

NURSES' KNOWLEDGE, PRACTICES AND ASSOCIATED FACTORS OF MANAGING PATIENTS WITH SUSPECTED SPINAL CORD INJURIES

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ABSTRACT

Background: Spinal cord injury (SCI) care requires specialized knowledge and practical competencies to ensure effective patient management. This study aimed to assess the knowledge and practices of nurses in providing care to patients with suspected SCI across public-sector tertiary care hospitals in Islamabad.

Methods: A cross-sectional analytical study was conducted in 2024 with 118 nurses from emergency departments of public-sector tertiary care hospitals in Islamabad, Pakistan. Data were collected using structured questionnaires that assessed demographic characteristics, knowledge, and practical competencies of nurses in SCI care.

Results: Most nurses (70.3%) demonstrated adequate theoretical knowledge of SCI, particularly regarding the anatomy and physiology of vertebral column and etiology of SCI including common risk factors. However, 75.4% were rated as below the competency threshold in practical nursing tasks such as patient assessment, vital sign monitoring, and interventions. A significant association was found between age and knowledge, with older nurses exhibiting higher levels of knowledge. The study also revealed a strong link between knowledge and practical competency, whereby nurses with better theoretical knowledge were more likely to be met the competency threshold in practice.

Conclusions: While most nurses possessed good knowledge of SCI care, there was a notable gap in their ability to apply this knowledge in practice. These findings highlight the need for enhanced practical training, continuous professional development, and targeted education that focuses on critical care and interventions in SCI management. Strengthening practical competencies through structured training and mentorship programs is essential for improving nursing care quality and patient outcomes in SCI settings.

Keywords: Spinal cord injury, knowledge, practice.

INTRODUCTION

Spinal cord injury (SCI) is a serious and potentially life-altering condition that can result in permanent neurological impairment, disability, and substantial reductions in quality of life. Inadequate or delayed management may exacerbate secondary neurological damage and increase the risk of potentially life-threatening complications. It is estimated that 40–80 new cases of SCI occur per million populations

annually, with the majority resulting from traumatic causes (1). SCI is associated with substantial morbidity and long-term disability, making it a major global public health concern that requires timely recognition and evidence-based management.

The global burden of SCI has increased considerably over recent decades. According to estimates based on the Global Burden of Diseases, Injuries, and Risk Factors Study, approximately

20.6 million people were living with SCI worldwide in 2019, with nearly 0.9 million new cases occurring annually. SCI was estimated to account for approximately 6.2 million years lived with disability. Although age-standardized incidence rates have remained relatively stable, the absolute number of individuals affected by SCI has increased substantially, reflecting population growth and demographic changes (2).

SCI also represents a persistent public health challenge in the United States. One study reported that more than 250,000 individuals in the United States were living with SCI, with approximately 17,000 new cases occurring annually. Despite advances in prevention, diagnosis, surgical management, and critical care, SCI continues to be associated with considerable morbidity and long-term disability (3). Effective SCI management requires early assessment, radiographic evaluation, spinal stabilization, and coordinated care across prehospital services.

The burden of SCI is particularly important in low- and middle-income countries, including Pakistan. Reported incidence rates in Pakistan range from 3.3 to 195.4 cases per million populations, with road traffic injuries, falls, and violence identified as major causes (4). The delivery of timely and specialized SCI care in Pakistan is further challenged by limited healthcare resources. The country has a substantial shortage of neurosurgical professionals, with approximately one neurosurgeon available for every 720,000 people, potentially limiting access to specialized acute care and rehabilitation services (4). Shortages of nurses, particularly those with specialized competencies in neurological care, may further constrain the delivery of high-quality care to patients with SCI (5). These systemic limitations emphasize the importance of strengthening the knowledge and clinical competencies of healthcare professionals involved in the frontline management of patients with suspected SCI.

The emergency department (ED) plays a critical role in the early recognition, assessment, stabilization, and management of patients with suspected SCI. Nurses are central to this process, providing neurological and physiological monitoring, maintaining spinal precautions,

managing pain and medications, preventing complications, and supporting communication, education, and documentation (6). The quality of SCI care depends substantially on nurses' knowledge, clinical skills, and adherence to evidence-based practices. Met the competency threshold nurses can recognize complications early, provide appropriate monitoring and interventions, collaborate effectively with the multidisciplinary healthcare team, and contribute to improved patient outcomes (7).

