



PREVALENCE AND RISK FACTORS OF MUSCULOSKELETAL DISORDERS IN NURSES IN THE OPERATING ROOM

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ABSTRACT

Work-related Musculoskeletal Disorders (WMSDs) are health problems affecting the musculoskeletal system caused by non-ergonomic working environments and may result in soft tissue damage. These conditions can lead to chronic pain and fatigue, particularly among operating room nurses, thereby compromising occupational safety and work performance. To determine the prevalence and risk factors of work-related musculoskeletal disorders among operating room nurses. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines were used for article selection. The JBI Critical Appraisal Checklist was employed to assess methodological quality. Articles were retrieved from Scopus, EBSCO, Springer Nature Link, ScienceDirect, and ProQuest databases covering the period from 2016 to 2026 using full-text articles. Of the 1,819 articles initially identified, 10 studies were included in this review following a screening process based on predefined inclusion and exclusion criteria. Data were extracted using a standardized form that included study characteristics, prevalence rates, affected body regions, and reported risk factors of WMSDs. The extracted data were analyzed using a narrative synthesis approach by grouping findings according to prevalence and categories of risk factors, including individual, biomechanical, and organizational factors. The prevalence of WMSDs ranged from 45.9% to 92.5%, with lower back pain reported as the most common complaint, followed by neck, shoulder, waist, and knee discomfort. Risk factors associated with WMSDs include individual factors, biomechanical factors, and organizational factors. The risk of WMSDs is multifactorial in nature. Therefore, comprehensive and continuous ergonomic interventions are needed to reduce the risk of musculoskeletal disorders and improve the quality of life of operating room nurses.

Keywords: musculoskeletal disorders; operating room nurses; work-related musculoskeletal disorders

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INTRODUCTION

Work-related Musculoskeletal Disorders (WMSDs) are health conditions affecting the musculoskeletal system that are commonly caused by non-ergonomic working environments, including repetitive movements, heavy lifting, and spinal rotation. Clinically, WMSDs can lead to degeneration and inflammation of soft tissues, including joints, tendons, ligaments, muscles, peripheral nerves, and blood vessels. These conditions often result in chronic pain and fatigue among nurses, leading to reduced quality of nursing care, decreased productivity, and diminished quality of life. Consequently, WMSDs negatively affect both healthcare organizational performance and individual nurses' well-being (Fayzi et al., 2022; Krishnanmoorthy et al., 2020; Tavakkol et al., 2020; Yizengaw et al., 2021).

Studies have identified the operating room as one of the hospital units with the highest risk of musculoskeletal disorders compared with other healthcare settings, such as inpatient wards, intensive care units, emergency departments, and outpatient clinics (Ayvaz et al., 2023). Operating room nurses are integral members of the surgical team who play a professional role in patient care planning and management. Their daily exposure to ergonomic risk factors associated with job

demands and the operating room environment increases their susceptibility to musculoskeletal disorders. Such factors include prolonged standing, awkward body postures, and physically demanding tasks performed during surgical procedures. The high prevalence of these occupational exposures indicates that operating room nurses constitute one of the populations most vulnerable to developing WMSDs (Clari et al., 2021; Ocaktan & Karabacak, 2025).

The risk of musculoskeletal disorders in the operating room is multifactorial. This is largely attributable to the nature of surgical work, which involves both static and dynamic physical demands, including maintaining prolonged postures as well as adapting to changing surgical procedures and medical equipment. Therefore, a comprehensive review of the literature is needed to identify the factors contributing to these risks. Furthermore, existing evidence regarding the effectiveness of preventive interventions for musculoskeletal disorders in operating room settings remains inconsistent. In light of these considerations, this systematic review was conducted to determine the prevalence and identify the risk factors associated with work-related musculoskeletal disorders among operating room nurses.

METHOD

Design and Search Strategy

This systematic review searched for relevant studies across five electronic databases: Scopus, EBSCO, Springer Nature Link, ScienceDirect, and ProQuest. The search strategy employed the following keywords:

("musculoskeletal disorders" OR "work-related musculoskeletal disorders" OR "WRMSD" OR "musculoskeletal injury" OR "musculoskeletal pain") AND ("operating room nurses" OR "surgical nurses" OR "perioperative nurses" OR "OR nurses")

Articles were selected in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.

