

Real Experiences of Low Back Pain in Nursing Students During Nursing Operations: A Qualitative Study

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Abstract: *Objective:* To explore the authentic experiences of low back pain among nursing students during clinical practice and provide evidence for prevention and management. *Methods:* Twenty-three nursing students were recruited between November 1 and December 31, 2024. Semi-structured face-to-face focus group interviews were conducted, and data were analyzed using Colaizzi's seven-step method. *Results:* Five main themes and five sub-themes were identified: influencing factors of low back pain; high-risk procedures exacerbating pain; insufficient preventive knowledge; dual impacts on learning and psychology; and expectations for equipment improvement. *Conclusion:* Optimizing the training environment, standardizing operation protocols, and strengthening ergonomic training can reduce occupational low back pain and improve health protection awareness among nursing students.

Keywords: Nursing students; Low back pain; Muscle fatigue; Occupational protection; Qualitative research; Clinical practice; Ergonomics

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1. Introduction

With continuous advancements in medical technology, nursing professionals, as a critical component of the healthcare system, have drawn increasing societal attention to occupational health issues. Nursing work involves prolonged standing, frequent gait transitions, and patient handling, characterized by high intensity and repetitive motions, which elevate the risk of lumbar and back injuries among nursing staff^[1]. Although research on occupational diseases among nursing personnel has grown in recent years, qualitative studies examining lumbar and back muscle fatigue experienced by nursing students during practical training remain relatively scarce. Nursing students undergo extensive hands-on training during their academic years but often lack knowledge and experience in lumbar protection measures, resulting in a high incidence of low

back pain among this population ^[2]. This not only impacts students' academic performance and quality of life but may also reduce their willingness to pursue careers in nursing, thereby adversely affecting professional development ^[3]. Therefore, in-depth exploration of the authentic experiences of lumbar and back muscle fatigue during nursing operations holds significant practical value. This study employs qualitative research methods, conducting in-depth interviews with nursing students at our university to analyze influencing factors and propose recommendations regarding muscle fatigue associated with lumbar and back-related tasks.

2. Study subjects and methods

2.1. Study subjects

Using purposive sampling method, nursing students enrolled in higher education institutions from November 1, 2024 to December 31, 2024 were selected as study subjects. Inclusion criteria included: nursing students participating in nursing-related practical courses; those capable of clearly expressing their perceptions and experiences during lumbar and back-related tasks, and voluntarily signing informed consent forms. Exclusion criteria included: nursing students with recent major lumbar or back disorders. Sample size was determined based on data saturation principles to ensure no new topics emerged during interviews. A total of 3 group interviews were conducted with 23 nursing students, and their demographic data are presented in **Table 1**. This study has been approved by the hospital ethics committee (Ethics Approval Number: 202415) and strictly adhered to confidentiality principles.

Table 1. General characteristics of study subjects (n = 23)

Number	Age	Sex	Stature	Education	School year	Period of schooling
N1	23	woman	165 cm	upgrade from junior college student to university student	Grade 2	5 years
N2	22	woman	157 cm	upgrade from junior college student to university student	Grade 2	5 years
N3	23	woman	168 cm	upgrade from junior college student to university student	Grade 2	5 years
N4	24	woman	163 cm	upgrade from junior college student to university student	Grade 2	5 years
N5	22	woman	157 cm	upgrade from junior college student to university student	Grade 2	5 years
N6	23	woman	158 cm	upgrade from junior college student to university student	Grade 2	5 years
S1	23	woman	156 cm	upgrade from junior college student to university student	Grade 2	5 years
S2	22	woman	157 cm	upgrade from junior college student to university student	Grade 2	5 years
S3	23	woman	158 cm	upgrade from junior college student to university student	Grade 2	5 years
S4	23	woman	164 cm	upgrade from junior college student to university student	Grade 2	5 years
S5	22	woman	170 cm	upgrade from junior college student to university student	Grade 2	5 years

Number	Age	Sex	Stature	Education	School year	Period of schooling
S6	24	man	165 cm	upgrade from junior college student to university student	Grade 2	5 years
S7	21	man	185 cm	undergraduate course	Grade 2	3 years
H1	24	woman	155 cm	upgrade from junior college student to university student	Grade 2	5 years
H2	23	woman	167 cm	upgrade from junior college student to university student	Grade 2	5 years
H3	21	woman	158 cm	upgrade from junior college student to university student	Grade 2	8 years
H4	23	woman	169 cm	upgrade from junior college student to university student	Grade 2	8 years
H5	19	woman	150 cm	undergraduate course	Grade 3	3 years
H6	20	woman	150 cm	undergraduate course	Grade 3	3 years
H7	21	man	178 cm	undergraduate course	Grade 3	3 years
H8	21	man	181 cm	undergraduate course	Grade 3	3 years
H9	21	man	183 cm	undergraduate course	Grade 3	3 years
H10	21	man	179 cm	undergraduate course	Grade 3	3 years

