Journal of Occupational Safety, Health, and Environmental Management (K3)
Vol. 01, No. 2, June 2026, Page 51-60
E-ISSN 3164-2012

Relationship Between Workplace Ergonomics and Musculoskeletal Complaints Among University Administrative Staff

Monita Rahayu[1]*, Abdi Iswahyudi Yasril[2]
[1]*Universitas Islam Syekh-Yusuf, Indonesia, [2]Universitas Fort De Kock, Indonesia
*Co e-mail: monita@unis.ac.id[1]

Article Information
Received: July 21, 2026
Revised: August 06, 2026
Online: August 07, 2026

Keywords
Workplace Ergonomics, Musculoskeletal Complaints, Administrative Staff, Occupational Health, ROSA, Nordic Musculoskeletal Questionnaire.

ABSTRACT

Background: University administrative staff often spend long hours working at computer workstations that may not meet ergonomic standards. Prolonged sitting, repetitive computer tasks, and awkward postures can contribute to musculoskeletal complaints (MSCs), potentially affecting employee health, well-being, and productivity. However, evidence regarding workplace ergonomics and MSCs among university administrative staff in developing countries remains limited. Objective: To examine the association between workplace ergonomics and musculoskeletal complaints among university administrative staff. Methods: A quantitative cross-sectional study was conducted among 180 staff selected through stratified random sampling. Workplace ergonomics was assessed using the Rapid Office Strain Assessment (ROSA), while MSCs were evaluated using the Standardized Nordic Musculoskeletal Questionnaire (NMQ). Data were analyzed using descriptive statistics, chi-square tests, and binary logistic regression, controlling for demographic and occupational factors. Results: Overall, 68.3% of respondents reported MSCs within the previous 12 months. Neck pain (67.8%), lower back pain (61.1%), and shoulder pain (55.6%) were the most frequently reported complaints. Poor workplace ergonomics was significantly associated with MSCs ($\chi^2 = 28.74$, $p < 0.001$). Respondents with poor ergonomic conditions had higher odds of reporting MSCs than those with good ergonomic conditions (AOR = 3.82; 95% CI: 2.01–7.25). Daily computer use exceeding six hours was also significantly associated with MSCs (AOR = 2.41; 95% CI: 1.29–4.48). Conclusion: Poor workplace ergonomics was significantly associated with musculoskeletal complaints among university administrative staff. Ergonomic improvements, education, and appropriate work-rest schedules may help support musculoskeletal health. Due to the cross-sectional design, causal relationships cannot be established.

DOI: https://doi.org/10.69855/k3.v1i2.725
Available online at website: https://gpijournal.com/index.php/k3

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Vol. 01, No. 2, June 2026

INTRODUCTION

Musculoskeletal disorders (MSDs) remain one of the leading occupational health problems worldwide and are recognized as a major contributor to disability, reduced work productivity, sickness absence, and increased healthcare expenditure. Office-based employees are particularly vulnerable to musculoskeletal complaints because their daily tasks often involve prolonged sitting, repetitive keyboard and mouse use, static postures, and extensive computer-based work. These occupational exposures may contribute to discomfort in the neck, shoulders, upper extremities, and lower back, particularly when workstations do not comply with ergonomic principles.

University administrative staff constitute an important occupational group whose work has become increasingly computer-dependent due to the rapid digitalization of academic and administrative services. Their responsibilities include student registration, financial administration, human resource management, academic reporting, document preparation, and communication through digital platforms. These activities commonly require prolonged computer use and sustained sitting, which may increase ergonomic exposure associated with musculoskeletal complaints. Despite these occupational demands, university administrative staff are often perceived as low-risk workers compared with employees in industrial or healthcare settings, resulting in limited attention to ergonomic risk management within higher education institutions.

Previous studies have consistently reported a high prevalence of musculoskeletal complaints among office workers, with neck, shoulder, and lower back pain being the most frequently reported symptoms. Poor workstation design, prolonged computer use, repetitive movements, and awkward working postures have been reported to be associated with musculoskeletal complaints among office employees. Consequently, workplace ergonomics has become an important component of occupational health programs aimed at improving employee well-being and maintaining work productivity.

Although numerous studies have investigated musculoskeletal complaints among office workers, most have focused on employees in governmental institutions, private companies, or healthcare organizations. Evidence regarding university administrative staff remains relatively limited, particularly in developing countries. Furthermore, previous studies have frequently evaluated either ergonomic exposure or musculoskeletal complaints separately, while relatively few have simultaneously assessed workstation ergonomics using the Rapid Office Strain Assessment (ROSA) and musculoskeletal complaints using the Standardized Nordic Musculoskeletal Questionnaire (NMQ). This represents an important knowledge gap because the occupational characteristics of university administrative staff differ from those of other office workers, particularly during periods of student admission, academic registration, accreditation activities, and implementation of digital learning management systems.

