

# Development, validation and reliability of work-related low back pain questionnaire for nursing professionals

## Desenvolvimento, validação e confiabilidade de questionário de dor lombar relacionada ao trabalho para profissionais de enfermagem

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**ABSTRACT | INTRODUCTION:** Multiple risk factors induce work-related musculoskeletal disorders (WMSDs), resulting in a higher prevalence of work-related low back pain among nurses. This research aimed to develop and establish the validity and reliability of work-related low back pain questionnaire (WRLBPQ) for nursing professionals. **METHODS:** This study employed a methodology centered on the development, reliability, and validation of a scale. Five experts with a master's degree in the relevant subject and a minimum of 10 years of academic experience participated in the first focal group discussion. Subsequently, thirty-five specialists engaged in the evaluation of content validity for the WRLBP questionnaire. To assess reliability, a sample of 200 staff nurses employed in hospitals was chosen to participate in this questionnaire. **RESULTS:** The newly developed WRLBPQ tool demonstrates strong scale-level content validity, achieving a score exceeding 0.78 for each item. The kappa values for each item ranged from 0.97 for item quality to 1 for item content, indicating excellent agreement. The universal acceptance of each item was 0.91 for quality and 1 for content. The Pearson correlation coefficient was employed to determine test-retest reliability, yielding a result of  $\rho = 1$  for session 1 and  $\rho = 0.82$  for session 2. Inter-rater reliability was determined using the intra-class correlation coefficient (ICC), with values of 0.76 for rater A and 0.86 for rater B, alongside a Cronbach alpha of 0.98. **CONCLUSION:** The WRLBP questionnaire, the first measurement tool among nursing professionals, is a reliable and valid tool for evaluating WRLBP among nursing professionals.

**KEYWORDS:** Nursing. Low Back Pain. Validity. Reliability. Surveys and Questionnaires.

**RESUMO | INTRODUÇÃO:** Vários fatores de risco induzem distúrbios musculoesqueléticos relacionados ao trabalho (DORTs), resultando em uma maior prevalência de dor lombar relacionada ao trabalho entre enfermeiros. Esta pesquisa teve como objetivo desenvolver e estabelecer a validade e confiabilidade de questionário de dor lombar relacionada ao trabalho (WRLBPQ) para profissionais de enfermagem. **MÉTODOS:** Este estudo empregou uma metodologia centrada no desenvolvimento, confiabilidade e validação de uma escala. Cinco especialistas com mestrado no assunto relevante e um mínimo de 10 anos de experiência acadêmica participaram da primeira discussão do grupo focal. Posteriormente, trinta e cinco especialistas se envolveram na avaliação da validade de conteúdo do questionário WRLBP. Para avaliar a confiabilidade, uma amostra de 200 enfermeiros empregados em hospitais foi escolhida para participar deste questionário. **RESULTADOS:** A ferramenta WRLBPQ recém-desenvolvida demonstra forte validade de conteúdo em nível de escala, alcançando uma pontuação superior a 0,78 para cada item. Os valores de kappa para cada item variaram de 0,97 para qualidade do item a 1 para conteúdo do item, indicando excelente concordância. A aceitação universal de cada item foi de 0,91 para qualidade e 1 para conteúdo. O coeficiente de correlação de Pearson foi empregado para determinar a confiabilidade teste-reteste, produzindo um resultado de  $\rho = 1$  para a sessão 1 e  $\rho = 0,82$  para a sessão 2. A confiabilidade interavaliador foi determinada usando o coeficiente de correlação intraclassa (CCI), com valores de 0,76 para o avaliador A e 0,86 para o avaliador B, juntamente com um alfa de Cronbach de 0,98. **CONCLUSÃO:** O questionário WRLBP, a primeira ferramenta de medição entre profissionais de enfermagem, é uma ferramenta confiável e válida para avaliar WRLBP entre profissionais de enfermagem.

**PALAVRAS-CHAVE:** Enfermeiro. Dor Lombar. Validade. Confiabilidade. Questionário.

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## 1. Introduction

Work-related low back pain (LBP) is a musculoskeletal condition resulting from excessive workload, improper posture, and occupational stress. The most common cause of disability and impairment in the world's population is low back pain<sup>1</sup>. LBP results in several healthcare workers absence from work, which requires visits to the doctor, taking sick leave, retiring prematurely, and experiencing a loss of workdays. Most medical professionals reported that their lower back was the most vulnerable area, followed by the neck, shoulder, and hand or wrist<sup>2</sup>.

