

# Predictive Determinants of Pediatric Nursing Practices for Children Undergoing Lumbar Puncture in Oncology-Hematology Units: A Descriptive Correlational Study

Redictive  
Determents Of  
Pediatric Nursing  
Practices  
During LP

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## ABSTRACT

**Objective:** To evaluate predictive determents of pediatric nursing practices during lumbar puncture in oncology-hematology units.

**Study Design:** Descriptive correlational study

**Place and Duration of Study:** This study was conducted at the Pediatric Oncology-Hematology Units from 8<sup>th</sup> October to 1<sup>st</sup> September 2024 to 31<sup>st</sup> December 2024.

**Methods:** 50 pediatric nurses were enrolled. The sampling includes pediatric nurse of both male and female, who works in the pediatric oncology and hematology units, and has one year of nursing experiences in these units. Conversely, the exclusion criteria comprised members who refused to participate in the study, and nurses who received more than 60% pre-test, and nurses who were included in the pilot study.

**Results:** 80% of nurses had poor nursing practices during lumbar puncture in oncology-hematology units with a total mean score of  $14.0 \pm 3.91$ . The results show a statistically significant correlation between predictive determents namely: years of nursing experiences ( $p=.028$ ); years of experiences in hematology and oncology nursing ( $p=.015$ ); and their nursing qualification ( $p=.049$ ) and pediatric nursing practices during lumbar puncture in oncology-hematology units.

**Conclusion:** Nurses' qualifications and their experiences in hematology nursing improve patient care during lumbar puncture. It emphasizes the necessities for ongoing nursingpractice development via planning strategies and suggests targeted pediatric nurses training programs to enhance their skills in pediatric patient outcomes.

**Key Words:** Children, Pediatric nursing practices, Lumbar puncture, Pediatric oncology, Hematology, Predictive determinants

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## INTRODUCTION

Lumbar Puncture (LP) refer to procedure by which a needle is inserted into the subarachnoid space of the lower back to remove cerebrospinal fluid (CSF) for diagnosis or treatment. This procedure is usually done between the third and fourth lumbar vertebrae or the fourth and fifth lumbar vertebrae (just below the end of the spinal cord).<sup>1,2</sup>

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The procedure is used to diagnose conditions such as bacterial meningitis, multiple sclerosis, and subarachnoid hemorrhage, and it can also be used for intracranial teletherapy pressure management.<sup>3</sup> In pediatric oncology, LP is a systematic step in chemotherapy for children with advanced leukemia. The process begins when the disease is in remission and continues throughout the intensive treatment period, requiring regular follow-up for one to three months.<sup>4,5</sup> Repeated LP can cause significant physical and mental distress to pediatric patients, requiring effective pain management strategies and a holistic care approach to manage pain and improve the child's experience.<sup>6</sup> Nursing staff play a key role in preparing a child for LP, ensuring proper positioning and adherence to aseptic procedures during the procedure. Correct positioning of the child is crucial as it determines the success of the procedure and reduces the risk of complications such as skull fractures after LP. Nursing staff are responsible for assessing the child's position and ensuring that the child is in constant motion to prevent neurological damage during the procedure.<sup>7</sup>

Inadequate nursing care during a LP can have a negative adverse effect on patient outcomes and the overall success of the procedure. Lack of specialized anatomical knowledge and technical skills can lead to complications such as headache after LP, the most common side effect, and even more serious complications such as traumatic puncture of the spine and spinal cord injuries.<sup>8</sup>

Several factors influence nurses' performance variations regarding LP procedures, including practitioner experience, nurses and patient characteristics, and institutional protocols. Practitioner training and experience are major contributors to this variability.<sup>9</sup> For example, Mayo Clinic implemented a quality improvement program to enable nurses to perform LP, which physicians traditionally performed. The program was supported by a comprehensive training program to ensure nurses had the skills necessary to safely and effectively expand their scope of practice and improve patient access to care; while some nurses have a strong interest in pain management and parenting options, others may lack the skills and confidence to provide optimal support, which may negatively impact the child's experience and surgical outcome.<sup>10,11</sup>

Despite the growing interest in supporting pediatric medical procedures, few studies have specifically examined how nurses influence the clinical performance of pediatric LP procedures in oncology and hematology settings, and the knowledge gap highlights the need to study whether and how these factors influence nursing behavior and quality of care. Although some studies have shown that factors such as age, gender, and education do not directly affect nurses' performance, it is also acknowledged that demographic factors can negatively impact nurses' performance if not controlled, leading to poorer and more negative performance outcomes.<sup>4,5</sup> Therefore, the purpose was to investigate the impact of nurses' demographic factors on their nursing practices during LP procedures in pediatric oncology-hematology units.