Despite the critical role of nurses in the early management of suspected SCI, providing consistent and evidence-based care remains challenging due to high patient volumes, time-sensitive decision-making, and variations in nurses' knowledge and clinical skills. Staff turnover and limited opportunities for specialized education may further contribute to gaps between knowledge and clinical practice. These challenges are particularly relevant in resource-constrained settings such as Pakistan, where limited evidence exists regarding nurses' knowledge and practices in SCI management. Furthermore, factors associated with nurses' knowledge and practices, particularly in public hospitals in Islamabad, remain underexplored. Identifying these gaps is essential for developing targeted educational programs and strengthening the quality of SCI care.

Therefore, this study aimed to assess the knowledge and practices of nurses in public hospitals in Islamabad regarding the management of patients with suspected SCI and to identify factors associated with their knowledge and practices.

Methods

A cross-sectional analytical study was conducted in 2024 among EDs nurses working in four tertiary care public hospitals in Islamabad, Pakistan, including Pakistan Institute of Medical Sciences, Federal Government Polyclinic Hospital, Capital Hospital and Federal Government Hospital. These hospitals provide specialized trauma care and receive a high volume of patients with suspected spinal cord injury (SCI).

The study population comprised registered nurses providing direct patient care in the EDs of the

selected hospitals. Nurses with at least six months of ED experience were eligible to participate. Nurse managers, supervisors, and clinical instructors who were not directly involved in patient care were excluded. A total population (census) sampling approach was employed. During the study period, all registered nurses working in the emergency departments of the four selected public-sector tertiary care hospitals who met the eligibility criteria constituted the accessible study population. A total of 118 eligible nurses were identified across the four hospitals, and all were invited to participate. All 118 eligible nurses agreed to participate and completed the questionnaire; therefore, no eligible participants were excluded or declined participation. The final sample included all eligible nurses in the accessible study population ($n = 118$), resulting in a response rate of 100%.

Data were collected using a structured self-administered questionnaire adapted from Ali et al. (2022) and modified according to the study context and current evidence-based recommendations (8). The questionnaire consisted of three sections. The first section collected demographic information, including age, gender, educational, total nursing experience, previous SCI-related training, and frequency of caring for patients with SCI. The second section assessed nurses' knowledge regarding spinal cord injury and comprised 21 multiple-choice items covering anatomy and physiology of the vertebral column, causes and risk factors, clinical manifestations and complications and nursing care. Each correct response received one point, resulting in a total score ranging from 0 to 21. Knowledge scores were categorized as poor (0–7), average (8–14), and good (15–21). The third section evaluated nurses' practice using 41 items related to the assessment and management of patients with suspected SCI, including assessment of vital signs, general survey, head, neck, chest, abdomen, back, extremities, and nursing interventions. Each practice item was weighted equally, and each item contributed equally to the total practice score. No differential weighting was applied because the scoring approach was based on the original questionnaire and the study aimed

to assess overall practice competency. The practice score was calculated by assigning equal weight to each of the 41 items. Participants who achieved at least 85% of the total possible score were classified as meeting the competency threshold, whereas those scoring below 85% were classified as below the competency threshold. The 85% cutoff was adopted from the scoring approach used in the source questionnaire and was retained to ensure consistency with the original instrument. However, this threshold should be interpreted as an operational criterion for categorizing practice performance rather than as a universally validated clinical standard.

Content validity was established using the Content Validity Index (CVI) based on the evaluation of five experts in nursing research and instrument development. The scale-level CVI was 0.99 for relevance and 0.97 for clarity. A pilot study was conducted among 12 nurses from a comparable public hospital in Rawalpindi. The pilot participants were excluded from the final analysis. Internal consistency reliability was assessed using Cronbach's alpha, yielding coefficients of 0.77 for the knowledge scale and 0.88 for the practice scale.

After obtaining institutional approvals, the principal investigator coordinated with nurse managers to recruit eligible participants. The objectives of the study were explained, written informed consent was obtained, and the questionnaires were distributed during duty hours at times convenient for the participants. Completed questionnaires were collected on the same day.

Data were analyzed using SPSS version 26. Descriptive statistics, including frequencies and percentages, were used to summarize participants' demographic characteristics as well as knowledge and practice levels. Before conducting the association analyses, the assumptions of the Chi-square test were assessed, including the independence of observations and the adequacy of expected cell frequencies. The Chi-square test was used to examine associations between categorical variables when its assumptions were met. When the assumptions were not satisfied because of small expected cell frequencies, Fisher's Exact Test

was used as appropriate. Statistical significance was set at $p < 0.05$. For statistically significant Chi-square tests involving variables with more than two categories, post-hoc pairwise comparisons with appropriate adjustment for multiple comparisons were considered to identify the specific groups contributing to the overall association.