Inclusion and Exclusion Criteria

The literature search was guided by the PICO framework: Population = operating room nurses; Intervention/Exposure = operating room work environment; Comparison = none; and Outcome = musculoskeletal disorders.

The inclusion criteria were: (1) studies involving operating room nurses, (2) participants of any gender, (3) nurses with a minimum of one year of work experience, (4) studies published within the last ten years, (5) articles published in English, and (6) studies employing a cross-sectional design. The exclusion criteria included review articles and studies for which the full text was unavailable.

Search Results

The database search identified a total of 1,819 English-language articles, including 53 from Scopus, 849 from EBSCO, 165 from Springer Nature Link, 117 from ScienceDirect, and 635 from ProQuest. After removing 148 duplicate records, 1,671 articles remained for screening. These articles were assessed according to the predefined inclusion and exclusion criteria, resulting in 10 studies being included in the final review.

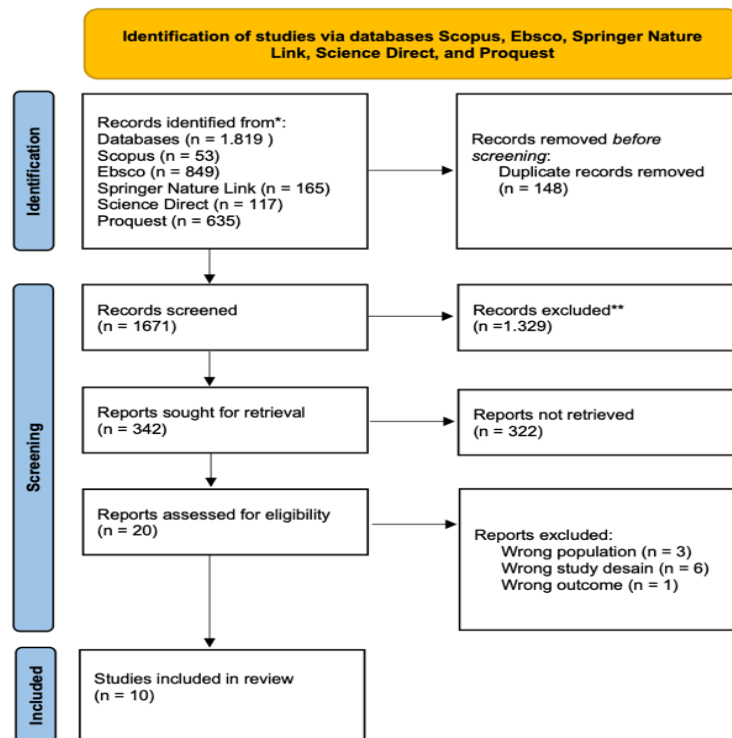


Figure 1 PRISMA Flowchart

Quality Assessment

Article quality was assessed using the JBI *critical appraisal checklist for cross-sectional* designs, with eight questions that each article had to answer with a "yes," "no," or "unclear" response. Of the 10 selected articles, the risk of bias was low, ranging from 87.5% to 100% (see Table 1). The analyzed studies were conducted in Turkey, Spain, Iran, Ethiopia, and Italy, with a total of 2,650 respondents.

RESULT

Table 1.
JBI Critical Appraisal Checklist for Cross-Sectional

No	Checklist Cross-sectional	Koyuncu et al (2024)	Marti- ejarque et al (2021)	Ocaktan &Karabacal (2025)	Fayzi e al (2022)	Zahibirai et al (2024)	Yizengav et al (2021)	Tavakko et al (2020)	Asghar et al (2019)	Karim et al (2025)	Clari et al (2019)
1.	Have the criteria for inclusion in the sample been clearly defined?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
2.	Are objective criteria and standards used to measure the condition?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
3.	Was the exposure measured in a valid and reliable manner?	Y	Y	Y	Y	Y	Y	Y	Y	Y	N

