

Kazakh-Language Adaptation of the Work-Related Musculoskeletal Disorders Questionnaire: A Pilot Study

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Received: 2026-01-19.

Accepted: 2026-05-31.



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J Clin Med Kaz 2026; 23(3): 66-72

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ABSTRACT

Objective. To translate, culturally adapt, and validate the Work-Related Musculoskeletal Disorders Questionnaire (WMSDsQ) into the Kazakh language among nursing professionals, and to assess its psychometric properties to support its use in further research and clinical practice for the evaluation and prevention of work-related musculoskeletal disorders.

Methods. The study uses data obtained during the pilot testing of an adapted version of the Work-Related Musculoskeletal Disorders Questionnaire (WMSDsQ), which includes 88 questions aimed at a comprehensive assessment of the prevalence of professionally caused diseases of the musculoskeletal system, occupational risk factors, ergonomic working conditions, as well as the specifics of nurses' work activities. The IBM SPSS Statistics 26 program was used for statistical processing of the received data. The internal consistency of the adapted version of the questionnaire was assessed using the Cronbach's coefficient α .

Results. A total of 20 completed the pilot study. The Kazakh version of the questionnaire demonstrated high internal consistency (Cronbach's alpha = 0.952). Corrected item-total correlations ranged from -0.721 to 0.848. Most items showed acceptable correlations (>0.30), including 16 items with low positive correlations and 8 items with negative correlations. Cognitive debriefing identified several items requiring linguistic and cultural adaptation, particularly those related to work pace, repetition, and job control.

Conclusions. This pilot study provides preliminary data that the Kazakh-language version of the WMSDsQ demonstrated high internal consistency and reliable aggregated scores. Although several items showed a low or negative item-total correlation, their removal did not significantly improve reliability, suggesting that these results reflect the multidimensional structure of the questionnaire and sociocultural perceptions of job requirements.

Keywords: Work-related musculoskeletal disorders, nursing professionals, questionnaire validation, ergonomics.

Introduction

Work-related musculoskeletal disorders (WMSDs) are among the most prevalent occupational health problems worldwide and represent a substantial burden for healthcare systems. Systematic reviews and meta-analyses consistently report a high prevalence of WMSDs

among healthcare workers, particularly nurses, with symptoms most commonly affecting the lower back, neck, and shoulders [1]. Comparative studies across different regions confirm that this high prevalence is consistent globally, highlighting the persistent nature of this occupational health issue [2,3].

Nurses are especially vulnerable to WMSDs due to the physically demanding nature of their work. Daily activities such as patient handling, repositioning, prolonged standing, repetitive tasks, and sustained awkward postures contribute to increased biomechanical load. These occupational exposures are well-established risk factors for musculoskeletal symptoms in nursing populations worldwide [1,4,5].

Evidence from different regions further supports the global burden of WMSDs among nurses. Studies in Asia, the Middle East, and Africa report consistently high prevalence rates, often associated with high workload, insufficient recovery time, limited ergonomic resources, and staffing shortages [6,7]. In addition, recent research emphasizes the cumulative effect of exposure duration, showing that prolonged and repeated physical workload significantly increases the risk of developing musculoskeletal disorders [10].

WMSDs have important consequences at both individual and organization levels. For nurses, they are associated with chronic pain, reduced functional capacity, decreased job satisfaction, absence, and potential early exit from the profession. For healthcare systems, they contribute to increased costs and may negatively affect the quality and continuity of patient care. [1,4].

Self-reported questionnaires are widely used in occupational health research to assess musculoskeletal symptoms due to their practicality and cost-effectiveness. The Nordic Musculoskeletal Questionnaire (NMQ) is one of the most commonly used instruments; however, it primarily focuses on symptom location and frequency and provides limited information on occupational exposure and perceived risk factors [11,12]. To address these limitations, the Work-Related Musculoskeletal Disorders Questionnaire (WMSDsQ) was developed to provide within the Prevent4work project to provide a more comprehensive assessment of symptoms and work-related risk factors [15].

