



THE RELATIONSHIP BETWEEN THE IMPLEMENTATION OF BODY ERGONOMICS AND THE RISK OF WORK INJURIES AMONG NURSES AT RS TK. II MOH. RIDWAN MEURAKSA

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ABSTRACT

The proper application of ergonomics plays an important role in preventing work injuries among nursing personnel who perform high levels of physical activity. Inadequate ergonomic practices may increase the risk of musculoskeletal complaints in nurses during routine clinical tasks. This study aimed to determine the relationship between the application of body ergonomics and the risk of work injuries among nurses at RS TK. II Moh. Ridwan Meuraksa. This study employed a quantitative approach with a cross-sectional design. A total of 132 nurses, including implementing nurses and heads of wards, were selected using a total sampling technique. The application of body ergonomics was assessed using the Ovako Working Posture Analysis System (OWAS), while the risk of work injury was measured using the Nordic Body Map (NBM). Instrument validity was tested using the Pearson Product Moment correlation ($N = 30$; $r \text{ table} = 0.361$), and all items were declared valid. Reliability testing yielded a Cronbach's Alpha value of 0.964 for the NBM (very high reliability) and 0.673 for the OWAS (moderate reliability). Data were analyzed using the Chi-square test. The results showed no significant relationship between the application of body ergonomics and the risk of work injuries among nurses ($p\text{-value} = 0.582$). Among individual characteristics, only age was significantly associated with the risk of work injury ($p\text{-value} < 0.001$), whereas BMI, height, and education level showed no significant association. Nurses performed various activities, including computer-based nursing documentation, vital sign assessment, wound care, infusion and catheter removal, medication administration, blood glucose monitoring, and patient mobilization. The most frequently reported musculoskeletal complaints were experienced in the neck, shoulders, back to waist, arms, wrists, knees, and calves. Musculoskeletal injuries among nurses are influenced by workload, working posture, and duration of work. Therefore, the role of nursing management in providing ergonomics training is essential, particularly for young nurses.

Keywords: body ergonomics; musculoskeletal disorder; nurse; occupational injury risk; work duration

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INTRODUCTION

Nurses constitute the largest group of healthcare professionals in hospitals and play a crucial role in the delivery of healthcare services (Aisyah, Imani, & Rahayu, 2022). In carrying out their duties, nurses perform various tasks that require intensive and repetitive physical activity, including patient mobilisation, wound care, infusion insertion, vital sign assessment, and nursing documentation. Continuous direct interaction with patients places nurses at a high risk of developing occupational diseases, particularly work-related musculoskeletal injuries (Fitriani et al., 2020). This condition highlights the importance of occupational health and safety issues among nursing personnel within hospital settings.

One of the main factors contributing to work-related injuries among nurses is the improper application of ergonomic principles in daily work practices. Ergonomics is the scientific discipline concerned with understanding the interactions between humans and their working environment, with the aim of designing safe, comfortable, and efficient work systems (Balaputra & Sutomo, 2019). In addition to being a field of study, ergonomics serves as a guideline for implementing work

systems that are aligned with human capabilities and limitations. Inadequate ergonomic practices may result in discomfort, increased risk of injury, reduced work effectiveness and productivity, and ultimately compromise the quality of nursing care provided to patients.

In nursing practice, non-ergonomic working postures are still frequently observed. Activities such as bending during infusion insertion, twisting the body while transferring patients, maintaining static postures for prolonged periods during computer-based documentation, and manually lifting patients without assistive devices may impose excessive strain on the musculoskeletal system. Such strain is commonly experienced in the neck, shoulders, back, waist, arms, and wrists, particularly when postures are unbalanced or repeated over long durations (Dewi, 2020). Prolonged exposure to these conditions increases the risk of developing musculoskeletal disorders (MSDs) among nurses.