Ethical approval was obtained from the Institutional Review Board and Ethics Committee of Shifa Tameer-e-Millat University (ethical code: 230-24). Administrative permission was obtained from all participating hospitals before data collection. Participation was voluntary, and written informed consent was obtained from all participants. To minimize any potential power imbalance between supervisors and subordinate nurses, participants were informed that their

decision to participate or decline participation would not affect their employment, performance evaluation, professional relationships, or access to workplace opportunities. Nurse managers assisted only with identifying eligible participants and were not involved in obtaining informed consent or collecting completed questionnaires. Participants were also informed that they could withdraw from the study at any time without any consequences. Confidentiality and anonymity were maintained throughout the study, and all collected data were securely stored with restricted access.

Results

A total of 118 nurses from four tertiary care public hospitals in Islamabad participated in the study, yielding a response rate of 100%. The demographic information is presented in Table 1.

Table 1: Demographic Characteristics of Participants

Demographic Variables	Category	Frequency	Percentage
Age (years)	20-24	10	8.5
	25-29	22	18.6
	30-34	38	32.2
	Above 35	48	40.7
Gender	Male	43	36.4
	Female	75	63.6
Education	Diploma	21	17.8
	Bachelors	95	80.5
	Masters	2	1.7
Past Experience	< 1 year	7	5.9
	1-5 years	43	36.4
	6-10 years	38	32.2
	> 10 years	30	25.5
Spinal cord injury training	Yes	19	16.1
	No	99	83.9
Frequency of caring for SCI Patients	Never	5	4.2
	Rarely	50	42.4
	Sometimes	56	47.5
	Always	7	5.9

Table 2 presents the participants' overall levels of knowledge and practice regarding SCI management. Most participants (70.3%) had good knowledge, followed by 28.0% with average

knowledge and 1.7% with poor knowledge. In terms of practice, 75.4% of participants were classified as below the competency threshold,

while 24.6% were classified as met the competency threshold.

Table 2: Level of Knowledge and Practice among Nurses

Variable	Category	Frequency	Percentage
Level of Knowledge categories	Poor	2	1.7
	Average	33	28.0
	Good	83	70.3
Overall Practice level Category	Below the competency threshold	89	75.4
	Met the competency threshold	29	24.6

Table 3 presents the association between demographic characteristics and participants' knowledge levels regarding SCI management. A statistically significant association was found between age and knowledge level ($\chi^2 = 20.35$, $p < 0.001$), with a small-to-moderate strength of association (Cramer's $V = 0.294$). Higher proportions of good knowledge were observed among participants in the older age groups, particularly those aged 30–34 years and above 35

years. No statistically significant association was found between knowledge level and gender ($\chi^2 = 2.18$, $p = 0.34$) or educational level ($\chi^2 = 3.43$, $p = 0.65$). Similarly, previous training in SCI care was not significantly associated with knowledge level ($\chi^2 = 1.09$, $p = 0.58$). The frequency of caring for patients with SCI was also not significantly associated with knowledge level ($\chi^2 = 4.73$, $p = 0.64$).

Table 3: Association Between Demographic Characteristics and Knowledge Levels

Variable	Category	Poor	Average	Good	Chi Square	Cramer's V	P
Age	20-24	0	7	3	20.35	0.294	< 0.001
	25-29	0	11	11			
	30-34	1	4	32			
	>35	1	10	37			
Gender	Male	0	15	28	2.18	-	0.34
	Female	2	18	55			
Education	Diploma	0	4	17	3.43	-	0.65
	Bachelor	2	29	64			
	Master	0	0	2			
Training spinal cord injury care	Yes	0	7	12	1.09	-	0.58
	No	2	26	71			
Frequency of caring for spinal cord injury patients	Never	0	3	2	4.73	-	0.64
	Rarely	1	12	37			
	Sometimes	1	16	39			

	Always	0	2	5			
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Table 4 presents the association between demographic characteristics and participants' practice levels regarding SCI management. No statistically significant association was found between practice level and age ($\chi^2 = 3.29$, $p = 0.35$), gender ($\chi^2 = 0.48$, $p = 0.51$), or professional experience ($\chi^2 = 4.10$, $p = 0.24$). Although participants with higher educational qualifications

showed a slightly higher proportion of met the competency threshold practice, the association between education and practice was not statistically significant ($\chi^2 = 5.31$, $p = 0.06$). Similarly, neither previous training in SCI care ($\chi^2 = 0.15$, $p = 1.00$) nor frequency of caring for patients with SCI ($\chi^2 = 4.97$, $p = 0.14$) was significantly associated with practice level.

