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Research Paper

Validation of the Russian version of the Copenhagen Burnout Inventory among nurses in Kazakhstan and Kyrgyzstan

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ABSTRACT

Objectives: This study aimed to validate the Russian version of the Copenhagen Burnout Inventory (R-CBI) among nurses in Kazakhstan and Kyrgyzstan and explored factors contributing to burnout.
Methods: The original Copenhagen Burnout Inventory (CBI) was translated into the R-CBI using a rigorous forward-backward method and reviewed by experts. Between July and November 2022, 1,530 nurses were recruited through convenience sampling method from various nursing settings in Kazakhstan and Kyrgyzstan to test the scale's reliability and validity, including confirmatory factor analysis (CFA), internal consistency reliability, and concurrent validity. A linear regression analysis was conducted to identify influencing factors of burnout.
Results: The content of the R-CBI is consistent with the original CBI, consisting of 19 items with three dimensions. The Cronbach's α coefficient is 0.926 in Kazakhstan and 0.922 in Kyrgyzstan, ranging from 0.830 to 0.898 for three dimensions. The CFA results among nurses in Kazakhstan and Kyrgyzstan supported the three-factor structure of R-CBI with good fit indices. Concurrent validity was established through significant correlations ($P < 0.001$) with job satisfaction questionnaire ($r = -0.457$), Depression Anxiety Stress Scales ($r = 0.506$ in depression, $r = 0.485$ in anxiety, $r = 0.564$ in stress), and WHO-5 Well-Being Index ($r = -0.528$). The overall burnout level was 36.1 ± 17.6 and 37.5 ± 17.4 in Kazakhstani and Kyrgyzstani nurses, respectively. Significant influencing factors of burnout included gender, age, educational level, and COVID-19 infection history.
Conclusions: The R-CBI was proved to be a reliable and valid tool for assessing nurses' burnout in Kazakhstan and Kyrgyzstan.

What is known?

- Nurses' burnout is a well-documented phenomenon with significant impacts on both individual health and healthcare system efficiency. It is characterized by emotional exhaustion, depersonalization, and a reduced sense of personal accomplishment, leading to decreased job satisfaction and higher turnover rates.
- Previous studies have validated the Copenhagen Burnout Inventory (CBI) across various countries. However, its applicability and reliability in Central Asian contexts, particularly among nurses in Kazakhstan and Kyrgyzstan, have been less explored.

What is new?

- This study validated the Russian version of the CBI (R-CBI) among nurses in Kazakhstan and Kyrgyzstan, demonstrating good reliability and validity.
- The findings revealed significant influencing factors of burnout, including gender, age, education level, and COVID-19 infection history.

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1. Introduction

Burnout among healthcare professionals, particularly nurses, has emerged as a critical issue in occupational health, significantly impacting staff well-being, patient care quality, and healthcare system efficiency [1–6]. Characterized by emotional exhaustion, depersonalization, and a diminished sense of personal accomplishment, burnout in nurses can lead to decreased job satisfaction, higher turnover rates, and reduced quality of patient care [7,8]. A systematic review and meta-analysis encompassing 45,539 nurses from 49 countries across multiple specialties found that the overall pooled prevalence of burnout symptoms among global nurses was 11.23% [9]. This statistic highlights the widespread impact of burnout on nurses worldwide and underscores the critical need for effective interventions and support systems.

Nurses are at a heightened risk of burnout due to the emotionally and physically demanding nature of their work, which often involves long hours, shift work, and frequent rescue [10,11]. The prevalence of burnout among nurses affects their health and compromises patient safety, as evidenced by links between nurse burnout and increased rates of hospital-acquired infections and medical errors [12,13]. Burnout can be significantly influenced by both organizational and personal factors, including workload, staffing levels, work environment, and individual coping strategies [14,15]. Additionally, the impact of burnout extends beyond the individual to affect the entire healthcare system, leading to higher healthcare costs due to absenteeism and employee turnover [16,17].