No	Checklist Cross-sectional	Koyuncu et al (2024)	Marti- ejarque et al (2021)	Ocaktan &Karabacal (2025)	Fayzi e al (2022)	Zahibira et al (2024)	Yizengav et al (2021)	Tavakko et al (2020)	Asghar et al (2019)	Karim et al (2025)	Clari et al (2019)
4.	Are the measured outcomes done in a valid and reliable manner?	Y	<i>Unclear</i>	Y	Y	Y	<i>Unclear</i>	Y	Y	Y	Y
5.	Have confounding factors been identified?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
6.	Have strategies to address confounding factors been mentioned?	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
7.	Is the statistical analysis used appropriate?	Y	Y	Y	<i>Unclear</i>	Y	Y	Y	Y	Y	Y
8.	Are the research subjects and their setting described in detail?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
<i>Overall appraisal</i>		7/8	7/8	8/8	7/8	8/8	7/8	8/8	8/8	8/8	7/8
<i>Methodological quality</i>		87.5%	87.5%	100%	87.5%	100%	87.5%	100%	100%	100%	87.5%

Table 2.
Article Summary

No	Authors	Article title	Aim	Design	Sample	Results
1.	Koyuncu et al. (2025)In Turkey	The Impact of Work-Related Musculoskeletal Pains on Routine Tasks Among ORN : A Multicenter Cross-Sectional Study	Determining work-related musculoskeletal pain and its impact on routine work in operating room nurses	<i>Cross-Sectional</i>	105 Respondents	The prevalence of musculoskeletal pain in the past 12 months was most commonly found in the lower back (69.5%), neck pain (68.6%), and back pain (61.9%). Pain in the hands, wrists, back, shoulders, and lower back can increase with increased work hours and potentially increase the risk of disability. Women are at higher risk of experiencing lower back and back pain.
2.	Martí-Ejarque et al. (2021)In Spanish	Occupational Diseases and Perceived Health in Operating Room Nurses: A Multicenter Cross-Sectional Observational Study	To determine the influence of the working environment of operating room nurses compared to inpatient nurses on health.	<i>Cross-Sectional</i>	331 Respondents	Operating room nurses have a statistically significant risk of developing musculoskeletal disorders (MSDs) and contact dermatitis. The prevalence of musculoskeletal pain was highest in the lower back (73.4%) and neck (64.9%). The SF12 questionnaire also showed that operating room nurses had lower physical health component scores than inpatient nurses.

No	Authors	Article title	Aim	Design	Sample	Results
3	Ocaktan & Karabacak (2025)In Türkiye	An Overlooked Hazard for ORN :Ergonomic Risks and Consequences Related to Working Position	Determining the risks and effects of body posture and working conditions in the operating room on operating room nurses on musculoskeletal disorders	Cross-Sectional	85 Respondents	The highest prevalence of musculoskeletal pain was found in the neck (72.5%), lower back (70.8%), and shoulders (65.8%). The REBA posture analysis showed a score of 7.7, indicating that operating room nurses are at a moderate to high ergonomic risk level.
4.	Fayzi et al. (2022)In Iran	Prevalence and Clinical Characteristics of Low Back Pain among Operating Room Personnel: A Cross-Sectional Study in South of Iran	Evaluating the prevalence and clinical characteristics of low back pain	Cross-Sectional	385 Respondents	The prevalence of low back pain is 74%. The study concluded that there is a significant association between low back pain, education level, and marital status.
5.	Zabihird et al. (2024)In Iran	Prevalence of Low Back Pain and Association Factors Among Operating Room Personnel of Ahvaz Hospitals: A Cross-Sectional Study	Knowing the prevalence and risk factors for low back pain	Cross-Sectional	323 Respondents	The prevalence of low back pain was 74.3%. Statistical analysis showed a significant association between low back pain and gender (especially women), marital status, body mass index (BMI), age, shift work system, length of service, static posture while on duty, and the total number of shifts worked.
6.	Yizengaw et al. (2021)In Ethiopia	Prevalence and factors associated with work-related musculoskeletal disorder among health care providers working in the operation room	To determine the prevalence and factors associated with work-related musculoskeletal disorders among health workers working in operating rooms.	Cross-Sectional	394 Respondents	The prevalence of work-related musculoskeletal disorders was 64.2%. Low back pain was the most common problem, at 39.8%. Factors significantly associated with musculoskeletal disorders included working overtime, educational status, lack of assistance during procedures, and working the night shift.
7.	Tavakkoli et al. (2020)In Iran	Survey of awareness about the risk factors of low back pain among operating room personnel of Shiraz hospitals: A cross-sectional study	Evaluating the prevalence and risk factors of low back pain in operating room healthcare workers	Cross-Sectional	385 Respondents	The prevalence of low back pain was 74%. The average personnel awareness score regarding LBP risk factors was 24.88 ± 4.18 (categorized as moderate/good). Despite this high level of awareness, the data show no direct linear relationship between the level of risk knowledge and the actual prevalence of LBP in the field.
8.	Asghari et al. (2019)In Iran	Musculoskeletal pain in operating room nurses: Associations with quality of work life, working posture, socio-demographic and job characteristics	Evaluating the relationship between sociodemographic and occupational characteristics and quality of work life (QWL) and work posture on musculoskeletal pain (MSP)	Cross-Sectional	144 Respondents	The prevalence of musculoskeletal disorders in the lower back (61.9%), knees (60.5%), ankles/feet (55.8%), and neck (44.9%). Poor ergonomic posture at work (REBA score) averaging 7.7 and low quality of work life (QWL) are strongly correlated with the risk of musculoskeletal pain.
9.	karimi et al. (2025)In Iran	A cross-sectional study on dimensions of low back pain in Hamedan Hospitals	To determine the prevalence, dimensions, and risk factors of LBP among operating room personnel.	Cross-Sectional	350 Respondents	Prevalence of <i>Low back pain</i> (LBP) was 78.3% with the highest being the maxillofacial section and the lowest being plastic surgery. The most common types of LBP are acute (40.6%) and regional (local) pain types. LBP is