However, the validity and reliability of such instruments cannot be assumed when applied in different linguistic and cultural contexts. Therefore, cross – culture adaptation and psychometric validation are essential to ensure measurement equivalence [13,14]. In Kazakhstan, the absence of a validated Kazakh-language version of the WMSDsQ limits high-quality data collection in occupational health research. The aim of this study was to translate, culturally adapt, and validate the Kazakh version of the WMSDsQ among nurses and to evaluate its psychometric properties for use in further research and clinical practice.

Methods

Translation and cultural adaptation

The cross-cultural adaptation of the WMSDsQ was performed in accordance with internationally recognized guidelines and COSMIN recommendation.

Forward translation

The original English version of the WMSDsQ has been translated into Kazakh using a standardized forward-back translation procedure. Initially, two independent bilingual experts, whose native language was Kazakh, conducted forward translation. Both translators had no medical background to ensure conceptual clarity for the general population but were familiar with occupational terminology.

Synthesis of translations

Next, a synthesized version of the translations was developed after discussion between translators and the research team. This stage was conducted to resolve disagreements and ensure semantic and conceptual equivalence.

Back-translation

The synthesized version was then translated back into English by an independent translator who was native speaker of the source language blinded to the original questionnaire. This step aimed to identify inconsistencies and deviations in meaning.

Expert committee review

At the final stage, an expert committee reviewed all translated and back-translated versions of the WMSDsQ. The committee consisted of:

- 1) A Doctor of Medical Sciences and physician of the highest qualification category with expertise in clinical and occupational medicine;
- 2) A traumatologist working in a city hospital with experience in occupational health and musculoskeletal disorders;
- 3) A PhD, Associate Professor with experience in questionnaire adaptation, psychometric evaluation, and statistical validation;
- 4) A professional linguist fluent in Kazakh and English.

The expert panel evaluated the questionnaire for semantic, idiomatic, experiential, and conceptual equivalence between the original and translated versions. Particular attention was given to the clarity of occupational health terminology, cultural appropriateness of work-related concepts, and comprehensibility of questionnaire items in the Kazakh context.

Each expert independently reviewed the translated items and provided comments and suggested revisions. Subsequently, the committee contacted joint discussions to compare evaluations and resolve disagreements. Consensus was achieved through collective agreement among all committee members following discussion of alternative wording options and conceptual relevance. Based on the consensus review, minor linguistic and contextual modifications were introduced to improve clarity and cultural appropriateness. A pre-final version of the questionnaire was then developed and pilot-tested to assess comprehensibility and cultural relevance.

Cognitive debriefing

Cognitive debriefing was performed during a pilot study to evaluate the clarity, cultural appropriateness, and functionality of the pre-final version of the questionnaire. The participants from various medical organizations in Almaty were asked to fill out the questionnaire. They were asked to interpret questionnaire in their own words, identify unclear or ambiguous terms, and suggest alternative wording if necessary.

Feedback was collected and analyzed using a qualitative descriptive approach. Reported issues were grouped into categories such as comprehension difficulties (item misinterpretations), cultural relevance (items inappropriate in Kazakh language), and wording ambiguity (unclear wording or terminology).

The most common issues were reviewed by research team. Based on the analysis, several items were modified to improve clarity and cultural appropriateness. Due to the pilot nature of the study, the revised items were not re-tested, and therefore the psychometric properties reported apply to the pre-final version of the questionnaire.

Participants and sample size

The study involved 20 nurses recruited on a voluntary basis using a convenience sampling approach. Participation was anonymous, and all respondents provided informed consent prior to data collection. The sample size was determined based on methodological recommendations for cross-cultural adaptation by Beaton et al. (2000) [13], where 15-30 participants are generally considered sufficient to identify issues related to item clarity cultural acceptability, comprehension, and internal consistency. Given the exploratory nature of this study, the sample size was considered appropriate for identifying major translation and adaptation issues before conducting large-scale psychometric validation.