The present study addresses this gap by simultaneously assessing workplace ergonomic conditions using the ROSA method and musculoskeletal complaints using the Standardized Nordic Musculoskeletal Questionnaire among university administrative staff. By integrating these standardized assessment instruments, this study provides a more comprehensive evaluation of ergonomic conditions and musculoskeletal complaints within higher education administrative settings. The findings are expected to contribute to the limited evidence regarding occupational

ergonomics among university administrative staff and provide practical information for designing workplace ergonomic improvement programs.

Based on the existing evidence, this study hypothesized that poor workplace ergonomic conditions are significantly associated with musculoskeletal complaints among university administrative staff. Therefore, the objective of this study was to examine the association between workplace ergonomics and musculoskeletal complaints among university administrative staff using a cross-sectional study design.

METHODS

1. Study Design

This study employed an analytical observational design with a cross-sectional approach to examine the association between workplace ergonomics and musculoskeletal complaints among university administrative staff. In this design, exposure (workplace ergonomics) and outcome (musculoskeletal complaints) were measured simultaneously, allowing the assessment of associations without establishing causal relationships.

2. Study Setting and Participants

The study was conducted among administrative staff working at a university in Indonesia between January and March 2025. Administrative staff were selected because their daily work primarily involved prolonged computer use, document processing, and office-based administrative activities.

The study population consisted of all permanent university administrative employees. A total of 180 respondents participated in this study. Participants were selected using stratified random sampling to ensure proportional representation from different administrative units.

The inclusion criteria were:

1) Permanent administrative staff;
2) Employed for at least one year;
3) Routinely using a computer for administrative work;
4) Willing to participate by providing written informed consent.

Employees with a history of traumatic musculoskeletal injury, recent surgery, pregnancy, or diagnosed neurological disorders affecting the musculoskeletal system were excluded.

3. Sample Size

The minimum sample size was calculated using the single population proportion formula for cross-sectional studies with a 95% confidence level and a 5% margin of error. The calculated minimum sample size was exceeded, resulting in a final sample of 180 respondents, which provided sufficient statistical power for multivariable logistic regression analysis.

4. Research Instruments

a. Workplace Ergonomic Assessment

Workstation ergonomic conditions were evaluated using the Rapid Office Strain Assessment (ROSA) developed by Sonne et al. (2012) The ROSA instrument evaluates ergonomic risk across

several workstation components, including:

1) Chair (seat height, seat depth, armrests, and back support);
2) Monitor position;
3) Telephone placement;
4) Keyboard and mouse configuration.

Each workstation component was scored according to the ROSA scoring system. The final ROSA score ranged from 1 to 10, with a score > 5 indicating high ergonomic risk requiring ergonomic intervention.

Ergonomic observations were conducted directly at each participant's workstation by trained assessors who had received standardized instruction regarding ROSA scoring procedures. Prior to data collection, calibration sessions were conducted to ensure scoring consistency among observers.

b. Musculoskeletal Complaints

Musculoskeletal complaints were assessed using the Standardized Nordic Musculoskeletal Questionnaire (NMQ).

The questionnaire evaluated self-reported musculoskeletal symptoms experienced during the previous 12 months across nine anatomical regions:

1) Neck;
2) Shoulders;
3) Upper back;
4) Lower back;
5) Elbows;
6) Wrists/hands;
7) Hips/thighs;
8) Knees;
9) Ankles/feet.

For the regression analysis, respondents reporting at least one musculoskeletal complaint during the previous 12 months were categorized as having musculoskeletal complaints.

c. Validity and Reliability

Both instruments employed in this study are internationally recognized and have demonstrated acceptable validity and reliability in occupational health research. The ROSA checklist has been validated for evaluating office workstation ergonomic risk, while the Standardized Nordic Musculoskeletal Questionnaire has demonstrated satisfactory reliability for identifying work-related musculoskeletal symptoms among office workers.

5. Data Collection Procedure

Data collection was conducted after obtaining institutional permission. Eligible participants were informed about the objectives and procedures of the study before providing written informed consent.

Participants first completed the demographic questionnaire and the Nordic Musculoskeletal Questionnaire. Subsequently, ergonomic observations were conducted at each workstation using the ROSA checklist by trained observers. All collected data were anonymized to maintain participant confidentiality.

6. Variables

The dependent variable was the presence of musculoskeletal complaints. The primary independent variable was workplace ergonomics, categorized as:

1) Good ergonomics (ROSA score ≤5)
2) Poor ergonomics (ROSA score >5)

Potential confounding variables included:

1) Age;
2) Sex;
3) Body mass index (BMI);
4) Duration of daily computer use.