Numerous studies have demonstrated that musculoskeletal disorders represent a major occupational health problem in the nursing profession. Data from the International Labour Organization (ILO) and the Indonesian Ministry of Health indicate that MSDs are among the leading causes of decreased wellbeing and productivity among healthcare workers (Riris & Nasri, 2024). Furthermore, data from the Bureau of Labor Statistics (BLS) in 2018 reported that the incidence of MSDs among nurses in the private sector reached 46.0 cases per 10,000 full-time workers, significantly higher than the average across all occupations. MSDs accounted for approximately 44.1% of all occupational injuries among nurses, with the lower back being the most frequently affected body part (51.8%). These injuries were predominantly associated with manual patient handling activities.

International studies also report a high prevalence of musculoskeletal complaints among nurses. A study by Yang et al. (2020) found that 97% of intensive care unit nurses in Hunan Province, China, experienced at least one musculoskeletal symptom within the previous 12 months. The most commonly reported complaints were lower back pain, followed by neck and shoulder pain. These findings further emphasise that physical workload and non-ergonomic working postures are significant risk factors for musculoskeletal disorders in nursing practice.

Despite the extensive evidence demonstrating the high prevalence of musculoskeletal injuries among nurses, comprehensive and specific data regarding the appropriate application of body ergonomics in nursing practice remain limited, particularly in Indonesia. To date, official institutions such as the World Health Organization (WHO), the International Labour Organization (ILO), the National Institute for Occupational Safety and Health (NIOSH), and the Indonesian Ministry of Health have not provided explicit data linking the application of body ergonomics with the risk of occupational injuries among nurses based on objective posture assessments. Most existing data rely on self-reported measures, which may introduce reporting bias and limit the accuracy of ergonomic risk assessments (Hulshof, 2021). This limitation highlights a significant gap in the evidence base for the systematic management of ergonomic risks in nursing.

In contrast to the industrial and manufacturing sectors, where ergonomics has been well integrated into occupational health and safety systems, its application in the healthcare sector—particularly in nursing—remains suboptimal. Insufficient attention to ergonomic practices among nurses may increase the risk of occupational injuries and musculoskeletal disorders, ultimately affecting both nurse safety and the quality of healthcare services. Moreover, detailed data regarding the duration of non-neutral postures, the frequency of manual lifting without assistive devices, and prolonged static postures during work shifts are still scarce. This lack of information hinders the development of effective and context-specific preventive strategies.

RS TK. II Moh. Ridwan Meuraksa, as a military hospital, has unique workplace characteristics and operational challenges, including limited nursing staff and high service demands. These conditions

may increase the physical workload of nurses and encourage the adoption of non-ergonomic working postures during nursing care activities. In this context, nursing management plays a strategic role in controlling ergonomic risks through workload management, provision of appropriate work facilities, and the integration of ergonomic principles into occupational injury prevention efforts (Sartika et al., 2024).

Based on the above considerations, research is needed to objectively assess the application of body ergonomics and to identify the risk of occupational injuries among nurses. Therefore, this study aimed to analyse the relationship between the application of body ergonomics and the risk of work-related injuries among nurses at RS TK. II Moh. Ridwan Meuraksa, Jakarta. The findings of this study are expected to serve as a foundation for nursing management in the systematic implementation of ergonomic practices to enhance occupational safety and the quality of nursing care.

METHOD

This study employed a quantitative approach with an analytic observational design using a cross-sectional method. The research was conducted in 13 inpatient wards of RS TK. II Moh. Ridwan Meuraksa, Jakarta. Data collection took place from July to August 2025. The study involved 132 nurses, including head nurses and staff nurses, who were recruited using a total sampling technique. The inclusion criteria were nurses actively working in inpatient units, having a minimum working experience of more than three months, providing informed consent to participate, being directly involved in patient care with physical activities, and being able to complete the Nordic Body Map (NBM) questionnaire. Nurses who did not complete the questionnaire in full were excluded from the study.

Validity and reliability testing were conducted prior to data collection. The NBM instrument, consisting of 28 items, was tested using the Pearson Product Moment correlation at a 5% significance level ($N = 30$; $r_{\text{table}} = 0.361$). Items were considered valid if $r_{\text{count}} > r_{\text{table}}$ ($0.362 - 0.930$) and $\text{Sig. (2-tailed)} < 0.05$, and all items were declared valid. Reliability testing yielded a Cronbach's Alpha value of 0.964, indicating very high internal consistency. Similarly, the OWAS instrument was tested using the Pearson Product Moment correlation with the same criteria ($N = 30$; $r_{\text{table}} = 0.361$), and all indicators were declared valid. Reliability testing produced a Cronbach's Alpha value of 0.673, indicating moderate reliability (0.50–0.70).