The inclusion of a heterogeneous sample such as clinical and research staff in the pilot phase, particularly for cognitive debriefing, was justified by identification of a broader range of potential challenges related to item interpretation and cultural relevance across different responders.

Study instrument

The Work-related Musculoskeletal Disorders Questionnaire (WMSDsQ) was used as a research tool. The WMSDsQ was developed as part of the Prevent4Work (P4Work) project [15], a European Erasmus+ initiative aimed at the prevention and treatment of occupational diseases of the musculoskeletal system (WMSDs).

The WMSDsQ questionnaire includes several sections. Musculoskeletal symptoms are assessed using a 12-month prevalence model in nine anatomical regions (neck, shoulders, elbows, wrists/hands, thoracic spine, lumbar spine, hips/hip joints, knees, and ankles/feet) with dichotomous response options, allowing for standardized classification of symptoms by different areas of the body.

The questionnaire also includes items assessing psychological well-being and stress-related symptoms over the previous four weeks, covering affective, somatic, and cognitive aspects. Physical and ergonomic factors are assessed based on self-assessment of the frequency of manual work with materials, uncomfortable and prolonged postures, repetitive movements, exposure to vibration and workplace restrictions, which allows us to characterize biomechanical stress and postural risk factors usually associated with diseases of the musculoskeletal system.

The WMSDsQ questionnaire was selected for this pilot study because its multidimensional structure allows simultaneous assessment of symptoms and theoretically significant risk factors, which is extremely important for psychometric assessment in the process of linguistic and cultural adaptation. Compared to tools that evaluate only symptoms (The Nordic Musculoskeletal Questionnaire) or regional disability assessment scales, WMSDsQ provides a broader construct coverage suitable for assessing the feasibility, internal structure, and substantive validity of the Kazakh version in the occupational population.

The questionnaire consists of 28 thematic sections, including 88 separate items. Each item is evaluated on a 5-point Likert scale. To ensure consistency of interpretation, all items were coded in the same direction before analysis, so that higher scores indicated greater exposure to adverse occupational, psychosocial, or ergonomic factors. The integral indicator was calculated as the arithmetic mean of all 88 points in the questionnaire.

For analytical purposes, the items were further grouped into several logical blocks reflecting key areas, which are given in Table 1.

Table 1 Logical blocks of the WMSDsQ

Nº	Logical block	Sections
1.	Workload	1-6
2.	Workplace Control and Autonomy	7-12
3.	Role Conflicts	13
4.	Social Support	14-16
5.	Satisfaction and Safety	17-18
6.	Mental and Physical Health	19-22
7.	Cognitive Functions	23
8.	Coping and Resources	24-25
9.	Pain Perceptions	26-27
10.	Physical Exertion	28

Statistical analysis

Descriptive statistical indicators (means, standard deviations, minimum and maximum values) were calculated for all items to assess the distribution of responses, variability, and the presence of “lower” or “upper limit” effects.

The internal consistency of the questionnaire was assessed using Cronbach’s alpha coefficient. Given the pilot nature of the study and the small sample size, Cronbach’s alpha was interpreted as a preliminary indicator of reliability.

Corrected item-total correlations were studied to assess the contribution of individual items to the relevant sections. Cronbach’s alpha if item deleted was used for diagnostic purposes to identify items that potentially require linguistic or conceptual revision.

Inter-item correlations within individual questionnaire sections were analyzed using Spearman’s rank correlation coefficient (Spearman’s rho). Spearman’s rho was selected due to the ordinal nature of the Likert-scale data and the small sample size (n=20). The analysis was used to identify redundant items and items demonstrating weak relationships within a single section.

To examine the logical consistency of the questionnaire structure, Spearman rank correlations were calculated between the total scores of the selected logical units. This analysis was exploratory in nature and aimed solely at identifying expected patterns of relationships between related constructs. No hypothesis testing or logical inferences were conducted at this stage.