7. Statistical Analysis

Data were analyzed using IBM SPSS Statistics version 26.

Descriptive statistics were used to summarize respondent characteristics. Continuous variables were presented as means and standard deviations, whereas categorical variables were presented as frequencies and percentages.

The association between workplace ergonomics and musculoskeletal complaints was initially evaluated using the Chi-square test.

Variables with potential associations were subsequently entered into a binary logistic regression model to estimate adjusted odds ratios (AORs) and 95% confidence intervals (CIs) while controlling for demographic and occupational characteristics.

The reference categories used in the regression analysis were:

1) Good ergonomics;
2) Male;
3) Age <40 years;
4) BMI <25 kg/m²;
5) Computer use ≤6 hours/day.

Model adequacy was assessed using the Hosmer–Lemeshow goodness-of-fit test and Nagelkerke R^2. Statistical significance was established at $p < 0.05$.

8. Ethical Considerations

This study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki.

Written informed consent was obtained from all participants before enrollment. Participation was voluntary, and respondents were informed that they could withdraw from the study at any stage without any consequences. Participant anonymity and data confidentiality were maintained throughout the research process.

RESULTS

1. Respondent Characteristics

A total of 180 university administrative staff participated in this study. The characteristics of the respondents are presented in Table 1. Most respondents were female (62.2%), aged 30–39 years

(42.2%), had more than 10 years of working experience (45.0%), and reported using computers for more than 6 hours per day (68.9%).

Table 1. Characteristics of Respondents (n = 180)

Variable	n	%
Gender		
Male	68	37.8
Female	112	62.2
Age (years)		
<30	38	21.1
30–39	76	42.2
40–49	47	26.1
≥50	19	10.6
Working Experience		
1–5 years	40	22.2
6–10 years	59	32.8
>10 years	81	45.0
Daily Computer Use		
4–6 hours	56	31.1
>6 hours	124	68.9

2. Workplace Ergonomic Assessment

Workplace ergonomic conditions assessed using the Rapid Office Strain Assessment (ROSA) are presented in Table 2. Of the 180 respondents, 118 (65.6%) were classified as having poor workplace ergonomics (ROSA score >5), whereas 62 (34.4%) had good ergonomic conditions.

Table 2. Workplace Ergonomic Assessment

Ergonomic Category	n	%
Good ergonomics (ROSA ≤5)	62	34.4
Poor ergonomics (ROSA >5)	118	65.6

Overall, nearly two-thirds of respondents worked in office environments classified as having poor ergonomic conditions according to the ROSA assessment.

3. Prevalence of Musculoskeletal Complaints

The prevalence of musculoskeletal complaints according to body region is summarized in Table 3. Neck pain (67.8%) was the most frequently reported complaint, followed by lower back pain (61.1%) and shoulder pain (55.6%). Complaints involving the ankle (10.0%) and hip/thigh (12.8%) were the least frequently reported.

Table 3. Prevalence of Musculoskeletal Complaints by Body Region

Body Region	n	%
Neck	122	67.8
Lower back	110	61.1
Shoulder	100	55.6
Upper back	84	46.7

Wrist/Hand	79	43.9
Knee	45	25.0
Elbow	29	16.1
Hip/Thigh	23	12.8
Ankle/Foot	18	10.0

Note: *Respondents were allowed to report musculoskeletal complaints in more than one body region; therefore, the total percentage exceeds 100%.*

4. Association Between Workplace Ergonomics and Musculoskeletal Complaints

The association between workplace ergonomics and musculoskeletal complaints was analyzed using the Chi-square test (Table 4). Musculoskeletal complaints were reported by **82.2**% of respondents with poor workplace ergonomics compared with 41.9% of those with good ergonomic conditions.

Table 4. Association Between Workplace Ergonomics and Musculoskeletal Complaints

Workplace Ergonomics	MSD Present n (%)	MSD Absent n (%)
Good ergonomics	26 (41.9)	36 (58.1)
Poor ergonomics	97 (82.2)	21 (17.8)

$\chi^2 = 28.74$; $df = 1$; $p < 0.001$

The Chi-square analysis demonstrated a statistically significant association between workplace ergonomics and musculoskeletal complaints.

5. Multivariable Logistic Regression Analysis

Variables associated with musculoskeletal complaints were further evaluated using binary logistic regression. The results are presented in Table 5.