2.2. Research methods

2.2.1. Development of interview outline

The research team initially drafted an interview outline based on literature review and group discussions to align with the study objectives. Three senior experts (associate senior level or above) with over 15 years of experience in nursing management, ergonomics, and rehabilitation medicine were consulted to analyze and evaluate the outline, with subsequent revisions made according to their feedback. Preliminary interviews with five nursing students were conducted, and the outline was further refined based on the results. The final interview outline is as follows:

- (1) Have you ever experienced lower back pain during practical training operations?
- (2) What do you consider to be the primary cause of low back pain?
- (3) What methods do you typically employ to alleviate or reduce pain when experiencing lumbar and back pain?
- (4) Which courses on practical training operations have you attended? Have the content and format of these courses had an impact on your lumbar and back health?
- (5) Among these procedures, which ones are more likely to cause lumbar and back pain? What physical and subjective sensations have these pains brought you?
- (6) During the procedure, which postures or movements may exacerbate your lower back pain?
- (7) Do you think the surrounding environment has affected your working posture?
- (8) When participating in practical training courses, would you adopt certain self-protection measures to mitigate the occurrence of lumbar and back pain?

2.2.2. Data collection and quality control

Data collection was conducted using semi-structured face-to-face group focus interviews in the nursing practice training laboratory at the school. Prior to interviews, participants were thoroughly informed about the research objectives, methodology, and content, with scheduled interview times agreed upon. With

informed consent, all sessions were recorded audio-visually. Researchers maintained neutral and respectful attitudes to ensure participants could freely express thoughts and feelings in a comfortable environment, listened attentively without interruption, and avoided leading questions. Each interview lasted 20-40 minutes. Adhering to qualitative research's data saturation principle, the team conducted three interviews. Post-interview, team members cross-checked transcripts, revisiting ambiguous or questionable sections for verification. Two researchers collaboratively reviewed, analyzed, coded, and refined transcripts, then compared them with original data to establish research themes.

2.2.3. Data analysis

Data analysis was conducted using NVIVO 12.0 software. After interviews, collected data were transcribed by two team members and verified by the research group. The Colaizzi seven-step analysis method ^[4] was employed for data processing, involving repeated word-by-word and sentence-by-sentence reviews of interview transcripts to extract theme-relevant statements and code recurring perspectives. Codified viewpoints were aggregated to identify common characteristics, with each emerging theme described in detail and similar viewpoints distinguished. In case of discrepancies during data analysis, the final conclusions were determined through group discussion by the research team.

3. Results

3.1. Major influencing factors of low back pain in nursing students

3.1.1. Environmental factors

Responding students commonly reported issues with practical training environments, including excessively low beds, insufficient bed spacing, overcrowded classrooms, and inappropriate temperature or lighting conditions. These factors compel them to adopt poor postures or increase physical exertion, thereby elevating the risk of lumbar and back pain. S1: "The bed height is too low, making each procedure inconvenient and requiring frequent bending". H3: "The narrow spacing between beds in the training room limits my ability to maintain proper posture when pushing the treatment cart during procedures". H4: "Crowded spaces with limited room often restrict movement range". N3: "Excessive heat and ineffective air conditioning exacerbate fatigue during operations". H10: "Poor lighting conditions during blood draws make visual assessment difficult, significantly increasing effort requirements".

3.1.2. Repetitive operations induce muscle fatigue

Multiple technical procedures in nursing practice, such as catheterization and cardiopulmonary resuscitation (CPR), require repetitive operations, leading to lumbar and back muscle fatigue. H5: "During catheterization disinfection for patients, repeated bending and standing up causes significant strain on the lumbar region, resulting in inability to maintain posture for extended periods". S2: "During CPR, the high-frequency compressions required by the procedure typically last approximately 5 minutes, necessitating sustained arm extension and lumbar force application. Post-procedure, lumbar and back muscle fatigue becomes particularly pronounced".