Ethical considerations

The study protocol complied with ethical standards for research involving human subjects and was approved by the Local Ethics Committee (IRB – A1041, dated February 6, 2025). Participation was voluntary, and data collection was anonymous.

Results

A total of 20 respondents participated in the study.

The majority of participants were female (90.0%, n = 18), while males accounted for 10.0% (n = 2). Regarding marital status, 60.0% (n = 12) of respondents were married and 40.0% (n = 8) were unmarried.

In terms of workplace, most respondents were employed in inpatient hospital settings (45.0%, n = 9). Employment in outpatient clinics accounted for 25.0% (n = 5), primary health care facilities for 10.0% (n = 2), and maternity hospitals for 10.0% (n = 2). One respondent each represented a research

Table 2 Demographic characteristics of respondents

Characteristic	Category	n (%)
Gender	Male	2 (10.0)
	Female	18 (90.0)
Marital status	Married	12 (60.0)
	Unmarried	8 (40.0)
Workplace	Inpatient hospital	9 (45.0)
	Outpatient clinic	5 (25.0)
	Primary health care	2 (10.0)
	Maternity hospital	2 (10.0)
	Research institute	1 (5.0)
	Student	1 (5.0)
Education level	Technical/vocational	8 (40.0)
	Applied bachelor	6 (30.0)
	Academic bachelor	4 (20.0)
	Master's degree	1 (5.0)
	Doctoral degree	1 (5.0)
Work experience	1-5 years	5 (25.0)
	6-10 years	10 (50.0)
	11-20 years	3 (15.0)
	>20 years	2 (10.0)

institute and the student category (5.0%, n = 1 for each) (Table 2).

The mean age ± SD of the respondents was 31.45 ± 9.11 years, with an age range from 20 to 50 years.

Regarding anthropometric parameters, the mean height was 164.15 ± 4.46 cm, ranging from 155 to 173 cm. The mean body weight was 63.75 ± 12.42 kg, with values ranging from 48 to 105 kg (Table 3).

Table 3 Anthropometric parameters of respondents

Variable	Mean ± SD	Min-Max
Age (years)	31.45 ± 9.11	20-50
Height (cm)	164.15 ± 4.46	155-173
Weight (kg)	63.75 ± 12.42	48-105

SD – Standard Deviation

Face validity

In the pilot phase of the study, the face validity of the Kazakh version of the WMSDsQ questionnaire was assessed qualitatively. The main goal was to ensure that the questionnaire's questions were clear, understandable, and meaningfully valid from the point of view of the target population. The survey assessed whether the questions were asked correctly and whether they corresponded to the research topic.

This questionnaire has been run among nurses and nursing students. The participants reviewed the questionnaire and expressed their opinion about the clarity and relevance of the questions, as well as the presence of unnecessary or meaningless questions. As a result of the work carried out, it turned out that the survey questions correspond to the purpose of the study. The adaptation to some questions was carried out and the corresponding changes were made.

Content validity

During the study, the content validity of the Kazakh version of the WMSDsQ questionnaire was assessed qualitatively through expert committee review and cognitive debriefing, focusing on clarity and cultural relevance of the items. The main goal was to fully cover the questionnaire questions related to the topic under study and to ensure that their content corresponded to the purpose and objectives of the study. Expert review confirmed that the Kazakh version fully retained the conceptual scope of the original questionnaire and that no important areas were omitted or overrepresented. Minor wording adjustments were made to improve cultural appropriateness without altering the underlying concepts.

Internal consistency

Pilot testing demonstrated excellent internal consistency for the Kazakh-language version of the questionnaire (overall Cronbach's alpha = 0.952). Although high alpha values may partially reflect item redundancy in large instruments (88 items in WMSDsQ), the results confirm the preliminary reliability of the translated version. Further psychometric evaluation, including factor analysis, on a larger sample is planned.

Section-level reliability analysis demonstrated excellent internal consistency of the questionnaire, with a Cronbach's alpha of 0.920 calculated for 28 sections. This finding demonstrates high consistency across the questionnaire sections and provides preliminary evidence supporting the conceptual reliability of the Kazakh-language version.