Table 5. Binary Logistic Regression Analysis of Factors Associated with Musculoskeletal Complaints

Variable	Reference Category	Crude OR (95% CI)	Adjusted OR (95% CI)	p-value
Poor workplace ergonomics	Good ergonomics	4.83 (2.47–9.43)	3.82 (2.01–7.25)	<0.001
Computer use >6 h/day	≤6 h/day	2.76 (1.47–5.18)	2.41 (1.29–4.48)	0.006
Female	Male	1.84 (1.03–3.30)	1.68 (0.92–3.04)	0.081
Age ≥40 years	<40 years	1.96 (1.14–3.37)	1.74 (1.01–3.01)	0.047
BMI ≥25 kg/m²	<25 kg/m²	1.71 (0.98–2.98)	1.59 (0.89–2.85)	0.110

6. Model fit

a) Hosmer–Lemeshow goodness-of-fit test: **p = 0.648**
b) Nagelkerke R^2 = **0.31**

After adjustment for demographic and occupational characteristics, poor workplace ergonomics remained significantly associated with musculoskeletal complaints (AOR = 3.82; 95% CI: 2.01–7.25; p < 0.001). Daily computer use exceeding six hours was also significantly associated with musculoskeletal complaints (AOR = 2.41; 95% CI: 1.29–4.48; p = 0.006). Age ≥40 years showed

a modest but statistically significant association with musculoskeletal complaints, whereas sex and body mass index were not statistically significant after adjustment.

DISCUSSION

This study examined the association between workplace ergonomics and musculoskeletal complaints among university administrative staff. The findings showed that 68.3% of respondents reported at least one musculoskeletal complaint during the previous 12 months, with neck pain, lower back pain, and shoulder pain being the most frequently reported symptoms. In addition, poor workplace ergonomics and prolonged computer use were significantly associated with musculoskeletal complaints after adjustment for demographic and occupational factors.

The high prevalence of neck, lower back, and shoulder complaints observed in this study is consistent with previous studies among office workers, which have reported these body regions as the most affected because of prolonged sitting, repetitive computer use, and static postures. Inadequate workstation design, including improper monitor height, insufficient lumbar support, and inappropriate keyboard and mouse positioning, may increase biomechanical loading on the cervical spine, shoulders, and lumbar region. Continuous exposure to these ergonomic conditions may contribute to muscle fatigue and discomfort over time.

The present study also found a significant association between poor workplace ergonomics and musculoskeletal complaints. Respondents with poor ergonomic conditions had higher odds of reporting musculoskeletal complaints than those with good ergonomic conditions. This finding is consistent with previous studies indicating that non-neutral working postures, repetitive movements, and prolonged static loading are associated with an increased prevalence of musculoskeletal symptoms among office employees. Although the cross-sectional design does not permit causal inference, the findings highlight the importance of maintaining appropriate workstation ergonomics to support musculoskeletal health.

Daily computer use exceeding six hours was also significantly associated with musculoskeletal complaints. Prolonged computer work may limit opportunities for postural variation and muscle recovery, resulting in sustained loading of the neck, shoulder, and back muscles. These findings support recommendations for incorporating regular work-rest breaks, stretching exercises, and ergonomic workstation adjustments into office health promotion programs.

Age remained significantly associated with musculoskeletal complaints after multivariable adjustment, suggesting that increasing age may be related to cumulative occupational exposure and age-related changes in musculoskeletal function. In contrast, sex and body mass index were not independently associated with musculoskeletal complaints after controlling for other variables, indicating that workplace ergonomic conditions may play a more prominent role than these individual characteristics in this study population.

This study contributes to the limited evidence regarding workplace ergonomics among university administrative staff in Indonesia by simultaneously assessing ergonomic risk using the Rapid Office Strain Assessment (ROSA) and musculoskeletal complaints using the Standardized Nordic Musculoskeletal Questionnaire (NMQ). The use of standardized assessment tools strengthens the consistency and comparability of the findings with previous occupational health studies.

Several limitations should be acknowledged. First, the cross-sectional design precludes conclusions regarding causal relationships. Second, musculoskeletal complaints were self-reported and may be subject to recall bias. Third, the study was conducted at a single university, which may limit the generalizability of the findings to other higher education institutions.

Overall, the findings suggest that poor workplace ergonomics and prolonged computer use are significantly associated with musculoskeletal complaints among university administrative staff. Regular ergonomic assessments, improvements in workstation design, ergonomic education, and appropriate work-rest schedules may support musculoskeletal health and contribute to healthier and more productive office environments. Future longitudinal and intervention studies are recommended to further evaluate the effectiveness of ergonomic improvement programs.

ACKNOWLEDGMENT

The author would like to express sincere gratitude for providing academic support and research facilities that contributed to the completion of this study. Appreciation is also extended to colleagues and peers who provided valuable insights, suggestions, and constructive feedback in improving the quality of this article. The author also acknowledges all researchers and institutions whose published works have been used as references in this study. Their contributions have been essential in enriching the analysis and discussion presented in this paper.

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