Various scales have been utilized to assess burnout among nurses, including the Maslach Burnout Inventory (MBI) [12–14,16], the Oldenburg Burnout Inventory (OLBI) [18–20], and the Copenhagen Burnout Inventory (CBI) [21–23]. The MBI is the most widely used instrument for measuring burnout and includes three dimensions: emotional exhaustion, depersonalization, and personal accomplishment. The MBI is highly regarded for its extensive validation and reliability across various professional groups, particularly healthcare workers [24]. However, it has been criticized for its focus on personal feelings rather than work-related causes of burnout, and its licensing cost can be a barrier for some researchers. The OLBI addresses some of the limitations of the MBI by including both exhaustion and disengagement dimensions, which relate to attitudes toward work in general rather than feelings toward clients specifically. The OLBI is designed to be more directly linked to the work context and includes positively and negatively formulated items to reduce response bias. Despite its advantages, the OLBI is less frequently used than the MBI and has been subject to fewer validations across diverse populations [25]. The CBI developed by Kristensen et al. [26], diverges from the MBI and OLBI by focusing exclusively on the symptoms of burnout rather than mixing symptoms with potential causes or consequences. A notable feature of the CBI is its simplicity and its broader definition of burnout, which does not limit the assessment to traditional work environments but extends to personal fatigue and exhaustion perceived in daily activities. The scale is freely available, which facilitates its use in large-scale studies and across countries where funding for research tools might be limited. Therefore, the selection of the CBI for this study was driven by its appropriateness for the target population, its ease of use in cross-cultural research, and its comprehensive approach to measuring all relevant aspects of burnout.

The accuracy of burnout assessment hinges on the validity and reliability of the instruments used. Acceptable validity values for the CBI scale have been described among nurses and healthcare professionals in Brazil [27], Iran [23,28], Vietnam [29], Lebanon [30], Spain [31], and America [22]. Moreover, previous validation of the Russian version of the revised Copenhagen Burnout Inventory demonstrated acceptable internal consistency and construct validity in a sample of medical students in Kazakhstan [32].

While the CBI has been validated in various countries, its application and validation in Central Asia, particularly among nurses in Kazakhstan and Kyrgyzstan, remain understudied. Validating it is crucial, as linguistic and cultural differences can significantly impact the interpretability of psychological scales. Ensuring that the CBI accurately measures burnout in these populations is essential for timely diagnosis and developing targeted interventions to mitigate burnout and enhance nurse well-being [33]. This study aimed to validate the R-CBI among nurses in Kazakhstan and Kyrgyzstan. Moreover, this study also conducted the results of using a scale to assess factors associated with burnout among nurses, because it can help to demonstrate the practical applicability and relevance of the validated tool in real-world settings.

2. Methods

2.1. Study design

A cross-sectional study was conducted to validate the Russian version of the Copenhagen Burnout Inventory (R-CBI) and explore the factors contributing to burnout among nurses in Kazakhstan and Kyrgyzstan.

2.2. Study setting and participants

Participants were recruited through convenience sampling from various nursing settings in Kazakhstan and Kyrgyzstan between July and November 2022, including ambulance services, outpatient clinics, inpatient units, and national research centers. Inclusion criteria were as follows: 1) 18 years or older; 2) registered nurses; 3) employed on a full-time or part-time; 4) speak Russian fluently regardless of ethnic group; 5) informed consent. Exclusion criteria included those who did not complete the survey or provide complete responses.

2.3. Study samples

To ensure that the study had sufficient power to detect statistically significant results and validate the scale's psychometric properties, a combined approach using power analysis and the formula for calculating sample size for proportions in a large population was employed. A power analysis was conducted to determine the minimum required sample size. Assuming a medium effect size (Cohen's $d = 0.5$), a significance level of 0.05, and a desired power of 0.80, the initial required sample size was calculated to be 384 participants. Given an expected effect size of 0.5, the sample size required per group was calculated to be approximately 64 participants. The total population of registered nurses in Kazakhstan is 188,800, and 34,637 in Kyrgyzstan. Additionally, using the formula for calculating sample size for proportions in a large population and assuming a 50% response distribution with a 5% margin of error, the required sample size was also estimated to be 384. The actual sample size achieved in Kyrgyzstan was 332 participants. Although slightly below the initial target, this sample size is still robust enough to validate the burnout scale, particularly given the study's focus and the close approximation to the calculated requirement [34].

2.4. Measures

2.4.1. Sociodemographic and health status data

Data were collected through a structured questionnaire that included gender, age, education level, occupation type, managerial position, family status, presence of children, and COVID-19 history. Among them, education level including secondary special education (college), it means the level is completed after 9th or 11th grade (secondary school) and receives a diploma in Nursing after 2-4 years of specialized education in medical colleges; the other is higher education (bachelor's degree), it means the level is completed after secondary school (11 years of schooling) or after secondary special education and involves 4 years of university education leading to a Bachelor of Nursing degree.