Table 4: Association of Demographic variables with Practice

Variable	Category	Below the competency threshold	Met the competency threshold	Chi Square	P
Age	20-24	9	1	3.29	0.35
	25-29	19	3		
	30-34	26	11		
	>35	34	14		
Gender	Male	34	9	0.48	0.51
	Female	55	20		
Experience	<1 year	6	1	4.10	0.24
	1-5 years	32	11		
	6-10 years	32	6		
	>10 years	19	11		
Education	Diploma	15	6	5.31	0.06
	Bachelor	74	21		
	Master	0	2		
Training spinal cord injury care	Yes	15	4	0.15	1
	No	74	25		
Frequency of caring SCI patients	Never	5	0	4.97	0.14
	Rarely	33	17		
	Sometimes	46	10		
	Always	5	2		

Table 5 presents the association between participants' knowledge and practice levels regarding SCI management. Because the assumptions for the Pearson Chi-square test were not fully satisfied due to sparse cell counts, including expected frequencies of less than 1, the

Fisher-Freeman-Halton Exact Test was used. A statistically significant association was observed between knowledge and practice levels (exact $p < 0.001$), with a moderate-to-strong association (Cramer's $V = 0.411$). All participants with poor or average knowledge were classified as below the

competency threshold in practice, whereas all 29 participants who met the competency threshold in practice had good knowledge. Among participants

with good knowledge, 54 were classified as below the competency threshold and 29 as having met the competency threshold.

Table 5: Association Between Knowledge and Practice Levels Regarding SCI Management

Variable	Category	Below the competency threshold	Met the competency threshold	Statistical Test	Cramer's V	P
Knowledge and Practice association	Poor	2	0	19.897	0.411	<0.001
	Average	33	0			
	Good	54	29			

Discussion

The demographic analysis provides an important context for understanding the results of this study. The majority of participants were over 35 years old, females, held a bachelor's degree. This indicates a relatively experienced and educated workforce; however, there are still notable gaps in advanced education. Despite the dominance of bachelor's degree holders, only a small fraction (1.7%) possessed a master's degree, suggesting limited engagement with higher education in nursing in Pakistan. Prior studies have highlighted that higher educational attainment may enhance critical thinking and clinical decision-making, particularly in specialized areas such as SCI care (9). Therefore, the lack of advanced degrees among participants could partially explain the inadequate translation of knowledge into practice.

In terms of experience, 36.4% of the participants had 1-5 years of professional experience and 32.2% had 6-10 years which reflects the representation of relatively experienced nurses. However, this study found that years of experience did not correlate significantly with higher practical competency. This is a significant finding as it challenges the assumption that more experience necessarily leads to better clinical skills. This may indicate that without continuous professional development, practical skills may decrease, regardless of the number of years spent in the profession. This aligns with the literature suggesting that ongoing education and skills training are crucial for maintaining and enhancing clinical competency, particularly in specialized areas of SCI care (10).

The knowledge assessment showed positive results, with 70.3% of the participants demonstrating good knowledge of SCI care. This high level of theoretical understanding suggests that participants are generally well informed about key aspects of SCI, such as the structure and function of the vertebral column, and common causes and sites of injury. These findings are consistent with other studies in the field, which found that nurses often possess strong theoretical knowledge because of the emphasis placed on academic learning during nursing education (11). Despite the strong knowledge base, some critical areas have weaknesses. For instance, knowledge about complications experienced by SCI patients was low, with only 36.4% nurses answering correctly. This highlights a gap in understanding the full spectrum of SCI management, particularly in acute and critical care settings. Similarly, knowledge about urgent nursing interventions and post-stabilization procedures was lacking in a significant proportion of the participants. These findings suggest that while nurses may be knowledgeable about the basics of SCI, there are specific, nuanced areas in which their knowledge could be enhanced. This mirrors the findings of other studies that emphasize the need for targeted education focusing on complex, real-world scenarios that nurses face in clinical practice (12). The most significant finding of this study was the significant gap between knowledge and practice. While most participants demonstrated adequate theoretical knowledge, 75.4% were rated below the competency threshold in practical skills. This discrepancy between knowing and doing

highlights a critical issue for nursing education and professional practice. This reflects the well-documented challenge of translating classroom knowledge into clinical expertise, a problem that is particularly acute in specialized areas such as SCI care (13).