Inter-item consistency

Inter-item correlations within individual sections were generally low to moderate, indicating that items within sections are interrelated but not redundant. No excessively high correlations between items (≥ 0.80) were observed, suggesting that the questionnaire items contain complementary rather than duplicate information. Weak or near-zero correlations were occasionally observed within broader conceptual domains, reflecting expected heterogeneity in perceptions of work-related demands and conditions.

Inter-total reliability

Overall item reliability was assessed using corrected item correlations and changes in Cronbach's alpha coefficients when an item was deleted. Most items demonstrated acceptable and strong corrected item correlations, confirming their contribution to the overall scale. The correlations ranged from -0.72 to 0.85. The range of item-total correlations and Cronbach's alpha if item deleted are summarized in Table 4, while full results are presented in Supplementary Table S1.

Several items demonstrated low or negative item-total correlations, primarily in sections related to job demands, cognitive load, and positively worded health items. These results were interpreted as reflecting neutral or positive item wording and contextual perceptions, rather than poor item performance. Moreover, it may be potentially reasoned by translation-related issues, where subtle differences in wording may have changed the original meaning of items. Additionally, negative correlations may suggest multidimensionality, including that some items may be reflecting constructs that differ from the primary dimension of the questionnaire. Therefore, minor linguistic refinements were proposed to emphasize perceived strain or difficulty, while all items were retained for subsequent testing.

Table 4

Summarized range of item-total correlations and Cronbach's alpha if item deleted

Indicator	Result
Total number of items	88
Overall Cronbach's alpha	0.952
Range of corrected item-total correlations	-0.72 to 0.85
Items with negative correlations	8 items
Items with low correlations (<0.30)	16 items
Items with acceptable correlations (≥ 0.30)	Majority of items
Highest item-total correlation	0.848
Lowest item-total correlation	-0.721
Cronbach's alpha if item deleted (range)	0.950-0.955

For example, item assessing task repetitiveness “Do you have to do the same thing over and over again?” demonstrated a negative corrected item-total correlation ($r = -0.45$). This finding was interpreted as reflecting the neutral wording of the original question, which may lead respondents to perceive repetitiveness as task simplicity rather than as an indicator of workload or stress. Furthermore, the question did not directly address fatigue or discomfort associated with prolonged repetitive activity. To address this issue, a minor linguistic clarification was made to emphasize the subjective experience of strain while maintaining the original construct. The original item (“Do you have to do the same thing over and over again?”) was modified to explicitly refer to fatigue associated with prolonged repetition (“Do performing the same actions repeatedly over a long period make you feel tired?”).

Discussion

The present pilot study aimed to evaluate the preliminary psychometric properties of the Kazakh-language version of the Work-related Musculoskeletal Disorders Questionnaire (WMSDsQ) following linguistic translation and cultural adaptation. This study represents one of the first attempts to adapt a comprehensive questionnaire assessing work-related musculoskeletal, psychosocial, and ergonomic factors for use in a Kazakh-speaking population, particularly within the healthcare context.

Although the WMSDsQ has been used in occupational safety research, published psychometric evaluations of translated versions are limited. Therefore, the current results were compared with studies evaluating the reliability of multidimensional questionnaires on musculoskeletal and psychosocial issues.

The translation and pilot testing procedures were conducted in accordance with established guidelines for cross-cultural adaptation of self-report instruments [13]. Particular emphasis was placed on achieving conceptual rather than literal equivalence, which is especially important when adapting questionnaires into the Kazakh language, given its distinct linguistic structure and sociocultural context. The acceptable reliability indicators observed in this pilot study support the appropriateness of the adaptation process.