Nurses have high back pain rates due to their employment nature and are categorized into two types: occupational and individual low back pain<sup>3,4</sup>. Robust epidemiological data indicates a likely correlation between the rise in LBP prevalence and physically strenuous occupations, improper postures, repeated tasks, lifting heavy objects, prolonged standing, and vibration exposure<sup>4,5</sup>. The prevalence of musculoskeletal discomfort among professionals such as nurses is 50.7%, with 26.4% specifically linked to work-related lower back pain<sup>6</sup>. A recent study report revealed that 57% of dentists had lower back pain<sup>7</sup>. A research on cytotechnologists indicates that neck pain is the most widespread, affecting 55-60% of individuals, followed by upper back, hand, and lower back pain<sup>8</sup>. Low back pain affects employment productivity and labor force participation, eventually causing financial loss and unintentionally impacting the economy and society. Nurses might compromise personal hygiene and comfort while caring, lifting and transporting patients<sup>9</sup>. Nurses are more prone than other healthcare workers to suffer excessive workloads, burnout, stress, and demotivation at work, all of which expose them to LBP in various ways. They also spend more time with patients by providing direct care. In the course of their regular employment, nurses are also exposed to activities that foster favorable circumstances for LBP<sup>10</sup>.

The 2013 global burden of disease study reported 58.2 million disability-adjusted life years, positioning it as the 11th leading cause of poor health globally<sup>11</sup>. Low back pain affects 15% to 45% of the global population and more than 50% of individuals, at some stages, seek treatment<sup>1</sup>. Preliminary research suggests that LBP contributes to a greater number of

disability-adjusted life years than some global burden diseases, such as lung cancer, tuberculosis, and road traffic accidents, ranking it among the top ten variables associated with morbidity and disability<sup>12</sup>. A prior research indicates that the prevalence of WMSDs among nurses is around 55.5%, and workplace environments for nursing professionals result in a sixfold rise in the occurrence of back pain<sup>1</sup>. Other professionals, including physiotherapists, show varying prevalence percentages of low back pain, with physiotherapists indicating a prevalence rate of 51.9%<sup>13</sup> and dieticians is about 50%<sup>14</sup>. To mitigate the impact of LBP on nurses, ergonomic strategies and psychological support are crucial for enhancing work efficiency and performance quality<sup>15</sup>.

Low back discomfort may cause many physiological complications that impede a nursing professional's ability to perform daily tasks and sustain interpersonal relationships, therefore diminishing their quality of life<sup>5,16</sup>. LBP is rarely life-threatening, but it needs long-term treatment, making it a major concern for hospital staff with patient-care responsibilities. Nurses must constantly monitor LBP as it impacts nursing practice, insurance costs, and occupational remuneration<sup>17</sup>. The hidden economic cost related to the disease's impact on labor productivity surpasses the direct medical expenditures. There is a growing need for research that examines the individual, physical, and psychological aspects of low back pain among nursing staff from a multidimensional perspective. Therefore, developing a specific questionnaire for nursing practitioners is crucial to promptly identify and prevent work-related low back pain. Currently, there is no available tool that can reliably diagnose work-related low back pain in nurses who follow all mandatory safety protocols, thereby completely preventing LBP<sup>3</sup>. The WRLBP questionnaire aids in the early diagnosis of LBP in nurses and provides ergonomic advice to the nursing staff.

## 2. Methodology

### 2.1. Study design and setting

This research emphasizes the design, validation, and reliability of an instrument in the English language.

From July to September 2024, the study was carried out at REDACTED. Every expert filled out an electronic informed consent form before contributing to the design development process via Google Forms. In order to get information from 35 expert panels, we used Google Forms and forwarded it to them via e-mail or WhatsApp. Participation in this study was entirely voluntary, and no compensation was offered for involvement. REDACTED was the site of participant recruitment for reliability analysis. Prior to giving the WRLBP questionnaire, the main investigator and both assessors conducted an in-person interview. The Delphi method is a structured forecasting strategy that employs the collective views of a panel of experts. A multitude of academic and medical fields have embraced the Delphi approach<sup>18</sup>. This approach has been used in several healthcare-related endeavors, including the evaluation of existing information and the development of assessment tools and metrics<sup>19,20</sup>.

2.2. Recruitment criteria

A group of forty experts, including five for the focal discussion and thirty-five for the content validation procedure, were solicited to engage in the research. The inclusion criteria for experts included a master's degree in nursing, active participation in educational institutions, and a minimum of ten years of experience. To ensure reliability, 200 nursing staff aged 25 to 40, with a history of work-related low back pain and a minimum of 3 years of professional experience, participated in this study. Participants are excluded if they have a past diagnosis of spinal problems, neurological disorders, traumatic low back pain or other rheumatic conditions.