No	Authors	Article title	Aim	Design	Sample	Results
						significantly related to factors such as age, length of service, and the type of hospital where they serve.
10.	Clari et al. (2019)In Italy	Upper Limb Work-Related Musculoskeletal Disorders in Operating Room Nurses: A Multicenter Cross-Sectional Study	Evaluating the relationship between personal characteristics with the risk of work-related musculoskeletal disorders (WMSD) of the upper limbs in operating room surgical nurses (ORNs)	Cross-Sectional	148 Respondents	The prevalence of work-related musculoskeletal disorders in the upper extremities is 45.9%. Working full-time significantly increases the risk of musculoskeletal disorders.

DISCUSSION

This systematic review aimed to analyze the prevalence and risk factors of musculoskeletal disorders among operating room nurses. The analysis included individual factors (sex, age, body mass index [BMI], educational level, and physical activity), biomechanical and occupational factors (work posture), as well as organizational and psychosocial factors (shift work schedules and overtime). The operating room environment poses a high risk of musculoskeletal disorders among nurses due to excessive physical and biomechanical demands, both static and dynamic in nature. Static stress is considered a primary contributor, resulting from maintaining rigid body postures for prolonged periods, adopting non-ergonomic postures during surgical procedures, performing monotonous tasks, and making sudden movements during emergency situations. These conditions lead to prolonged postural strain. In addition, dynamic stress commonly results from physically demanding activities such as pushing, pulling, or lifting patients and surgical instruments (Asghari et al., 2019; Clari et al., 2021).

Prevalence of Musculoskeletal Disorders

The findings of this systematic review indicate that operating room nurses experienced pain in at least one musculoskeletal region during the previous year. The prevalence of musculoskeletal disorders ranged from 45.9% to 92.5%, with lower back pain being the most frequently reported complaint, followed by pain in the neck, shoulders, waist, and knees. Similarly, Kiruba et al. (2018) reported that 84% of operating room nurses experienced low back pain (LBP). LBP has been identified as one of the most common and significant musculoskeletal disorders among operating room nurses. It is a major contributor to absenteeism and a common reason for nurses to transfer to other work settings. These findings suggest that LBP is strongly associated with occupational exposure to biomechanical demands and physically tense working conditions in the operating room (Tavakkol et al., 2020; Zabihrad et al., 2024). The consistently high prevalence further confirms that the operating room is a workplace with substantial ergonomic risks for nursing personnel (Karimi et al., 2025).