2.4.2. The Russian version of the Copenhagen Burnout Inventory

CBI was developed by Kristensen et al. [26] and consists of 19 items in three subscales designed to measure different dimensions of burnout: personal burnout (PB) (six items), work-related burnout (WRB) (seven items), and client-related burnout (CRB) (six items). Each item is rated on a five-Likert scale ranging from "always," "often," "sometimes," "seldom," to "never," attributed to 5, 4, 3, 2, and 1 points, respectively, with inverse scoring for item 10. The total score ranges from 19 to 95, with higher scores indicating greater levels of burnout. In this study, R-CBI will be used and the translation process from CBI is as follows.

2.4.2.1. Translation process. Although the CBI is a public scale and free to use by researchers, our team contacted the original author (Prof. T.S. Kristensen) and received his approval to ensure full compliance and transparency. The original CBI was translated into R-CBI using a rigorous forward-backward translation method to ensure linguistic and conceptual equivalence between the English and Russian versions. Initially, the CBI was translated from English to Russian by two independent bilingual experts who were fluent in both languages and had a strong background in psychology. Each expert produced a separate Russian translation of the scale. These two versions were then compared and harmonized into a single preliminary Russian version through discussion and consensus among the translators and a third bilingual expert. The harmonized Russian version was then independently back-translated into English by two different bilingual translators who had not been involved in the initial forward translation. These translators were also fluent in both languages but were blinded to the original English version of the CBI to avoid bias. The back-translated English versions were compared against the original English scale to identify any discrepancies or differences in meaning.

The translation process culminated in a review by a panel of five experts in psychology and psychometrics. This panel, which included two psychologists with over five years of experience, one psychometrician with extensive experience in scale validation, and two academic researchers specializing in cross-cultural psychology, carefully reviewed both the back-translated English version and the Russian version. The panel's task was to ensure that the Russian translation faithfully represented the content and nuances of the original English version and that the scale was suitable for use in the Russian-speaking context, particularly in Kazakhstan and Kyrgyzstan. While a formal content validity assessment with specific indicators and threshold values was not conducted in this study, content validity was ensured through a review process involving occupational health and psychometrics experts. The R-CBI was evaluated by a panel of experts who assessed the relevance and representativeness of the items with respect to the conceptual dimensions of burnout. The panel included clinicians and academics familiar with the burnout phenomenon in healthcare settings, particularly in Kazakhstan and Kyrgyzstan. Each expert independently evaluated the conceptual and linguistic equivalence of the translated items with the original English version. The panel reached a consensus that the translated scale adequately captured the dimensions of burnout as defined by the original CBI. No modifications were made to the scale during the translation or review process, and the structure, content, and wording of the R-CBI remained identical to the original CBI (Appendix A).

2.4.2.2. Psychometric properties.

Internal consistency The Internal consistency of the R-CBI and its subscales was assessed using Cronbach's α coefficient, and values of 0.70 or above were considered of good reliability [35]. This analysis was crucial to ensure that the items within each subscale of the R-CBI cohered in measuring the same underlying concept of burnout.

Construct validity Construct validity was assessed using Confirmatory Factor Analysis (CFA). The CFA tested the three-factor structure of the R-CBI, corresponding to PB, WRB, and CRB. The model fit was evaluated using several fit indices [36]. Comparative Fit Index (CFI): an index where values above 0.90 suggest an acceptable fit of the model. Tucker-Lewis Index (TLI): similar to CFI, with values above 0.90 indicating a good fit. Root Mean Square Error of Approximation (RMSEA): values less than 0.08 are generally considered acceptable, with lower values indicating a better fit. The appropriateness of the correlation matrix for factor analysis was confirmed using Bartlett's test of sphericity ($P < 0.001$), and the Kaiser-Meyer-Olkin (KMO) measure verified sampling adequacy (> 0.90) [37].

Criterion-related validity Criterion-related validity was examined through concurrent validity analysis by correlating R-CBI scores with external criteria known to be related to burnout. These included self-reported measures of job satisfaction questionnaire [38], the Depression Anxiety Stress Scale (DASS) [39], and the WHO-5 Well-Being Index [40]. Correlations were performed using Spearman's correlation coefficients.