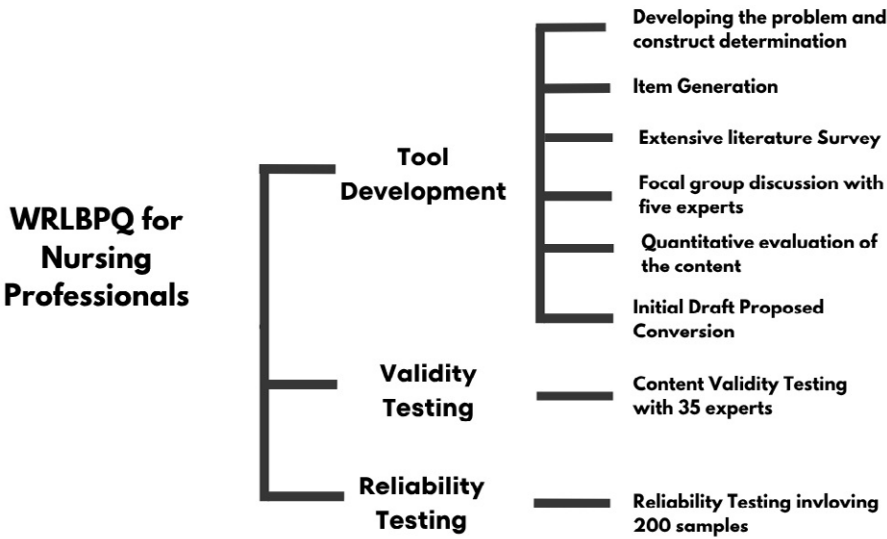
2.3. Ethical statement

Ethical clearance has been obtained from the ethical review board of Maharishi Markandeshwar Medical College and Hospital Solan, under the reference MMMCH/IEC/24/925. The study is registered with the Clinical Trial Registry of India under reference number CTRI/2024/09/073551 and was done in accordance with the 2013 revised Helsinki Declaration and the 2017 National Ethical Guidelines for Biomedical Research involving Human Participation. Prior to participating in this study, each participant received an informed consent form and written consent was obtained from the participants.

2.4. Procedure

The study had three main phases: tool development, validity testing and reliability testing. The layout detail is reported in Figure 1.

Figure 1. Layout of the questionnaire development phases



Source: the authors (2025).

## 2.5. Phase 1: Tool Development

In this phase of the study process, we examine WRLBP symptoms and ensure the development of WRLBP-related assessment tool items through a review of relevant literature. The tool development process involves the following stages:

### 2.5.1. *Developing the problems and constructing determination*

Experts defined the proposed instrument's framework and design. No instrument was available to evaluate work-related factors or the degree of low back pain in nursing professionals.

### 2.5.2. *Item generation*

A significant number of questions were identified as aligning with the questionnaire development section. The tool generated a work-related low back pain questionnaire for the nursing professionals' by reviewing literature on key occupational risk factors, sources of work-related pain, and discomfort from constrained positions, as well as pain linked to bending, prolonged standing, or sitting in awkward postures<sup>21,22</sup>.

### 2.5.3. *Extensive literature review*

Three members of the study team conducted the literature review employing a uniform methodology. The ScienceDirect, PubMed, Web of Science, and PEDro databases were initially analyzed to identify the essential domains and components in questionnaire design as presented in the published literature. The inclusion criteria included various elements related to the development of the English nursing questionnaire.

### 2.5.4. *Focal group discussion with experts*

A panel of five experts, each with over a decade of experience, first discussed the measure designed to evaluate low back pain in the workplace for nursing professionals, guided by the findings of the literature study. The panel of experts conducted initial assessments and then used their suggestions to develop the questionnaire. Initially, we developed a 14-item questionnaire and conducted a Delphi

round with five panels of experts, each reviewing the content relevance. We recognized two questions (one about prolonged walking during duty time and one concerning night shifts duty) as having non-relevance and excluded them from the initial 14-item questionnaire using the expert opinion. Consequently, we replaced one item 'poor posture' with the item indicating pain or discomfort during bending and twisting movements. The final questionnaire was created, including a 12-item question. Details are presented in Table 1.

### 2.5.5. *Quantitative evaluation of the content*

A panel of experts evaluated the quantitative assessment of each question in the item. The consensus among experts was used to assess the item content, and a single Delphi round was performed since 90% of experts concurred on an item, resulting in its incorporation into the subsequent phase of content validity.

