backrest design.
- Ethical considerations were maintained throughout the research process. Informed consent was obtained from all participants prior to data collection, and they were informed about the purpose of the study. Participant confidentiality and privacy were strictly maintained, and all collected information was used solely for academic purposes.
- The study did not receive any external funding or financial assistance and was conducted independently as part of academic research.
- The author further declares that there are no conflicts of interest related to this study.

References

- [1] Alan Hedge, H. F. a. E. L. C. U., 1999. *Cornell musculoskeletal discomfort questionnaires (CMDQ)*. [Online] Available at: <https://ergo.human.cornell.edu/ahmsquest.html> [Accessed March 2026].
- [2] Cho, C. Y. H. Y. S. & C. R. J., 2012. Musculoskeletal symptoms and associated risk factors among office workers with high workload computer use. <https://doi.org/10.1016/j.jmpt.2012.05.004>. *Journal of Manipulative and Physiological Therapeutics.*, 35(7), p. 534–540.
- [3] Janwantanakul, P. P. P. J. W. & S. T., 2008. Prevalence of self-reported musculoskeletal symptoms among office workers.. *Occupational Medicine.* <https://doi.org/10.1093/occmed/kqn072>, 58(6), p. 436–438..
- [4] Lis, A. M. B. K. M. K. H. & N. M., 2007. Association between sitting and occupational low back pain. <https://doi.org/10.1007/s00586-006-0143-7>. *European Spine Journal*, 16(2), p. 283–298.
- [5] Naik, T. & Rao, R., 2022. Identifying ergonomics risk factors in bank clerk workstations. <https://doi.org/10.2015/IJIRMF/202208019>.

- International Journal for Innovative Research in Multidisciplinary Field.*, 8(8), pp. 104-110.
- [6] Parry, S. & S. L., 2013. The contribution of office work to sedentary behaviour associated risk. <https://doi.org/10.1186/1471-2458-13-296>. *BMC Public Health*, Volume 13, p. 296.
 - [7] Pereira, C. & Rao, R., 2022. Musculoskeletal Discomfort and Associated Risk Factors Among Bank Clerks in Mumbai City and its Suburbs.. *International Journal of All Research Education and Scientific Methods (IJARESM)*, 10(7), pp. 2894 - 2899.
 - [8] Pheasant, S. & H. C. M., 2006. *Bodyspace: Anthropometry, ergonomics and the design of work*. 3rd ed. s.l.:CRC Press.
 - [9] Rao, R., 2018. *Introduction to Ergonomics*. 1st ed. Mumbai: Mumbai: ISBN: 978-93-5321-450-0.
 - [10] Rao, R., 2024. *Fundamentals of Ergonomics*. 1st ed. Mumbai: ISBN: 978-93-341-3235-9.
 - [11] Rempel, D. & T. K., 2006. Musculoskeletal symptoms among computer users: A review of ergonomic risk factors. *Occupational Ergonomics*, 6(1), pp. 1-12.
 - [12] Waghmare, S. & Rao, R., 2022. Perception of discomfort caused by work environment factors among bank clerks. *International Journal of Multidisciplinary Educational Research.*, 11(7), pp. 102 - 107.
 - [13] Zeal Pegado, Dr. Roopa Rao, "Enhancing Thermal Comfort and Postural Support In Desk Workers Through Ergonomic Heated Backrest Design", *International Journal of Creative Research Thoughts (IJCRT)*, ISSN:2320-2882, Volume.14, Issue 5, pp.c53-c62, May 2026, Available at: <http://www.ijcrt.org/papers/IJCRT2605246.pdf>

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