2.5. Data collection

Data were collected using a combination of digital survey distribution and institutional communication channels to ensure a broad and representative sample of nurses from both Kazakhstan and Kyrgyzstan. The primary data collection method involved distributing a link to the online survey created on the www.1ka.si platform via various social media platforms. These platforms included popular social networking sites and professional groups where nurses are active (e.g., Facebook, Telegram, WhatsApp). The use of social media allowed for wide and rapid dissemination of the survey link, reaching nurses across different regions and healthcare settings in both countries. In addition to the social media distribution, the study also leveraged institutional channels to enhance participation. Regional healthcare management offices were informed about the study, and they, in turn, communicated the opportunity to participate in the survey to the chief medical officers of hospitals. The chief medical officers were encouraged to inform their nursing staff about the study and the availability of the online survey. This method ensured that the survey reached nurses working in various healthcare environments, including those who may not be active on social media.

2.6. Data analysis

Data were analyzed using Jamovi (version 2.2.5) and R (version 4.4.1) software. Descriptive statistics, including means, standard deviations (*SD*), frequency (*n*), and percentages (%), were calculated

for all variables. The normality of the data was assessed using the Shapiro-Wilk test, and the homogeneity of variance was evaluated using Levene's test. Chi-square tests was used for categorical variables for group comparisons, and *t*-tests were employed for continuous variables when the assumptions of normality and homogeneity of variance were met. In cases where these assumptions were violated, appropriate non-parametric alternatives, such as the Mann-Whitney *U* test, were utilized. A linear regression analysis was conducted to assess the association between burnout and socio-demographic factors. The level of statistical significance adopted was $P < 0.05$.

2.7. Ethical considerations

The study was approved by the local ethics committees of "University Medical Center" Corporate Fund (11 of December 30, 2021) and I.K. Akhunbaev Kyrgyz State Medical Academy (13 of December 08, 2021).

3. Results

Overall, the study involved a total of 1,530 nurses from Kazakhstan ($n = 1{,}198$) and Kyrgyzstan ($n = 332$), predominantly female ($n = 1{,}368$, 89.4%). The mean age of participants was 40.2 ± 12.6 years. A significant majority held a secondary special education (college, 91.8%), while a smaller proportion had attained a higher education level (bachelor's degree, 8.2%) (Appendix A).

3.1. Internal consistency of the R-CBI

Cronbach's α coefficient for the R-CBI was 0.926 among the Kazakhstani nurses and 0.922 in Kyrgyzstan. The internal consistency of subscales ranged from 0.830 to 0.898. Overall, the R-CBI demonstrated good internal consistency and item reliability across both nurses in Kazakhstan and Kyrgyzstan.

3.2. Construct validity analysis

Barlett's test of sphericity was significant ($P < 0.001$), indicating that the correlation matrix was not an identity matrix and was suitable for structure detection. The KMO value exceeded 0.933, demonstrating excellent sampling adequacy for the analysis. The initial CFA results did not indicate covariant relationships between certain items, as expected based on theoretical considerations. This led to suboptimal fit indices, with CFI at 0.884 and 0.891, TLI at 0.867 and 0.875, and RMSEA at 0.091 and 0.085 for Kazakhstan and Kyrgyzstan, respectively. Next, we examined modification indices and identified theoretically justified adjustments. Specifically, we allowed covariances between error terms for PB1, PB2, PB3, PB4, PB5, WRB2, WRB3, CRB1, CRB4, and CRB5. These adjustments improved the model's fit, resulting in CFI at 0.922 and 0.914, TLI at 0.906 and 0.899, and RMSEA at 0.077 and 0.077 for Kazakhstan and Kyrgyzstan, respectively. The CFA results for the R-CBI among nurses in Kazakhstan and Kyrgyzstan demonstrated acceptable to good fit indices, supporting the factorial validity of the inventory in these contexts. Appendix B shows the factor model figure.

3.3. Criterion-related validity analysis

The criterion-related validity was established through correlations with the job satisfaction questionnaire ($r = -0.457$), the DASS ($r = 0.506$ in depression, $r = 0.485$ in anxiety, $r = 0.564$ in stress), and the WHO-5 Well-Being Index ($r = -0.528$), all correlations were significant ($P < 0.001$) (Appendix A). Negative correlations were observed between the R-CBI and job satisfaction questionnaire/the WHO-5 Well-Being Index, suggesting that higher burnout is associated with lower job satisfaction and well-being. However, positive correlations were noted between the R-CBI and the DASS, indicating that higher levels of burnout are associated with greater psychological distress.