### 2.5.6. *Initial draft proposed conversion*

The panel of experts reviewed the preliminary draft of the WRLBP questionnaire for nursing professionals and offered their insights (Table 1). A panel of 35 specialists, with postgraduate nursing qualifications and over ten years of experience, evaluates the content validity of the instrument ([Appendix 1](#)).

## 2.6. Phase 2: Validity testing

Quality and content were evaluated using a 4-point ordinal scale. The scale ranges from 1 to 4, where 1 denotes "not relevant," 2 signifies "somewhat relevant," 3 indicates "quite relevant," and 4 represents "highly relevant"<sup>23,24</sup>. Lynn's recommendation stipulates that an item-level content validity index (I-CVI) of 0.83 necessitates 80% consensus among experts. A minimum I-CVI over 0.78 met Lynn's (1986) criteria, deemed very significant<sup>23</sup>. The panel of experts is provided with a link to a Google Form via WhatsApp or email. Five days after receiving the invitation, they get a call, email, or WhatsApp message soliciting their participation in the content validation phase. Before validating the instrument, each expert evaluated its legitimacy. The panel of experts evaluated the first draft of the WRLBP questionnaire for nursing professionals and provided their feedback.

**Table 1.** Item included/excluded in Delphi round

No	Item	Expert's Rationale for exclusion	Included/Excluded
A	Duration of pain		Included
B	Nature of pain		Included
1	Pain intensity		Included
2	Stiffness in low back region		Included
3	Pain/discomfort in sitting		Included
4	Pain/discomfort in standing		Included
5	Pain/discomfort in patient care activities		Included
6	Poor posture	The expert suggested modifications to increase pain and discomfort during bending and twisting as the work of nurses necessitates frequent bending and twisting movements.	Modified
7	Prolonged walking	This item has been omitted because it exclusively concentrates on assessing pain or discomfort during extended walking, even though patient care activities don't necessitate prolonged walking by nursing staff.	Excluded
8	Night shift	This item has been removed because it exclusively evaluates the activities carried out by nursing staff during night shifts. Since all nursing staff perform the same activities during the morning, evening, and night shifts, we don't require specific items for the night shift.	Excluded
9	Pain/discomfort while dragging dressing trolley		Included
10	Pain/discomfort in assisting OT procedure		Included
11	Take break during working hours		Included
12	Take working day leave		Included

Source: the authors (2025).

## 2.7. Phase 3: Reliability testing

For the reliability study, we recruited 200 nurses whose low back pain was associated with their employment<sup>25</sup>. Each participant completed a written informed consent form before participation. Anthropometric data obtained includes age, height, weight, and BMI. The lead investigator evaluated the test-retest reliability of the WRLBP questionnaire on nursing personnel on two occasions, with a three-day interval between sessions (i.e., on day 1 and day 3). Two physiotherapists, Rater A with six years of clinical experience and Rater B with five years, replicated this procedure. Rater A conducted the first measurement, whilst rater B executed the subsequent one.

## 2.8. Statistical analysis

We first evaluated the content validity of the 12 items using a four-point ordinal scale. The content validity index (I-CVI) is calculated by dividing the total number of test assessments by the number of experts who determined that a test grade of 3 (very relevant) or 4 (extremely relevant) was appropriate ( $I-CVI > 0.78$  signifies excellent level). The index content validity (I-CVI) is an accepted item divided by the number of experts. The sum of all I-CVI scores/number of items is the scale level content validity index (S-CVI/Ave); the sum of portion relevance/number of items is the scale level content validity index (S-CVI/Ave). The sum of UA scores divided by item number is the scale level content validity index based on the universal agreement technique (S-CVI/UA)<sup>26,27</sup>.

The content validity ratio (CVR) can be derived as  $ne-N/2/N/2$ , where N is the total number of experts on the panel and ne is the number of experts divided by the number of experts indicating the item is essential. Kappa value ( $k$ ) =  $(I-CVI-Pc)/(1-Pc)$ . Pc represents the likelihood of a chance event, and a value of  $k = 0.75$  signifies an exceptional outcome<sup>26,27</sup>.

The statistical analysis was performed by using SPSS (version 26). The data's normality was assessed using the Kolmogorov-Smirnov test. Age, height, weight, and BMI exhibit a normal distribution; hence, a parametric test was used for analysis. Descriptive data were presented as mean  $\pm$  standard deviation. The Pearson correlation coefficient test was used to verify test-retest reliability. Inter-rater reliability was determined using the intra-class correlation coefficient.