3.1.3. Improper operating postures increase injury risk

Nursing students commonly report experiencing back pain or soreness during activities such as bending,

squatting, prolonged standing, and sustained single-posture operations. Basic nursing and skill training procedures, including bed making, intravenous infusion, and cardiopulmonary resuscitation (CPR), are high-risk scenarios. H10: “I feel my back becomes sore after prolonged bending or extended operation time”. N3: “During CPR procedures involving continuous chest compressions, I experience significant back fatigue afterward”. N6: “Non-standard postures increase pain susceptibility due to uneven force distribution”.

3.2. High-risk procedures exacerbate the occurrence of low back pain

Students consistently identified basic nursing procedures as the most common cause of low back pain. Tasks such as cardiopulmonary resuscitation (CPR), bed making, catheterization, and sponge baths, due to their complex and repetitive movements requiring bending or squatting, became high-risk points for low back pain. H4: “CPR procedures are frequent, and both during and after the process, I distinctly experience low back pain”. S1: “Bed making is the most exhausting, especially when folding bed corner covers, which requires prolonged bending and weight-bearing”. S5: “During urinary catheter insertion, maintaining prolonged bending in a fixed posture often causes discomfort and pain in the lower back”. H5: “During catheter insertion, constant bending in one position over extended periods leads to severe lower back pain”. H10: “Body wiping for patients (using hand gestures) involves leg elevation and patient turning, which significantly strains the lumbar spine”.

3.3. Insufficient awareness of prevention and delayed implementation of mitigation measures

Most students lack effective preventive measures against back discomfort, often only taking action after experiencing pain. Common relief methods include stretching, massage, using lumbar support belts, or resting, but few adopt proactive protective behaviors. N1: “We usually don’t take preventive steps—only resort to massage or lying down when in pain. Typically, we only notice back pain after class ends”. S5: “I’ve used lumbar support belts, but only when experiencing soreness”. N2: “Sometimes I stretch and twist my back to alleviate discomfort”. In summary, nursing students still face challenges such as insufficient knowledge and weak behavioral execution in preventing back injuries, urgently requiring systematic education and training to enhance their proactive prevention awareness and protective capabilities.

3.4. Dual effects of low back pain on learning outcomes and psychological state

3.4.1. Decline in operational efficiency and learning quality

Persistent lumbar and back discomfort significantly impacts nursing students’ operational performance during practical training, manifesting as slowed movements and reduced learning motivation. N5: “If I have back pain, performing these procedures will definitely be affected—my movements become uncoordinated or I can’t sustain them for long. I’m afraid I won’t master these operations”. N6: “Sometimes the pain is so severe that even sitting to read becomes uncomfortable. I just want to lie in bed resting, which inevitably delays my learning”.

3.4.2. Negative emotions and learning anxiety

Frequent physical discomfort triggers emotional fluctuations, with some nursing students experiencing negative emotions such as anxiety, worry, and a sense of helplessness, even doubting their academic abilities and future prospects. N5: “I’m already exhausted from the heavy course load, and my back pain persists. After class, I have no energy left to study—I just want to relax. The thought of having so much professional

knowledge to learn makes me genuinely worried about falling behind, and it's terrifying to think about it". N1: "I'm anxious and fearful of not keeping up with my classmates".

3.5. Students expect improved facilities and greater support

Students proposed multiple improvement suggestions, including adjustable-height beds, more ergonomic chairs and tools, as well as optimized practical training spaces. They aimed to reduce back pain caused by poor posture through environmental and equipment enhancements. H3: "We hope the bed height can be adjusted; otherwise, our operations would be too strenuous". N2: "It would be great if the school provided lumbar support belts". S4: "With more space and better equipment arrangement, we could adopt more relaxed postures".

4. Discussion

This study systematically analyzed the primary influencing factors and practical experiences of low back pain during nursing operations among 23 nursing students. The findings revealed that adverse working environments (e.g., confined spaces, suboptimal equipment design, inappropriate temperature/humidity conditions, insufficient lighting), repetitive tasks, and improper operational postures were the main causes of lumbar muscle fatigue and pain in nursing students. High-risk procedures such as cardiopulmonary resuscitation (CPR), bed-making, urinary catheter insertion, and patient transportation significantly increased the risk of lumbar injuries. Additionally, nursing students generally lacked adequate protective knowledge and behavioral competence, adopting passive approaches to pain prevention that often relied on post-class rest or temporary relief measures. Lumbar pain not only reduced learning efficiency and quality among nursing students but also induced negative emotions and occupational burnout. This situation warrants attention through targeted interventions, including enhanced occupational health education on lumbar pain management, strengthened self-protection awareness, rational improvements in environmental equipment (e.g., energy-efficient devices), optimized workspace organization, and scientifically designed work surfaces.