3.4. Predictors of burnout among nurses in Kazakhstan and Kyrgyzstan

The overall burnout level was 36.1 ± 17.6 and 37.5 ± 17.4 in Kazakhstani and Kyrgyzstani nurses, respectively. Burnout, WRB, and CRB levels did not significantly differ, while PB was significantly higher among nurses in Kyrgyzstan compared to Kazakhstan.

Female nurses reported higher burnout than male nurses, though this difference was not statistically significant in both countries. Kyrgyzstani nurses with higher educational levels reported significantly higher burnout compared to those with secondary special education ($P = 0.032$), no significant differences were found among nurses in Kazakhstan. Significant differences in burnout levels were observed among different occupational roles. Post-hoc comparisons indicated significantly lower burnout in Kazakhstani nurses working in National research centres compared to those in outpatient and ambulance settings. At the same time, nurses in Kyrgyzstani national centres experience higher burnout compared to those in other settings. No significant differences in burnout were observed based on managerial role or family status, suggesting these factors do not significantly influence burnout levels among nurses in these regions. Burnout levels varied significantly with COVID-19 history, $P < 0.001$. Post-hoc analysis showed higher burnout among nurses with moderate and severe COVID-19 symptoms compared to asymptomatic and negative cases (Appendix A).

The study conducted linear regression analyses to identify predictors of burnout among nurses in Kazakhstan and Kyrgyzstan, revealing distinct patterns in how demographic, professional, and health-related variables contribute to burnout levels. In Kazakhstan, the regression model accounted for 7.2% of the variance in burnout scores. Significant predictors included: gender, age, occupational role, having children, and COVID-19 history. Thus, female nurses reported slightly higher burnout than male nurses, and older age was associated with slightly lower burnout. Nurses working in national research centres or inpatient settings reported substantially lower burnout than those in ambulance settings, while no significant differences were observed between nurses working in outpatient and ambulance settings. Nurses with children reported significantly lower burnout levels compared to those without children. Mild to severe COVID-19 cases reported significantly higher burnout compared to negative cases (Table 1).

Subscale analyses revealed nuanced patterns. We found that gender was a significant predictor for PB and WRB, with female nurses reporting higher burnout levels than male nurses. Age was negatively associated with CRB and WRB, indicating that older nurses experienced lower burnout levels. Education played a role in PB, with nurses holding higher education degrees reporting significantly higher burnout compared to those with secondary special education. Family status and children had varying impacts on burnout. Divorced nurses reported higher PB compared to single nurses, while widowhood was associated with higher WRB. Nurses without children experienced higher WRB compared to those with children. Nurses working in national research centres reported significantly lower burnout levels across all subscales compared to those in ambulance settings with the most pronounced for WRB. COVID-19 history emerged as a significant predictor among the

Table 1
Influencing factors of burnout among Kazakhstan nurses.

Characteristics	β	*SE*	β'	95%*CI*	*t*	*P*
Intercept	33.378	3.646	–	–	9.155	<0.001
Gender (ref.: male)						
Female	5.224	1.782	0.297	0.098, 0.496	2.930	0.003
Age (years)	−0.102	0.048	−0.074	−0.142, −0.005	2.106	0.035
Education (ref.: secondary special)						
Higher	1.592	1.665	0.091	−0.095, 0.276	0.956	0.339
Workforce (ref.: ambulance)						
Outpatient	−1.120	1.556	−0.064	−0.237, 0.110	0.720	0.472
Inpatient	−3.715	1.661	−0.211	−0.396, −0.026	2.236	0.026
National research centers	−15.656	4.394	−0.890	−1.380, −0.400	3.563	<0.001
Manager position (ref.: no)						
Yes	−0.438	2.923	−0.025	−0.351, 0.301	0.150	0.881
Marital status (ref.: single)						
Married	2.770	1.623	0.157	−0.024, 0.339	1.706	0.088
Divorced	2.659	2.044	0.151	−0.078, 0.379	1.301	0.193
Widowhood	5.206	2.678	0.296	−0.003, 0.594	1.944	0.052
Children (ref.: no)						
Yes	−3.404	1.655	−0.193	−0.378, −0.009	2.057	0.040
COVID-19 history (ref.: negative)						
Positive-asymptomatic	−1.441	1.841	−0.082	−0.287, 0.123	0.782	0.434
Positive-mild	4.020	1.396	0.228	0.073, 0.384	2.880	0.004
Positive-moderate	8.826	1.422	0.502	0.343, 0.660	6.207	<0.001
Positive-severe	11.501	2.948	0.654	0.325, 0.982	3.901	<0.001

Note: $R^2 = 0.072$, $F = 6.110$, $P < 0.001$.