### 3. Results

#### 3.1. Content validity

In this study, we conducted content validation of WRLBP questionnaire through a group of 35 experts. In first Delphi round, each of the items in the questionnaire received more than 80% of the response rate. The item's content and quality were both universally accepted at 1 for content of item and 0.91 for quality of item (Table 2). Each item's I-CVI level was 1 (Table 3). The kappa value for each item was found to be 1 for content of item and 0.97 for quality of items, which shows excellent agreement (Table 4). The CVR for the WRLBP questionnaire was 0.94 for assessing quality of item and 1 for content of the item (Table 5).

#### 3.2. Reliability

The mean age, height, weight and BMI of the participants were  $31.27 \pm 4.46$  years,  $55.6 \pm 9.61$  kg,  $158 \pm 9.61$  cm and  $22.2 \pm 3.66$  kg/m<sup>2</sup> respectively which is reported in table 6. In order to determine the test-retest reliability of the WRLBP questionnaire between sessions 1 and 2, the results of the Pearson correlation coefficient test are shown in Table 7. The Rho values show that the scoring of the WRLBP questionnaire in both sessions is highly correlated. Table 8 shows the results of the WRLBP questionnaire's inter-rater reliability as determined by raters A and B. The high intra-class correlation coefficient (ICC) value and Cronbach's alpha (0.87) all point to the questionnaire's high reliability.

**Table 2.** Relevance rating for the content of the item

Part A: Relevance rating for the content of the item													
Item/ Expert	QA	QB	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Portion Relevance
Expert in agreement	35	35	35	35	35	35	35	35	35	35	35	35	1
I-CVI	1	1	1	1	1	1	1	1	1	1	1	1	S-CVI/Ave 1
UA	1	1	1	1	1	1	1	1	1	1	1	1	S-CVI/UA 1
Part B: Relevance rating for quality of the items													
Expert in agreement	34	35	35	35	35	35	35	35	35	35	35	35	1
I-CVI	0.97	1	1	1	1	1	1	1	1	1	1	1	S-CVI/Ave .99
UA	0	1	1	1	1	1	1	1	1	1	1	1	S-CVI/UA .91

Source: the authors (2025).

Average portion of item judged as clarity across the 35 experts = 0.99. S-CVI/Ave - Sum of all I-CVI across/ number of items =  $11.97/12 = 0.99$ .

S-CVI/Ave - Sum of proportion relevance rating/ number of experts =  $34.91/35 = 0.99$ .

S-CVI/UA - Average score of UA scores across all the item / number of items =  $11/12 = 0.91$ .

Abbreviations: I-CVI = Item-content validity index, UA = Universal agreement, S-CVI= Scale Content Validity index, Relevance rating recorded as 1 = (relevance scales 3 and 4, relevance rating recorded as 0 = (relevance scales 1 and 2).



**Table 3.** Item generated domains and percentage level of agreement between the experts of item-level content validation for the content of the item and quality of the item

Item	Work-Related Low Back Pain Questionnaire		Content of the item	
			I-CVI	I-CVI
1	Question A	Duration of pain	1	0.97
2	Question B	Nature of pain	1	1
3	Question 1	Pain intensity	1	1
4	Question 2	Stiffness in low back region	1	1
5	Question 3	Pain/discomfort in sitting	1	1
6	Question 4	Pain/discomfort in standing	1	1
7	Question 5	Pain/discomfort in patient care activities	1	1
8	Question 6	Pain/discomfort in bending and twisting	1	1
9	Question 7	Pain/discomfort while dragging dressing trolley	1	1
10	Question 8	Pain/discomfort in assisting OT procedure	1	1
11	Question 9	Take a break during working hours	1	1
12	Question 10	Take a working day leave	1	1

Source: the authors (2025).  
Abbreviation: I-CVI = Item-content validity index.

**Table 4.** The item-content validity index (I-CVI), Probability of chance agreement (PC), and the Kappa designating agreement of relevance (k\*)

Part A: Evaluation of WRLBP questionnaire for content of item												
Item/ Expert	QA	QB	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Expert in agreement	35	35	35	35	35	35	35	35	35	35	35	35
I-CVI	1	1	1	1	1	1	1	1	1	1	1	1
PC	0	0	0	0	0	0	0	0	0	0	0	0
Kappa	1	1	1	1	1	1	1	1	1	1	1	1
Part B: Evaluation of WRLBP questionnaire for quality of item												
Expert in agreement	34	35	35	35	35	35	35	35	35	35	35	35
I-CVI	0.97	1	1	1	1	1	1	1	1	1	1	1
PC	0	0	0	0	0	0	0	0	0	0	0	0
Kappa	0.97	1	1	1	1	1	1	1	1	1	1	1

Source: the authors (2025).  
Abbreviations: I-CVI = Item-content validity index, PC = probability of chance agreement,  
Relevance rating recorded as 1 = (relevance scale 3 and 4, relevance rating recorded as 0 = (relevance scale 1 and 2).