Data were collected through direct observation and structured interviews. Work posture observation was conducted using the Ovako Working Posture Analysis System (OWAS) in a non-interventional manner to assess the implementation of body ergonomics during nursing activities. Observed tasks included computer-based nursing documentation, measurement of vital signs, wound care procedures, infusion removal, medication preparation, blood glucose monitoring, catheter removal, as well as patient transfer and mobilization using stretchers or wheelchairs. The OWAS assessment evaluated four main components: back posture, arm position, leg position, and the load handled during work activities. Each component was assigned a numerical code and combined to determine the level of ergonomic risk according to standard OWAS guidelines.

Musculoskeletal complaints were assessed through structured interviews using the Nordic Body Map (NBM) instrument, which consists of 28 items measuring pain or discomfort in various body regions on a scale ranging from 0 to 3. Interviews were conducted after completion of posture observation and were scheduled to accommodate nurses' working hours so as not to interfere with patient care activities. In addition, a questionnaire was used to collect respondent characteristics, including age, educational level, body mass index (BMI), height, and length of employment. All collected data were analyzed to examine the relationship between the implementation of body ergonomics and the risk of occupational injuries. Ethical approval for this study was obtained from

the Health Research Ethics Committee of Universitas Pembangunan Nasional “Veteran” Jakarta (Approval No. 1118), as well as institutional permission from RS TK. II Moh. Ridwan Meuraksa (Approval No. Sket/250/VII/2025).

RESULT

Table 1.
Frequency Distribution of Characteristics of Inpatient Nurses (n= 132)

	Characteristics	f	%
Age	< 30 Years	55	41.7
	≥ 30 Years	77	58.3
Education	D3	112	84.8
	Ners	17	12.9
	S2	3	2.3
Length of Employment	< 3 Years	43	32.6
	≥ 3 Years	89	67.4
Body Mass Index	Overweight	0	0
	Normal	68	51.5
	Pre-obese	49	37.1
	Obesity Class I	10	7.6
	Obesity Class II	4	3.0
	Obesity Class III	1	0.8
Height	Short (< 155 cm)	11	8.3
	Normal (≥ 155 cm)	121	91.7

Table 1, shows that out of a total of 132 respondents, the majority of nurses were aged ≥ 30 years, totaling 77 individuals (58.3%). In terms of educational level, most respondents held a Diploma (D3), accounting for 112 nurses (84.8%). Based on length of employment, nurses with a working period of ≥ 3 years predominated, with 89 respondents (67.4%). Regarding body weight characteristics, most nurses had a normal Body Mass Index (BMI), comprising 68 individuals (51.5%). Meanwhile, based on height, the majority of respondents were classified as having normal height (≥ 155 cm), totaling 121 nurses (91.7%)

Table 2.
Frequency Distribution of Body Ergonomics Implementation among Inpatient Nurses (n= 132)

	Characteristics	f	%
Body Ergonomics Implementation	Low Risk	36	27.3
	Moderate Risk	46	34.8
	High Risk	39	29.5
	Very High Risk	11	8.3

Table 2, shows that the most prevalent risk category experienced by the respondents was moderate risk, affecting 46 nurses (34.8%). This finding indicates that the majority of respondents performed their work activities using postures that may pose a potential risk to the musculoskeletal system. According to the OWAS standard classification, a moderate risk level suggests that corrective actions to improve working posture are required, although such improvements are not considered urgent.

Tabel 3.
Frequency Distribution of Occupational Injury Risk among Inpatient Nurses (n= 132)

	Characteristics	f	%
Occupational Injury Risk	No Pain	36	27.3
	Mild Pain	46	34.8
	Moderate Pain	39	29.5
	Severe Pain	11	8.3

Table 3, The majority of respondents were classified in the Mild Pain category, comprising 46 nurses (34.8%). According to Susanto (2024), this category indicates that workers are still able to perform their duties adequately; however, early signs of physical discomfort have begun to appear.