Risk Factors for Musculoskeletal Disorders

Individual Factors

Several individual characteristics were identified as significant predictors of musculoskeletal disorders, including sex, age, BMI, educational level, and physical activity. Female nurses were found to be more likely to experience musculoskeletal disorders, particularly involving the knees, neck, and lower back, than male nurses (Asghari et al., 2019; Koyuncu et al., 2025). This increased susceptibility has been attributed to somatic and hormonal differences, exposure to cold working environments, limited opportunities for muscle conditioning, and additional responsibilities outside the operating room setting (Clari et al., 2021; Fayzi et al., 2022). Age and years of work experience were also significantly associated with the prevalence of musculoskeletal disorders. Although some

studies suggest that newly employed nurses are vulnerable during their first five years of practice, increasing age generally contributes to the cumulative effects of musculoskeletal stress, leading to chronic pain. Furthermore, a higher BMI has been associated with an increased risk of LBP because excess body weight places additional mechanical stress on spinal structures. Other factors, such as marital status, have also been reported to be significantly associated with LBP in several studies conducted in Iran. Conversely, operating room nurses who engage in regular exercise or physical activity tend to report lower rates of neck, knee, and ankle pain (Clari et al., 2021). Educational level has also been linked to musculoskeletal risk, as nurses with lower educational attainment may possess less knowledge and fewer skills regarding workplace ergonomics (Yizengaw et al., 2021).

Biomechanical and Occupational Factors

Specific operating room activities, such as pulling and transferring surgical instruments and preparing operating tables, can impose extreme physical and biomechanical demands on nurses. Static and non-ergonomic working postures, particularly neck or trunk flexion greater than 20 degrees, have been identified as major contributing factors based on Rapid Entire Body Assessment (REBA) evaluations. A mean REBA score of 7.7 indicates a high-risk level requiring immediate modifications in work practices and workstation design (Asghari et al., 2019). Furthermore, the role of the scrub nurse, which requires maintaining static postures throughout lengthy surgical procedures, significantly increases the risk of musculoskeletal disorders affecting the upper extremities and back (Clari et al., 2019; Koyuncu et al., 2025). Prolonged static work as a scrub nurse substantially increases the likelihood of disability involving the arms, shoulders, and hands. This is largely due to the need to maintain the same position for extended periods while holding retractors or handling heavy surgical equipment (Asghari et al., 2019).

Organizational and Psychosocial Factors

Work organization plays a critical role in the development of musculoskeletal disorders. Shift work has been shown to increase the risk of musculoskeletal disorders and physical fatigue among operating room nurses (Asghari et al., 2019). Working without assistance during surgical procedures and being required to perform over time may further exacerbate physical strain. In addition to physical demands, psychological stress and high mental workload have also been found to contribute to the perception and severity of musculoskeletal pain (Yizengaw et al., 2021).

CONCLUSION

Musculoskeletal disorders among operating room nurses represent a significant occupational health problem, with prevalence rates exceeding 60%. These conditions often develop during the first few years of employment, with the neck, lower back, shoulders, waist, and knees being the most commonly affected body regions. The risk of musculoskeletal disorders is multifactorial, involving individual characteristics such as sex, age, and body mass index (BMI), biomechanical demands including non-ergonomic postures and prolonged static positions, as well as organizational factors such as shift work and overtime. Therefore, comprehensive ergonomic interventions are needed, including workstation redesign, job rotation to reduce prolonged static exposure among operating room nurses, and continuous physical exercise and ergonomic training programs to minimize the risk of musculoskeletal disorders and improve nurses' quality of life. Furthermore, future research should focus on examining the relationships among various risk factors, particularly individual characteristics, workload, and work posture, to provide a more comprehensive understanding of the development and prevention of musculoskeletal disorders in operating room settings.

REFERENCES

- Asghari, E., Dianat, I., Abdollahzadeh, F., Mohammadi, F., Asghari, P., Jafarabadi, M.A., & Castellucci, H.I. (2019). Musculoskeletal pain in operating room nurses: Associations with quality of work life, working posture, socio-demographic and job characteristics. *International Journal of Industrial Ergonomics* , 72 , 330–337. <https://doi.org/10.1016/j.ergon.2019.06.009>