Kazakhstani nurses. Nurses who experienced mild to severe COVID-19 symptoms reported higher burnout levels compared to those with negative COVID-19 histories. This association was strongest for PB, followed by WRB and CRB (Appendix A).

In Kyrgyzstan, the model explained 13.4% of the variance in burnout, with significant findings indicating: occupational role and COVID-19 history. Thus, nurses working in national research centers reported significantly higher burnout than those in ambulance settings, which is the opposite of the results obtained in Kazakhstan. Nurses who had moderate or severe COVID-19 symptoms reported significantly higher overall burnout levels compared to those who tested negative (Table 2).

The subscale-specific regression analyses for nurses in Kyrgyzstan highlighted distinct predictors for PB, WRB, and CRB. Thus, age was a significant negative predictor only for CRB, indicating that older nurses experienced lower levels of client-related exhaustion. Education level showed significant associations with burnout, particularly for WRB and CRB, with higher-educated nurses reporting significantly greater burnout compared to those with secondary special education. Nurses working in national research centres reported the highest levels of PB, WRB, and CRB compared to those in ambulance settings. Moreover, moderate to severe symptoms consistently predicted higher burnout across all subscales, with the strongest effects seen in PB and WRB (Appendix A).

Table 2
Influencing factors of burnout among Kyrgyzstan nurses.

Characteristics	β	*SE*	β'	95%*CI*	*t*	*P*
Intercept	13.595	7.258	–	–	4.904	<0.001
Gender (ref.: male)						
Female	6.888	5.828	0.395	−0.263, 1.053	1.182	0.238
Age (years)	−0.175	0.094	−0.116	−0.239, 0.006	1.869	0.063
Education (ref.: secondary special)						
Higher	13.501	7.595	0.774	−0.083, 1.632	1.778	0.076
Workforce (ref.: ambulance)						
Outpatient	5.799	4.235	0.333	−0.145, 0.811	1.369	0.172
Inpatient	3.152	4.275	0.181	−0.302, 0.663	0.737	0.462
National research centers	12.989	5.044	0.745	0.176, 1.315	2.575	0.010
Manager position (ref.: no)						
Yes	4.196	3.518	0.241	−0.156, 0.638	1.193	0.234
Marital status (ref.: single)						
Married	−2.169	3.549	−0.124	−0.525, 0.276	0.611	0.541
Divorced	−1.460	4.353	−0.084	−0.575, 0.408	0.335	0.738
Widowhood	2.440	5.302	0.140	−0.458, 0.738	0.460	0.646
Children (ref.: no)						
Yes	−1.661	3.848	−0.095	−0.530, 0.339	0.432	0.666
COVID-19 history (ref.: negative)						
Positive-asymptomatic	5.334	3.956	0.306	−0.141, 0.753	1.348	0.179
Positive-mild	3.306	2.592	0.190	−0.103, 0.482	1.275	0.203
Positive-moderate	7.001	2.304	0.402	0.142, 0.662	3.038	0.003
Positive-severe	13.837	4.001	0.794	0.342, 1.245	3.458	<0.001

Note: $R^2 = 0.134$, $F = 3.250$, $P < 0.001$.

4. Discussion

4.1. Validation of the Russian version of the Copenhagen Burnout Inventory

The findings from our confirmatory factor analysis support the structural validity of the R-CBI in the Central Asian context. The adjustments made to the CFA model were informed by both the modification indices and the underlying theoretical framework. The improved fit indices suggest that the revised model more accurately captures the relationships between the measured constructs. The inclusion of covariances was particularly important in capturing the nuanced relationships between specific constructs. These results highlight the importance of iterative model testing and theoretical validation in structural equation modelling. The revised model not only fits the data better but also enhances our understanding of the constructs being measured. Given together, the model's overall fit can still be considered acceptable and sufficient for validating the R-CBI in this specific context, aligning with previous validations of the CBI in different cultural settings [22,26]. This suggests that the CBI's structure is robust across diverse populations, reaffirming the tool's applicability to international studies.