Table 4.
Results of the Analysis of the Association Between Age and Occupational Injury Risk Among Inpatient Nurses (n= 132)

Inpatient Nurses (n=152)											
Age	Occupational Injury Risk Among								Total	P-Value	
	No Pain		Mild Pain		Moderate Pain		Severe Pain				
	f	%	f	%	F	%	f	%			
<30 Years	19	34.5	22	40.0	12	21.8	2	3.6	55	100	<0.001
≥30 Years	16	20.8	15	19.5	16	20.8	30	39.0	77	100	

Table 4, The group of respondents aged < 30 years showed the highest proportion in the mild pain category, accounting for 40.0%. In contrast, respondents aged ≥ 30 years were predominantly classified in the severe pain category, with a proportion of 39.0%. The Chi-square test yielded a p-value < 0.001, indicating a statistically significant association between age and the level of musculoskeletal injury risk as measured by the Nordic Body Map (NBM). These findings suggest that younger nurses tend to experience milder musculoskeletal complaints, whereas older nurses are more likely to report more severe symptoms.

Table 5
Results of the Analysis of the Relationship Between Body Ergonomics Implementation and Occupational Injury Risk Among Inpatient Nurses (n= 132)

Occupational Injury Risk Among	Body Ergonomics Implementation (OWAS)								Total	P-Value	
	Low Risk		Moderate Risk		High Risk		Very High Risk				
	f	%	f	%	f	%	f	%			
No Pain	11	31.4	12	34.3	9	25.7	3	8.6	35	100	0.582
Mild Pain	9	24.3	13	35.1	10	27	5	13.5	37	100	
Moderate Pain	4	14.3	12	42.9	11	39.3	1	3.6	28	100	
Severe Pain	12	37.5	9	28.1	9	28.1	2	6.3	32	100	

Table 5, shows that the majority of nurses were in the moderate ergonomic practice category, totaling 46 respondents (34.8%), while musculoskeletal complaints were most frequently reported in the slightly painful category by 37 respondents (28.0%). More specifically, nurses who experienced pain were most commonly found in the moderate ergonomic practice group (42.9%), whereas severe pain complaints were more dominant among nurses with low ergonomic practice (37.5%). However, the Chi-Square test results showed a p-value of 0.582 ($p > 0.05$), indicating that there is no significant relationship between ergonomic practice and the risk of musculoskeletal injury among nurses at RS TK. II Moh. Ridwan Meuraksa. In other words, nurses with both low and high levels of ergonomic practice have a similar likelihood of experiencing work-related musculoskeletal injuries.

DISCUSSION

The findings of this study indicate that the majority of inpatient nurses at RS TK. II Moh. Ridwan Meuraksa were aged ≥ 30 years. This predominance of adult-age nurses reflects a workforce composition that is relatively mature and experienced. However, increasing age is accompanied by gradual physiological decline, including reduced muscle strength, joint flexibility, and physical endurance, which may heighten susceptibility to musculoskeletal disorders, particularly in occupations with high physical demands such as inpatient nursing.

Bivariate analysis revealed a statistically significant association between age and occupational injury risk as measured by the Nordic Body Map. Nurses aged < 30 years were more likely to experience mild musculoskeletal complaints, whereas those aged ≥ 30 years predominantly reported severe pain. This pattern suggests that advancing age is associated with increased severity of musculoskeletal symptoms, potentially due to cumulative physical workload exposure and a reduced capacity to adapt to sustained biomechanical stress.

These findings are consistent with the study by Arifuddin, Hardi, and Kalla (2023), which reported that age influences the risk of occupational accidents and injuries among nursing personnel. Age-related physiological changes may impair reaction time, muscular strength, and motor coordination,

thereby increasing the likelihood of injury during nursing activities. Conversely, although younger nurses generally possess better physical capacity, limited work experience may affect their awareness of occupational hazards.