**Table 5.** CVR for the item of each dimension where “Ne” represents the number of experts who rate an item as “essential”

No of item	Content of the item			Quality of the item		
	N	Ne	CVR	N	Ne	CVR
QA	35	35	1	35	34	0.94
QB	35	35	1	35	35	1
Q1	35	35	1	35	35	1
Q2	35	35	1	35	35	1
Q3	35	35	1	35	35	1
Q4	35	35	1	35	35	1
Q5	35	35	1	35	35	1
Q6	35	35	1	35	35	1
Q7	35	35	1	35	35	1
Q8	35	35	1	35	35	1
Q9	35	35	1	35	35	1
Q10	35	35	1	35	35	1

Source: the authors (2025).  
Abbreviation: CVR - content validity ratio, N = total no. of patient, Ne = no. of panel lists indicating items essential.

**Table 6.** Socio-demographic characteristics of the study participants

Variable	Number/Mean	Percentage/SD
Age	31.27	±4.46*
Weight	55.65	±9.61*
Height	158	±5.80*
BMI	22.34	±3.69*
Professional experience		
1-5 years	49	24.6%
6-10 years	136	67.9%
>10 years	15	7.5 %
Job station		
Medicine	24	11.9 %
Surgery	49	24.4%
Emergency	50	24.9%
ICU/CCU/HDU	42	20.9%
Ortho	35	17.9%
WRLBPQ-NP	23.63	±9.08*
WRLBPQ-NP category		
No pain	18	9.0%
Mild pain	66	33.0%
Moderate pain	68	34.0%
Severe pain	44	22.0%
Worst pain	4	2.0%

Source: the authors (2025).

BMI – Body mass index; ICU – Intensive care unit; CCU – Critical care unit; HDU – High dependency unit; WRLBPQ-NP – Work related low back pain questionnaire for nursing professionals; \*- Mean and Standard deviation.

**Table 7.** Pearson correlation coefficient test between test-retest reliability of work-related low back pain questionnaire between session 1 and session 2

Session	WRLBP Questionnaire score	Rho-value	P value
Test-retest session-1	23.42 ± 8.85	1.00	<0.001*
Test-retest session 2	24.39 ± 7.99	0.82	<0.001*

Source: the authors (2025).

P<0.05, Rho value shows an excellent correlation between WRLBP questionnaire measurement in session 2. \* Significant.

**Table 8.** Inter-rater reliability of the WRLBP questionnaire

Session	WRLBP questionnaire score	95%CI	ICC	Cronbach's alpha
Inter-rater A	24.60 ± 8.31	0.69 ± 0.82	0.764	0.873
Inter-rater B	23.27 ± 8.41	0.82 ± 0.90	0.863	0.873

Source: the authors (2025).

CI – Confidence interval; ICC – Intra-class correlation coefficient.

## 4. Discussion

This research sought to develop and validate the WRLBP questionnaire for nursing professionals, ensuring its reliability. The newly designed WRLBPQ tool exhibits robust scale-level content validity, exceptional test-retest reliability, and satisfactory interrater reliability.

Experts assert that the questionnaire has excellent content validity, indicating that it includes relevant questions capable of identifying nurses with work-related low back pain and perhaps recognizing risk factors. Compared to the previous study, the questionnaire demonstrates excellent content validity for non-specific low back pain in adolescents<sup>28</sup>. Our newly developed WRLBP questionnaire outperforms previous criterion questionnaires. Research by Bjorklund et al. on the validity and reliability of a newly designed fitness mapping questionnaire for low back pain patients indicates a Cronbach alpha of 0.90-0.95 for all questions<sup>29</sup>, corroborating the findings of our study.



The tool was verified by a panel of 35 experts, and tests that obtained 80% or more of the answers were chosen to go on to the content validity round. In the WRLBP questionnaire, the content validity index (I-CVI) for each item surpassed the acceptable threshold of 0.78 for both item quality and content. The item's S-CVI/UA (universal acceptability) scores were 1 for content and 0.91 for quality. The tool's S-CVI/UA value exceeded 0.8, falling inside the allowed range, indicating its capability to measure relevant material. The WRLBP questionnaire achieved an S-CVI/Ave of 1 for content and 0.99 for item quality, both beyond the acceptable threshold ( $\geq 0.9$ ). The kappa coefficient ( $k^*$ ) for the evaluation of each item's content in the WRLBP questionnaire is 1, and the quality of each item is 0.97, indicating excellent quality. Cicchetti and Sparrow suggested the following values for kappa: fair =  $k^*$  of 0.40 to 0.59, good =  $k^*$  of 0.60 to 0.74, and excellent =  $k^*$  of 0.75 to 1.00. Every item in the WRLBP questionnaire has a content validity ratio (CVR) of 1 and a quality score of 0.94, indicating a higher degree of relevancy<sup>30-34</sup>.