4.1. Environmental and equipment conditions exacerbate lumbar and back strain

Nursing students have identified factors such as excessively low bed heights, insufficient bed spacing, overcrowded training laboratories, and suboptimal temperature conditions as contributors to lumbar fatigue and pain. These findings align with existing research indicating that non-ergonomic bed heights and spatial configurations compel nursing staff to adopt poor postures like bending or twisting during procedures, thereby exacerbating lumbar load ^[5]. Studies have demonstrated that when nursing bed heights cannot be adjusted according to operator height, lumbar muscle activity intensity significantly increases ^[6]. Additionally, environmental factors such as excessive temperature and poor ventilation reduce nursing students' comfort levels and tolerance, indirectly increasing operational burden. Therefore, improving training environments and equipment conditions holds practical significance for alleviating lumbar pain among nursing students.

4.2. Poor posture and prolonged operation duration are major predisposing factors for low back pain

Nursing students generally consider bending, squatting, prolonged standing, and maintaining a single posture for extended periods as significant causes of low back pain. This finding is consistent with previous studies.

Multiple surveys indicate that nurses experience a significantly increased risk of musculoskeletal disorders (MSDs) in the lumbar and back regions due to prolonged bending, twisting, and sustained exertion during basic nursing care and operational training ^[7]. For instance, cardiopulmonary resuscitation (CPR), which requires repeated and continuous chest compressions, is recognized as a high-risk procedure for nursing staff experiencing low back pain ^[8]. The results of this study suggest that this trend manifests even during the practical training phase, underscoring the importance of incorporating ergonomics education and posture training into early stages of nursing education.

4.3. High-risk procedures are concentrated in basic nursing and emergency skills

Interview results revealed that students generally perceive cardiopulmonary resuscitation (CPR), bed-making, catheterization, and intravenous infusion as high-risk procedures associated with low back pain. This finding aligns closely with clinical studies indicating high-risk tasks. Literature reports that basic nursing care (e.g., repositioning, bed baths, and bed-making) and emergency nursing interventions are categorized as high-intensity movements frequently linked to lumbar spine injuries ^[9]. Additionally, CPR, due to its stringent requirements for pressure intensity and frequency, has been proven to impose significant strain on nurses' lumbar, back, and upper limb regions ^[10]. Therefore, this study provides student-derived clinical evidence, further demonstrating that basic and emergency procedures represent ergonomically critical risk points requiring special attention.

Most students lack effective preventive measures before experiencing lumbar and back discomfort, resorting to reactive strategies such as stretching, massage, or wearing lumbar belts only after pain occurs. This “post-event relief” pattern has also been observed in other studies. Surveys reveal that nursing students demonstrate insufficient self-protection awareness regarding musculoskeletal injuries, with low implementation rates of preventive behaviors including warm-ups, posture adjustments, and core muscle exercises ^[11]. Instead of addressing issues proactively, they often rely on lumbar support or brief rest only after pain onset, which fails to fundamentally reduce injury risks. This highlights the need to incorporate lumbar pain prevention knowledge and skills into nursing education, encouraging students to adopt proactive protective measures prior to clinical interventions.

Students expressed preferences for adjustable-height beds, more rational spatial layouts, and lumbar support belts. These demands are corroborated by existing literature. Studies indicate that providing height-adjustable nursing beds and transfer assistive devices can significantly reduce the incidence of lumbar and back injuries ^[12]. Concurrently, management's emphasis on ergonomics correlates negatively with occupational injury rates among nursing staff ^[13]. Therefore, the findings not only reflect students' individual experiences but also provide references for nursing institutions in teaching facility development and student health protection policies.

5. Summary

In summary, nursing students, as the core reserve of future nursing professionals, have become a “high-risk group” for occupational low back pain during clinical training and skill practice. Occupational low back pain during the nursing student phase not only directly compromises their current physiological health but may also exert latent impacts on future career development through issues such as “fixed incorrect operational postures” and “occupational health anxiety”. Low back problems among nursing students should not be

overlooked, and nursing administrators and practitioners must prioritize addressing these concerns by implementing targeted interventions. Establishing protective mechanisms to reduce the incidence of low back pain can thereby enhance the learning quality of nursing students.

Disclosure statement

The authors declare no conflict of interest.

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