Nevertheless, it is important to recognize that increased work experience accompanying age may serve as a protective factor through the adoption of safer work behaviors. Febrianti, Yusmanisari, and Umami (2024) emphasized that work experience and practical knowledge play a critical role in enhancing occupational safety among nurses. This suggests that injury risk among older nurses results from the interaction between biological aging processes and long-term occupational exposure.

Regarding educational background, most respondents held a Diploma III (D3) qualification. The predominance of D3 nurses reflects the practical skill orientation required in inpatient care settings. However, bivariate analysis showed no significant relationship between educational level and occupational injury risk. This finding indicates that formal education alone does not determine injury risk in the absence of consistent ergonomic practices and adherence to standard operating procedures.

This result aligns with Balaputra (2023), who reported that formal education level does not directly influence the occurrence of musculoskeletal disorders. Instead, practical knowledge, work habits, and compliance with safety procedures play a more decisive role. Therefore, continuous ergonomic training and effective workplace supervision are more critical than educational level alone in preventing occupational injuries.

In terms of length of employment, most respondents had worked for ≥ 3 years. However, no significant association was found between years of service and injury risk. This suggests that injury risk is not solely dependent on employment duration but is more strongly influenced by how nursing activities are performed. This finding is consistent with Nopriani and Apriyandi (2024), who reported that non-ergonomic working postures contribute more significantly to musculoskeletal complaints than length of service.

Although not statistically significant, distribution patterns indicated that nurses with longer employment duration tended to report more severe complaints, suggesting cumulative physical strain over time. This finding differs from that of Balaputra and Sutomo (2019), who identified a significant relationship between length of service and musculoskeletal complaints. Such discrepancies may be attributed to differences in workload characteristics and work environments across healthcare institutions.

Most respondents in this study had a normal Body Mass Index (BMI), and bivariate analysis showed no significant association between BMI and occupational injury risk. This finding is consistent with Purba & Situmorang. (2019), who concluded that BMI is not a primary determinant of occupational injuries among nurses. However, the higher proportion of complaints observed among nurses with elevated BMI suggests that BMI may act as an aggravating factor when combined with non-ergonomic working postures.

These findings partially contrast with those of Utami, Setiawan, & Setyaningsih. (2024), who reported that higher BMI increases biomechanical load on the musculoskeletal system. This discrepancy indicates that BMI should not be viewed as an independent risk factor but rather as one that interacts with operational factors such as work techniques, physical workload, and adherence to ergonomic guidelines.

Analysis of height also demonstrated no significant association with occupational injury risk. This result is consistent with studies by Supardi et al. (2022) and Kristina et al. (2020), which found that musculoskeletal complaints among nurses are more strongly influenced by work habits and body posture than by anthropometric characteristics. Nevertheless, mismatches between worker height and workplace design may still contribute to non-ergonomic postures, particularly among nurses with extreme height variations.

The implementation of body ergonomics in this study was predominantly categorized as moderate to high risk. However, statistically, no significant relationship was found between ergonomic implementation and occupational injury risk. This finding suggests that musculoskeletal injuries among nurses are multifactorial in nature. Similar conclusions were reported by Akodu and Ashalejo (2019) and Alsaqqa (2023), who emphasized the combined influence of individual factors, workload, and duration of postural exposure.

Despite the lack of statistical significance, distribution patterns indicated that more severe complaints were observed among nurses with poorer ergonomic implementation. This underscores the continued importance of ergonomics in injury prevention, even though it does not function as a single determining factor. Therefore, comprehensive injury prevention strategies are required, including workload management, patient-handling training, ergonomic supervision, and workplace adjustments tailored to individual nurse characteristics..

CONCLUSION

This study demonstrates that the application of body ergonomics is not significantly associated with the risk of occupational injury among nurses, indicating that musculoskeletal disorders are not caused by a single factor. Age was identified as the only individual characteristic significantly related to injury risk, with younger nurses more likely to experience mild complaints, while older nurses tended to report more severe musculoskeletal symptoms. Other characteristics, including Body Mass Index, length of employment, height, and educational level, showed no significant association with occupational injury risk, although certain groups exhibited a tendency toward increased complaints.

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