The specific practical tasks assessed in this study, such as palpating pulses, monitoring respiration, performing physical assessments, and detecting complications, are fundamental for SCI care. The fact that the majority of participants were below the competency threshold in these areas is concerning, as these skills are essential for ensuring patient safety and effective care. The findings suggest that traditional nursing education may not provide sufficient hands-on training in these areas, or that opportunities for practicing these skills in a clinical setting are limited. This supports the growing body of evidence advocating for more simulation-based learning and practical competency-based training in nursing curricula (14).

The study found a significant association between age and knowledge, with older participants demonstrating higher levels of theoretical knowledge. Although this finding may reflect differences in clinical exposure or accumulated experience, the cross-sectional design does not allow causal inferences. However, this did not translate into improved practical competency. Interestingly, gender and experience did not significantly influence knowledge or practices. This finding challenges the traditional assumption that more years in the profession automatically result in greater clinical expertise. In fact, this finding may indicate the need for ongoing professional development and continuous education; however, the cross-sectional design precludes conclusions about causal relationships. This aligns with research highlighting the importance of continuous learning and skill enhancement in the nursing profession (15).

Similarly, the lack of a significant association between gender and practical competency underscores that the challenges in translating knowledge into practice are widespread and are not confined to any particular demographic group. This suggests that barriers to effective skill

application are systemic and may relate to broader issues in nursing education and clinical training.

A key finding of this study was the strong association between knowledge and practice. Participants with good knowledge were significantly more likely to be met the competency threshold in practical skills. This underscores the importance of a strong theoretical foundation in clinical practice. However, this also highlights the need for structured training programs that emphasize the application of knowledge in practical settings. Evidence suggests that when nurses possess a deep understanding of the subject matter, they are better equipped to perform effectively in clinical scenarios.

The limitations of this study must be acknowledged. First, the study relied on self-reported measures of knowledge and practice, which may be subject to recall bias and social desirability bias. In particular, participants may have reported their clinical practices more favorably than their actual practices to present themselves as competent healthcare professionals. Therefore, the reported practice levels may not fully reflect actual clinical performance. Future studies should consider using direct observation, clinical audits, or objective competency assessments to complement self-reported measures. Second, the cross-sectional design provides information at a single point in time and does not allow for the assessment of changes in nurses' knowledge and practice over time or the evaluation of temporal relationships between the study variables. Therefore, longitudinal studies are needed to examine how knowledge and practice evolve over time, particularly following training or changes in clinical experience. Third, the study did not assess nurses' actual clinical performance through direct observation, clinical audits, or objective competency assessments. In addition, patient outcomes related to the quality of SCI care were not evaluated. Therefore, the self-reported practice findings may not fully reflect actual clinical performance or the impact of nurses' knowledge and practice on patient outcomes. Future studies should incorporate direct observation and objective performance measures and examine relevant patient outcomes to provide

a more comprehensive assessment of clinical practice. Forth, only bivariate analyses were performed to examine associations between the study variables. Multivariable analyses, such as logistic regression, were not conducted; therefore, the potential effects of confounding variables could not be assessed. Future studies should use multivariable statistical models to identify independent factors associated with nurses' knowledge and practice. Future researchers can investigate the factors that hinder the application of theoretical knowledge in practice, especially in high-stress settings like the ER. Future researchers can evaluate the impact of simulation-based learning and targeted training programs on enhancing nurses' knowledge and skills in SCI care through longitudinal interventional studies.

Conclusion

This study highlights a significant gap between nurses' theoretical knowledge and their practical competency in SCI care. While most nurses have a strong theoretical knowledge, many struggle to apply this knowledge in clinical settings, particularly in critical tasks related to patient assessment and care. These findings underscore the importance of enhancing practical training and continuous professional development to ensure that nurses provide met the competency threshold, high-quality care to patients with SCI. Addressing these gaps are crucial for improving patient outcomes and ensuring that nurses are fully equipped to manage SCI care complexities.

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