- Ayvaz, Ö., Özyıldırım, B. A., İşsever, H., Öztan, G., Atak, M., & Özel, S. (2023). Ergonomic risk assessment of working postures of nurses working in a medical faculty hospital with REBA and RULA methods. *Science Progress* , 106 (4). <https://doi.org/10.1177/00368504231216540>
- Clari, M., Garzaro, G., Di Maso, M., Donato, F., Godono, A., Paleologo, M., Dimonte, V., & Pira, E. (2019). Upper limb work-related musculoskeletal disorders in operating room nurses: A multicenter cross-sectional study. *International Journal of Environmental Research and Public Health* , 16 (16). <https://doi.org/10.3390/ijerph16162844>
- Clari, M., Godono, A., Garzaro, G., Voglino, G., Gualano, M.R., Migliaretti, G., Gullino, A., Ciocan, C., & Dimonte, V. (2021). Prevalence of musculoskeletal disorders among perioperative nurses: a systematic review and META-analysis. *BMC Musculoskeletal Disorders* , 22 (1). <https://doi.org/10.1186/s12891-021-04057-3>
- Fayzi, R., Karimi, A., Fereidouni, A., Salavatian, A., Imani, B., & Tavakkol, R. (2022). Prevalence and Clinical Characteristics of Low Back Pain among Operating Room Personnel: A Cross-Sectional Study in South of Iran. *Frontiers in Surgery* , 9 . <https://doi.org/10.3389/fsurg.2022.841339>
- Karimi, A., Imani, B., Zabihihrad, J., Feizi, R., Gharahzade, A., & Tavakkol, R. (2025). A cross-sectional study on dimensions of low back pain in Hamedan Hospitals. *Perioperative Care and Operating Room Management* , 38 . <https://doi.org/10.1016/j.pcorn.2025.100464>
- Kiruba, A., Segaran, F., & Kiruba Jeyakumar, A. (2018). Prevalence and risk factors of low back pain and disability index among operating room nurses. *Journal of Perioperative Nursing* , 31 .
- Koyuncu, A., Kaya, K., Kaya, O., & Yava, A. (2025). The Impact of Work-Related Musculoskeletal Pains on Routine Tasks Among Operating Room Nurses: A Multicenter Cross-Sectional Study. *Pain Management Nursing* , 26 (1), e88–e96. <https://doi.org/10.1016/j.pmn.2024.08.003>
- Krishnanmoorthy, G., Rampal, S., Karuthan, S., Baharudin, F., & Krishna, R. (2020). Effectiveness of Participatory Ergonomic Interventions on Work-Related Musculoskeletal Disorders, Sick Absenteeism, and Work Performance Among Nurses: Systematic Review. *JMIR Human Factors* , 12 . <https://doi.org/10.2196/68522>
- Martí-Ejarque, M. del M., Guiu Lázaro, G., Juncal, R.C., Pérez Paredes, S., & Díez-García, C. (2021). Occupational Diseases and Perceived Health in Operating Room Nurses: A Multicenter Cross-Sectional Observational Study. *Inquiry (United States)* , 58 . <https://doi.org/10.1177/00469580211060774>
- Ocaktan, N., & Karabacak, U. (2025). An Overlooked Hazard for Operating Room Nurses: Ergonomic Risks and Consequences Related to Working Position. *Nursing Research and Practice* , 2025 (1). <https://doi.org/10.1155/nrp/7808208>
- Tavakkol, R., Eslami, J., Amiri, A., & Zarshenas, L. (2020). Survey of awareness about the risk factors of low back pain among operating room personnel of Shiraz hospitals: A cross-sectional study. *Clinical Epidemiology and Global Health*, 8 (4), 1172–1176. <https://doi.org/10.1016/j.cegh.2020.04.010>
- Yizengaw, MA, Mustofa, SY, Ashagrie, HE, & Zeleke, TG (2021). Prevalence and factors associated with work-related musculoskeletal disorder among health care providers working in the operation room. *Annals of Medicine and Surgery*, 72. <https://doi.org/10.1016/j.amsu.2021.102989>
- Zabihihrad, J., Moniri, S., Tavakkol, R., Karimi, A., & Zarea, K. (2024). Zabihihrad-2024- Prevalence of Low Back Pain and Association Factors Among Operating Room Personnel of Ahvaz Hospitals- A Cross-Sectional Study. *Jundishapur J Chronic Dis Care*. <https://doi.org/https://doi.org/10.5812/jjcdc-145854>.