The WRLBP questionnaire has shown a significantly pertinent and exceptional item content validity index, S-CVI/Ave for both content and quality of each item, universal acceptance, and content validity ratio. The Kappa rating for the WRLBP questionnaire was outstanding, indicating both the quality and content of the item. Nursing personnel may use a WRLBP questionnaire to evaluate work-related low back pain<sup>31-34</sup>.

The WRLBP questionnaire demonstrated reliability across testing, with Pearson correlation values of  $Rho=1.00$  in session 1 and  $Rho=0.82$  in session 2, both with  $P<0.001$ . This demonstrated a robust correlation between the two sessions. Two seasoned evaluators assessed the WRLBP among nurses to determine the inter-rater reliability of the WRLBP questionnaire, revealing excellent inter-rater reliability with ICC values of 0.76 and 0.86, respectively. The high inter-rater reliability among nursing professionals about WRLBP indicates that this questionnaire is a more precise instrument for evaluating WRLBP when comparing findings from various raters<sup>35-37</sup>. The Quebec Back Pain Disability Scale is another scale that is easy to administer and score. It boasts high test-retest reliability, excellent content and construct

validity, and a strong correlation with other disability tools. The second tool is the APS (Abbey Pain Scale), which has reliability scores of 0.83 when resting and 0.88 during exercise, and it shows a relationship with the PAINAD (Pain Assessment in Advanced Dementia) scores of 0.75-0.82 at rest and 0.83-0.89 during exercise<sup>36</sup>. The Roland-Morris Disability Questionnaire (RMDQ) is another well-established measure, which was developed to capture the everyday functional impact of chronic low back pain. It has been shown to have test-retest reliability (*intra-class correlation coefficient* [ICC]  $> 0.70$ ) and internal consistency reliability (Cronbach's  $\alpha > 0.80$ ). It is primarily focused on physical functioning (mobility, ability to carry out activities of daily living)<sup>37</sup>. The Japan Orthopaedic Association Back Pain Evaluation Questionnaire (JOABPEQ) score rating system is another assessment tool for low back pain; it is the instrument that has been widely utilized to evaluate the functional results of many types of intervention for low back pain. It has good test-retest reliability, with both kappa and weighted kappa more than 0.50 for all but one item, which was 0.48. One of the major criticisms of this specific instrument, however, is that it is not a patient-oriented measurement but a physician-based one<sup>38</sup>.

The WRLBP questionnaire developed for this study is a valid and reliable instrument for the purpose of evaluating LBP among nursing professionals associated with their jobs. Despite being popular tools for measuring low back pain, the Oswestry Disability Index (ODI) and the Roland-Morris Disability Questionnaire (RMDQ) fail to consider the unique ergonomic risks and physical demands that nurses encounter. The questionnaire for this study fills this gap by incorporating questions on nurse-specific duties like lifting, moving patients, and prolonged standing.

#### 4.1. Limitations

The newly developed questionnaire has several limitations, including the narrowing down of its items based on the opinions and clinical acumen of subject experts. The questionnaire may not fully address all potential risk factors related to work lifestyle or psychological domains that could contribute to low back pain among nursing professionals.

## 4.2. Future scope

Future research should focus on parallel methods of reliability evaluation for work-related low back pain questionnaires designed for nurses. Well-designed prospective studies may also evaluate the prognostic efficacy of the instrument. This questionnaire facilitates the early identification of low back pain in nursing personnel, offers ergonomic recommendations to alleviate symptoms, and assists in formulating an initial exercise regimen for the patient. Subsequent study may investigate the influence of environmental variables across various healthcare settings and their impacts on low back pain, perhaps leading to more targeted preventative and treatment strategies.

## 5. Conclusion

WRLBP questionnaire is the first measurement tool used in India among nursing professionals which is a reliable and valid tool for evaluating WRLBP in nursing professionals.

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## Authors contributions

The authors declared that they have made substantial contributions to the work in terms of the conception or design of the research; the acquisition, analysis or interpretation of data for the work; and the writing or critical review for relevant intellectual content. All authors approved the final version to be published and agreed to take public responsibility for all aspects of the study.

## Competing interests

No financial, legal, or political conflicts involving third parties (government, private companies, and foundations, etc.) were declared for any aspect of the submitted work (including but not limited to grants and funding, advisory board participation, study design, manuscript preparation, statistical analysis, etc.).