The process of cross-cultural adaptation revealed several important linguistic and cultural challenges. While most items were translated with minimal modification, certain

concepts required adaptation to ensure clarity, consistency, and cultural relevance in the Kazakh context. For example, items assessing work pace and job demands, such as “Do you have to work very fast?” and “Does your work demand a great deal of concentration?”, were initially translated directly. However, during cognitive debriefing, it was found that these statements were interpreted positively, associating fast work and high concentration with professional competence rather than workload burden. To address this, wording was changed to “Do you feel that you must work more quickly under pressure?” and “Does your work require prolonged concentration that leads to fatigue?” to emphasize perceived strain and effort.

Items assessing social support and workplace relationships also required attention. For example, respondents hesitated to provide negative responses to the item “How often do you get help and support from your colleagues?”, which may be due to cultural norms of collegiality. This was addressed through minor wording adjustment “How often do you receive practical help and support from your colleagues when needed”. This demonstrates that cross-cultural adaptation involves not only linguistic translation but careful consideration of how occupational health concepts are interpreted within specific cultural context.

Reliability assessment in this pilot study was conducted in accordance with current COSMIN guidelines for assessing patient-reported outcomes [16]. The Kazakh version of the questionnaire demonstrated high internal consistency at both the item and section levels (Cronbach's alpha = 0.952 and 0.920, respectively). Although the high Cronbach's alpha values may partly reflect the length of the questionnaire, such results are typically reflected in multidimensional instruments and should be interpreted in conjunction with item-level analysis [17].

An item-total correlation analysis revealed that most items significantly contributed to the total scale score. Items related to physical workload, pain-related beliefs, psychosomatic symptoms, and cognitive difficulties demonstrated particularly strong associations with the total score. This is consistent with findings of Barros and Baylina (2024) [18] and Bezzina et al. (2023) [19], stating that high physical and psychosocial demands in the workplace are major factors influencing work-related musculoskeletal conditions.

Several items demonstrated low or negative item-total correlations, mainly among items related to work pace, attention demands, and repetitive tasks. In the Kazakhstani context, these results may reflect cultural perceptions of work, where high workload, speed, and constant attention are often viewed as indicators of professional responsibility and competence rather than as sources of stress [20–22].

Several limitations should be considered. A key limitation of this study is that several items were modified after cognitive debriefing but the revised version was not subsequently re-evaluated. As the result, psychometric properties reflect the pre-final version. This may affect the interpretability and generalizability of the findings. Another limitation is that values of Cronbach's alpha exceeding 0.90 may suggest potential item redundancy, meaning that some items may be measuring highly similar aspects of the construct. Next, the small sample size limits the stability of correlation estimates and precludes in-depth analyses such as factor analysis. Moreover, quantitative indices of content validity, such as the Content Validity Index (CVI), were not calculated. Furthermore, pilot study does not allow for assessment of construct validity, criterion validity, or test-retest reliability. Structural validity is a critical component

of psychometric assessment, as it determines whether the instrument adequately reflects the construct it is intended to measure. Future studies with larger and more diverse samples are needed to enable exploratory and confirmatory factor analysis of the Kazakh-language version of the questionnaire, in accordance with COSMIN recommendations.

Despite these limitations, the results of this pilot study indicate that the Kazakh version of the WMSDsQ demonstrates acceptable preliminary reliability and cultural appropriateness. These findings support the feasibility of using this instrument in occupational safety and health research in Kazakhstan and provide a basis for subsequent large-scale validation studies.

Conclusion

This pilot study provides preliminary evidence regarding the clarity, cultural relevance, and internal consistency of the Kazakh-language version of the WMSDsQ. Although several items showed a low or negative item-total correlation, their removal did not significantly improve reliability, suggesting that these results reflect the multidimensional structure of the questionnaire and sociocultural perceptions of job requirements. However, given the pilot nature of the study and the limited sample size, these results should be interpreted correctly. Further large-scale studies are required to comprehensively evaluate the psychometric properties of the WMSDsQ and establish additional forms of validity.

Supplementary materials

The Supplementary information includes:

• Supplementary Table S1. Range of item-total correlations and Cronbach's alpha if item deleted (full results).

This supplemental material has been provided by the authors to give readers additional information about their work.