Moreover, the high internal consistency values obtained (Cronbach's α coefficient ranging from 0.830 to 0.898 for the subscales) are comparable to those reported in other validation studies, demonstrating the reliability of the R-CBI in measuring the different facets of burnout [23]. The successful adaptation of the R-CBI confirmed through a rigorous forward-backwards translation process, highlights the scale's linguistic and conceptual suitability for Kazakhstan and Kyrgyzstan.

The R-CBI scale, along with its PB, WRB, and CRB subscales, showed strong positive correlations with each other, indicating that these dimensions are interrelated aspects of the overall burnout experience. The criterion-related validity of the R-CBI was evidenced by significant correlations with related constructs such as job satisfaction, depression, anxiety, stress, and well-being. These findings are consistent with the burnout literature, which posits that higher burnout levels are typically associated with lower job satisfaction and well-being, and higher levels of mental health issues [14,17]. The strong correlations across both countries reinforce the R-CBI's ability to accurately reflect the burnout syndrome as it is theoretically conceptualized. Moreover, these correlations underscore the importance of addressing burnout not just as an isolated phenomenon but as part of a broader spectrum of psychological well-being. Interventions aimed at reducing burnout are likely to have positive effects on reducing depression, anxiety, and stress, thereby improving overall mental health and job satisfaction among nurses.

4.2. Influencing factors of burnout among nurses

This study revealed several key predictors of burnout among nurses in Kazakhstan and Kyrgyzstan. Notably, the impact of COVID-19 on burnout was significant, with nurses who experienced moderate to severe symptoms of the virus reporting higher levels of burnout. This aligns with recent research indicating that healthcare professionals have been at increased risk of burnout due to the pandemic, due to both direct health impacts and increased work-related stress [18,19].

In terms of demographic predictors, older age was associated with lower burnout, highlighting possibly greater resilience or better-coping mechanisms developed over time [41,42]. Thus, one systematic review examined the nurses' burnout and associated risk factors during the COVID-19 pandemic younger age was associated with increased nurses' burnout [43]. Among the China and US healthcare professionals younger age or early- and mid-career practice were correlated with risk for higher stress [44,45]. At the same time, higher educational levels correlated with increased burnout, particularly in Kyrgyzstan. This might reflect greater professional expectations and responsibilities placed on more highly educated nurses, or possibly a greater awareness and willingness to report symptoms of burnout. For example, university-educated respondents more often achieved scores above the burnout cut-offs among healthcare workers in Central Europe [46].

Interestingly, unlike findings from some Western contexts, managerial role and family status were not significant predictors of burnout in this study. This could suggest cultural differences in work-family dynamics and management styles, or it may reflect a uniformity of stress levels across different nursing roles in Central Asia. Thus, Claponea et al. [47] concluded that single marital status and not having children were associated with a high prevalence of burnout among physicians. In the current study, nurses not having children were also found to have higher levels of burnout. On a regression analysis, having children reduced the risk of burnout among nurses in Kazakhstan, mainly due to work-related burnout. These findings suggested that having children but not a family status may serve as a protective factor against burnout in these contexts. However, the cultural nuances and systemic factors unique to Central Asia warrant further exploration to understand these relationships and inform targeted interventions fully.

Moreover, the regression analysis revealed that occupation plays a significant role in predicting burnout levels among nurses in both Kazakhstan and Kyrgyzstan, though the patterns differ between the two countries. In Kazakhstan, nurses working in national research centers and in-patient settings exhibited significantly lower burnout levels than those working in ambulance services. This suggests that the demanding nature of ambulance work, which often involves high-stress and emergency situations, may contribute to higher levels of burnout. Similar findings have been reported in other contexts where emergency medical services are associated with higher emotional exhaustion and depersonalization due to the intense nature of the work [48,49]. Conversely, national research centres may offer a more structured and potentially less stressful working environment, leading to lower burnout levels. In Kyrgyzstan, nurses working in national research centres reported higher burnout levels compared to their counterparts. This contrasts with the findings in Kazakhstan, suggesting that the occupational context and work environment in Kyrgyzstan may differ in ways that contribute to burnout. These differences between the two countries could be attributed to varying healthcare infrastructure, management practices, and expectations. The finding that occupation significantly predicts burnout in both contexts emphasizes the importance of further research addressing workplace conditions.