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## Appendix

### Appendix 1. Work-related low back pain questionnaire for nursing professionals (to be continued)

#### Work-Related Low Back Pain Questionnaire for Nursing Professionals (WRLBPQ-NP)

This questionnaire aims to gather information on work-related low back pain among nursing professionals. Kindly respond to each part and choose just one applicable box in each section.

**NOTE:** Question A & B will not be included in main scoring

**A. How long have you been suffering with low back pain?**

1. Less than 6 weeks (Acute phase)
2. Between 6-12 weeks (Subacute)
3. Over 12 weeks (Chronic phase)

**B. Is your low back pain radiate to the lower limb? If yes, which limb is being affected?**

1. No
2. Yes
  - a. Right
  - b. Left
  - c. Both

**1. Low back pain intensity**

- 1 I have no pain at all
- 2 I feel mild pain but can manage without pain care
- 3 I feel moderate pain which is relief by pain care
- 4 I feel severer pain which is little relief by pain care
- 5 The pain is worst imaginable which is not relief by any pain care

**2. Do you have any stiffness in low back region?**

- 1 I can move without any restriction
- 2 I feel mild restriction while movement
- 3 I feel moderate restriction while movement
- 4 The pain severely restricts my movement
- 5 The pain extremely restricts my movement

**3. Feel pain or discomfort throughout your job's sitting hours?**

- 1 I can sit as long as I want without any pain
- 2 I cannot sit more than 1 hour due to low back pain
- 3 I cannot sit more than 30 minutes due to low back pain
- 4 I cannot sit more than 10 minutes due to low back pain
- 5 My back pain cannot allow me to sit at all

**4. Feel pain or discomfort throughout your job's standing hours?**

- 1 I can stand as long as I want without any pain
- 2 I cannot stand for more than 1 hour due to low back pain
- 3 I cannot stand for more than 30 minutes due to low back pain
- 4 I cannot stand for more than 10 minutes due to low back pain
- 5 I cannot stand at all due to low back pain



**5. Feel pain or discomfort during patient care activities?**

- 1 I can care for patients without any pain in my lower back
- 2 I can't be able to provide patient care due to my lower back pain after 1 hour.
- 3 I can't be able to provide patient care due to my lower back pain after 30 minutes.
- 4 I can't be able to provide patient care due to my lower back pain after 10 minutes.
- 5 I need assistance from my colleagues in patient care due to my low back pain.

**6. Feel pain or discomfort during bending and twisting activities at work?**

- 1 I can bend and twist as I want without any pain
- 2 My back pain slightly restricts my ability to bend and twist.
- 3 My back pain moderately restricts my ability to bend and twist.
- 4 My back pain severely restricts my ability to bend and twist.
- 5 I can't bend and twist at all due to low back pain

**7. Feel pain or discomfort while dragging dressing trolleys?**

- 1 I feel no pain while dragging dressing trolley
- 2 I feel mild pain while dragging dressing trolley
- 3 I feel moderate pain while dragging dressing trolley
- 4 I feel severe pain while dragging dressing trolley
- 5 I feel worst imaginable pain while dragging dressing trolley

**8. Feel pain or discomfort while assisting operation theater (OT) procedure?**

- 1 I feel no pain while assisting in an OT procedure.
- 2 I feel mild pain while assisting in an OT procedure.
- 3 I feel moderate pain while assisting in an OT procedure.
- 4 I feel severer pain while assisting in an OT procedure.
- 5 I can't assist in an OT procedure due to my low back pain

**9. How often do you take break/rest during working hours?**

- 1 I don't require any rest/break during working hours.
- 2 I feel mild discomfort but do not require any breaks during working hours.
- 3 I need an intermittent rest/break during prolonged working hours.
- 4 I need rest/break frequently during working hours.
- 5 I need a rest/break every hour while working.

**10. How often do you take workday leaves for low back pain?**

- 1 I don't require any leave due to my low back pain.
- 2 I take leave very rarely due to low back pain.
- 3 I take leave rarely due to low back pain.
- 4 I take leave occasionally due to low back pain.
- 5 I take leave frequently due to low back pain.

Each question has five potential points: 1 for the first response and 5 for the final response. Calculate the total score for the 10 questions. The score ranges from 10 to 50; a lower score indicates less symptoms, and a higher score indicates the worst imaginable symptoms. Evaluate them according to the following scale.

Total score: 50

No pain: 1-10; Mild pain: 11-20; Moderate pain: 21-30; Severe pain: 31-40; Worst pain: 41-50

Source: the authors (2025).