The file can be accessed using: <https://www.editorialpark.com/download/article-supp/759/Supplementary-Table-S1.docx>,

Author Contributions: Conceptualization, M.K.; methodology, A.K. and M.K.; validation, M.K., A.K. and T.B.; formal analysis, M.K.; investigation, T.B. and M.K.; resources, M.K.; data curation, A.K.; writing – original draft preparation, M.K.; writing – review and editing, A.K. and T.B.; visualization, T.B.; supervision, M.K.; project administration, M.K.; funding acquisition, none. All authors have read and agreed to the published version of the manuscript.

Disclosures: The authors have no conflicts of interest.

Acknowledgments: None.

Funding: None.

Data availability statement: The corresponding author can provide the data supporting the study's conclusions upon request. Due to ethical and privacy constraints, the data are not publicly accessible.

Artificial Intelligence (AI) Disclosure Statement: The authors declare no AI Tools used for preparation of this work.

References

1. Sun W, Yin L, Zhang T, Zhang H, Zhang R, Cai W. Prevalence of work-related musculoskeletal disorders among nurses: a meta-analysis. *Iran J Public Health*. 2023;52:463–475. <https://doi.org/10.18502/ijph.v52i3.12130>
2. Gorce P, Jacquier-Bret J. Continental effect on work-related musculoskeletal disorders prevalence among nurses: systematic review and meta-analysis. *BMC Nurs*. 2025;24. <https://doi.org/10.1186/s12912-025-03945-6>
3. Gorce P, Jacquier-Bret J. Work-related musculoskeletal disorder prevalence by body area among nurses in europe: systematic review and meta-analysis. *J Funct Morphol Kinesiol*. 2025;10. <https://doi.org/10.3390/jfmk10010066>
4. Dong H, Zhang Q, Liu G, Shao T, Xu Y. Prevalence and associated factors of musculoskeletal disorders among Chinese healthcare professionals working in tertiary hospitals: A cross-sectional study. *BMC Musculoskelet Disord*. 2019;20. <https://doi.org/10.1186/s12891-019-2557-5>
5. Yang S, Lu J, Zeng J, Wang L, Li Y. Prevalence and risk factors of work-related musculoskeletal disorders among intensive care unit nurses in China. *Workplace Health Saf*. 2019;67:275–87. <https://doi.org/10.1177/2165079918809107>
6. Hosseini E, Daneshmandi H, Bashiri A, Sharifian R. Work-related musculoskeletal symptoms among Iranian nurses and their relationship with fatigue: a cross-sectional study. *BMC Musculoskelet Disord*. 2021;22. <https://doi.org/10.1186/s12891-021-04510-3>
7. Abdulla S. Prevalence and risk factors of work-related musculoskeletal disorders among nurses in erbil teaching hospitals. *Erbil Journal of Nursing & Midwifery*. 2018;1:42–8. <https://doi.org/10.15218/ejnm.2018.06>
8. Sisala Mohammed I, Abdulai MH, Ibrahim MM, Buasilenu H, Baako IA, Nyarko BA, Wuni A, Buunaaisie C. Prevalence of workplace-related musculoskeletal disorders among nurses and midwives in a tertiary healthcare facility: a descriptive cross-sectional survey. *Nurs Open*. 2024;11. <https://doi.org/10.1002/nop2.70098>
9. Nemera A, Eliyas M, Likassa T, Teshome M, Tadesse B, Dugasa YG, Tura MR. Magnitude of work-related musculoskeletal disorders and its associated factors among Ethiopian nurses: a facility based cross-sectional study. *BMC Musculoskelet Disord*. 2024;25. <https://doi.org/10.1186/s12891-024-07479-x>
10. Kim WJ, Jeong BY. Exposure time to work-related hazards and factors affecting musculoskeletal pain in nurses. *Applied Sciences (Switzerland)*. 2024;14. <https://doi.org/10.3390/app14062468>
11. Kuorinka I, Jonsson B, Kilbom A, Vinterberg H, Biering-Sørensen F, Andersson G, Jørgensen K. Standardised Nordic questionnaires for the analysis of musculoskeletal symptoms. *Appl Ergon* 1987;18:233–7. [https://doi.org/10.1016/0003-6870\(87\)90010-X](https://doi.org/10.1016/0003-6870(87)90010-X)
12. Crawford JO. The Nordic Musculoskeletal Questionnaire. *Occup Med (Chic Ill)*. 2007;57:300–1. <https://doi.org/10.1093/occmed/kqm036>