4.3. Applicability of the Russian version of the Copenhagen Burnout Inventory

The validation of the R-CBI among nurses in Kazakhstan and Kyrgyzstan demonstrates its reliability and cultural appropriateness for assessing burnout in Russian-speaking healthcare settings. The scale's strong internal consistency confirmed structural validity, and correlations with related constructs like job satisfaction and mental health indicators affirm its utility as a comprehensive tool for diagnosing burnout.

Furthermore, the scale's applicability extends beyond Kazakhstan and Kyrgyzstan, given its successful validation in these culturally distinct yet demographically similar contexts. This suggests that the R-CBI could be effectively utilized in other Russian-speaking regions, particularly in countries across Central Asia and

Eastern Europe where similar healthcare challenges and workforce dynamics exist. Its adaptability across different subgroups, including varying age groups and education levels, makes it a valuable instrument for both research and practical interventions in diverse healthcare environments. This makes the R-CBI not only a reliable tool for current applications but also a promising instrument for longitudinal studies and intervention-based research aiming to track burnout trends and assess the effectiveness of targeted interventions.

4.4. Implications for nursing management and policy

These findings have important implications for nursing management and health policy in Kazakhstan and Kyrgyzstan. Firstly, the validation of the R-CBI provides healthcare administrators and policymakers with a reliable, culturally adapted tool to regularly assess burnout levels. This can facilitate early identification of high-risk groups and inform targeted interventions to mitigate burnout, such as mental health support, workload adjustments, and enhanced professional development opportunities. Moreover, understanding the specific predictors of burnout can help in designing more effective prevention and intervention strategies. For instance, providing additional support for nurses during pandemics, improving conditions for younger and more highly educated nurses, and fostering a supportive workplace culture could be key areas of focus.

5. Limitations

While this study provides valuable insights into the validation of the R-CBI and the assessment of burnout among nurses in Kazakhstan and Kyrgyzstan, several limitations should be considered when interpreting the results. Firstly, the study relied on self-reported data, which are subject to biases such as social desirability and recall bias. Secondly, while the study aimed to culturally adapt the CBI for use in Kazakhstan and Kyrgyzstan, deeper cultural nuances that might influence the expression or perception of burnout could still affect the results. Cultural attitudes towards mental health and workplace stress, for instance, could impact how participants respond to survey items. Further qualitative research could enhance understanding of these cultural factors and refine the tool's adaptation. Thirdly, we acknowledge the potential limitation of using the same population for validating the CBI and analyzing influencing factors. This approach could introduce confounding effects, as the sample used to validate the scale may not fully represent the broader population of nurses in these countries. Ideally, scale validation and the analysis of predictors of burnout should be conducted on separate samples to minimize overlap and ensure independent assessment. Future research should consider validating the scale in one sample and analyzing influencing factors in another, ideally with larger and more diverse populations. Fourthly, the study focused on criterion-related validity through correlations with related constructs but did not include a broad range of external validity criteria that might impact burnout, such as organizational culture, leadership styles, or specific job demands unique to nursing in Central Asia. Including these factors in future research could provide a more comprehensive validation of the CBI. Moreover, the cross-sectional nature of this study limits the ability to infer causal relationships between burnout and its predictors. While we can observe associations, such as between COVID-19 symptoms and increased burnout, we cannot determine whether these factors directly cause increased burnout levels. Longitudinal studies are needed to track changes in burnout over time and to better understand the dynamics of its development.

6. Conclusions

The validation of the R-CBI in Kazakhstan and Kyrgyzstan represents a significant step forward in addressing nurse burnout in these regions. By adapting and confirming the reliability and validity of this instrument, this study not only enhances our understanding of burnout but also equips healthcare systems with the tools needed to combat this pervasive issue effectively. Future research should continue to explore the nuances of burnout across different cultural contexts and evaluate the effectiveness of specific interventions designed based on these insights.

Data availability statement

The datasets generated during and/or analyzed during the current study are available from the corresponding author upon reasonable request.

CRediT authorship contribution statement

Telman Seisembekov: Conceptualization, Methodology, Writing – review & editing, Supervision. **Nurlan Brimkulov:** Investigation, Data curation, Writing – review & editing. **Ainura Taalaikanova:** Investigation, Data curation, Writing – review & editing. **Galiya Smailova:** Investigation, Data curation, Writing – review & editing. **Aidos Bolatov:** Conceptualization, Methodology, Formal analysis, Validation, Investigation, Data curation, Writing – original draft.

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Declaration of competing interest

The authors declare that they have no competing interests.

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Appendices. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ijnss.2025.02.004.

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