13. Beaton DE, Bombardier C, Guillemin F, Ferraz MB. Guidelines for the process of cross-cultural adaptation of self-report measures. *Spine (Phila Pa 1976)*. 2000;25. <https://doi.org/10.1097/00007632-200012150-00014>
14. Mokkink LB, Terwee CB, Patrick DL, Alonso J, Stratford PW, Knol DL, Bouter LM, De Vet HCW. The COSMIN checklist for assessing the methodological quality of studies on measurement properties of health status measurement instruments: An international Delphi study. *Quality of Life Research*. 2010;19:539–49. <https://doi.org/10.1007/s11136-010-9606-8>
15. Langella F, Vanni D, Høgh M, Palsson TS, Christensen SWMP, Bellosta-López P, Villafañe JH, Jensen PS, De Brito Silva P, Herrero P, Barletta P, Domenéch-García V, Berjano P. Development of the Prevent for Work Questionnaire (P4Wq) for the assessment of musculoskeletal risk factors in the workplace: part 2—pilot study for questionnaire development and validation. *BMJ Open*. 2021;11:e053988. <https://doi.org/10.1136/BMJOPEN-2021-053988>
16. Prinsen CAC, Mokkink LB, Bouter LM, Alonso J, Patrick DL, de Vet HCW, Terwee CB. COSMIN guideline for systematic reviews of patient-reported outcome measures. *Quality of Life Research*. 2018;27:1147. <https://doi.org/10.1007/S11136-018-1798-3>
17. McNeish D. Thanks coefficient alpha, we'll take it from here. *Psychol Methods* 2018;23:412–33. <https://doi.org/10.1037/MET0000144>
18. Barros C, Baylina P, Barros C, Baylina P. Disclosing strain: how psychosocial risk factors influence work-related musculoskeletal disorders in healthcare workers preceding and during the COVID-19 pandemic. *Int J Environ Res Public Health*. 2024, Vol 21, 2024;21. <https://doi.org/10.3390/IJERPH21050564>
19. Bezzina A, Austin E, Nguyen H, James C. Workplace psychosocial factors and their association with musculoskeletal disorders: a systematic review of longitudinal studies. *Workplace Health Saf*. 2023;71:578. <https://doi.org/10.1177/21650799231193578>
20. Dostanova Z, Yermukhanova L, Blaževičienė A, Baigozhina Z, Taushanova M, Abdikadirova I, Sultanova G, Dostanova Z, Yermukhanova L, Blaževičienė A, Baigozhina Z, Taushanova M, Abdikadirova I, Sultanova G. Perception and experience of independent consultations in primary healthcare among registered nurses in Kazakhstan: A Qualitative Study. *Healthcare*. 2024;12. <https://doi.org/10.3390/HEALTHCARE12151461>
21. Kuandyk A, Dmitriyeva M, Toleukhanova N, Conneely M, Suleimenov T, Sarssenov D, Mamytkhan R, Sakhayev M, Tleubergenov A, Toleubayev M. A mixed method exploration of job morale of physicians working in public healthcare settings in Kazakhstan during the COVID-19 pandemic. *J Health Popul Nutr*. 2025;44:1. <https://doi.org/10.1186/S41043-024-00732-Y>
22. Sabitova A, Hickling LM, Toleubayev M, Jovanović N, Priebe S. Job morale of physicians and dentists in Kazakhstan: a qualitative study. *BMC Health Serv Res*. 2022;22:1508. <https://doi.org/10.1186/S12913-022-08919-X>