**METHODS**

This descriptive correlational study was conducted at Pediatric Oncology-Hematology Units from 8<sup>th</sup> October to 1<sup>st</sup> September 2024 to 31<sup>st</sup> December 2024 vide letter No. 62 dated 22-8-2024. A non-probability convenience sample randomly selected from 50 nurses. The sampling includes pediatric nurse of both male and female, who works in the pediatric oncology and hematology units, and has one year of nursing experiences in these units. Conversely, the exclusion criteria comprised members who refused to participate in the study, and nurses who received more than 60% pre-test, and nurses who were included in the pilot study.

Based on a Richard Geiger equivalent population proportion of 50%, error probability of 5%, confidence

of 95%, and the standard score corresponding to the level of confidence of 1.96, the minimum required sample size would be 49 nurses. To ensure adequate statistical power for detecting significant effects, a web-based sample size calculator was employed to determine the minimum required sample size. A margin of error of 5% was preferred, which means our results would be within five percentage points of the exact population value 95% of the time. Given an estimated population size of 55 and an assumed response distribution close to 50%, the calculations revealed that a minimum sample size of 49 indicates a higher degree of representation for the sample.

The questionnaire consisted of two main parts. The first part included demographic information about the participants. The second part contains two domains. The first domain is an observational checklist containing nine items that evaluate nurses' preparation of equipment needed for LP, and the second domain is an observational checklist containing twenty items that evaluate nursing practices during the LP procedure. These sections aimed to evaluate the performance of nursing staff in managing pediatric patients undergoing LP. To assess these practices, a three-point observation rating scale was employed across three different time intervals: Never (0-0.66), Sometimes (0.67-1.33), and Always (1.34-2).

All data analyses were performed utilizing SPSS-26. The RM-ANOVA test was employed to evaluate the relationship between nurses' practices regarding the care of children Undergoing LP levels and specific demographic characteristics. Statistical significance was deemed to exist when the p-value was less than 0.05.

**RESULTS**

**Table No. 1: Sociodemographic characteristics of pediatric nurses (N=50)**

Variable	No.	%
<b>Age</b>		
20 – 25	10	20.0
26 – 30	16	32.0
31 – 35	18	36.0
36 – 40	2	4.0
41 – 45	4	8.0
<b>Gender</b>		
Male	23	46.0
Female	27	54.0
<b>Marital status</b>		
Single	21	42.0
Married	27	54.0
Divorced	-	-
Widowed	2	4.0
<b>Nursing Qualification</b>		
Nursing high school	14	28.0
Diploma	14	28.0

Bachelor	22	44.0
<b>Years of experience in hematology and oncology</b>		
1 – 5	34	68.0
6 – 10	14	28.0
11 – 15	2	4.0
<b>Years of experience in nursing</b>		
1 – 5	14	28.0
6 – 10	24	48.0
11 – 15	6	12.0
16 – 20	6	12.0

Table 1 indicates that pediatric nurses aged between 31–35 years represented (36%) and was most common age group; and female nurses represented the majority, accounting for 54% of the sample. Also, 48% of the pediatric nurses had 6-10 years of nursing experiences. Specifically, the majority of them (68%) reported having 1-5 years of experience in hematology and oncology units. Additionally, 54% were married, and (48%) held a bachelor’s degree in Nursing.

Table 2 shows that pediatric nurses had poor level of nursing practice toward LP procedures and overall inadequate performance on children with total mean

score of 14.0±3.91. Majority of pediatric nurses (80%) exhibited poor procedural competency, whereas only 12% performed at a fair level and a mere 8% attained a good level of practice (Fig. 1).

Table 3 showed that a statistically significant correlation between predictive deterrents namely: years of nursing experiences (p=.028); years of experiences in hematology and oncology nursing (p=.015); and their nursing qualification (p value=.049) and pediatric nursing practices during lumbar puncture in oncology-hematology units. However, the statistical analysis indicates no significant correlation between pediatric nurses’ practices and their age, sex, and marital status.

**Table No. 2: The level of nurses' practices on lumbar puncture procedure**

Levels of practices	No.	%	Mean±SD
Poor	20	80.0	14.0±3.91
Fair	3	12.0	
Good	2	8.0	

Poor= 0 -8, Fair= 8.1-16, Good= 16.1-24

**Table No. 3: Correlation between levels of nurses’ practices and their predictive deterrents**

Variable		Mean	Standard deviation	Relationship
Age	20 – 25	14.80	3.271	$r^s = .343$ P-value= .093
	26 – 30	16.00	3.109	
	31 – 35	12.70	3.302	
	36 – 40	10.00	.000	
	41 – 45	14.50	2.121	
Gender	Male	14.09	3.177	$r^* = .034$ P-value= .873
	Female	14.07	3.583	
Years of experience in nursing	1 – 5	14.29	2.870	$r^s = .230$ P-value= .028*
	6 – 10	15.18	3.737	
	11 – 15	11.50	2.380	
	16 – 20	13.00	3.000	
Years of experience in hematology and oncology	1 – 5	10.00	.000	$r^s = .268$ P-value= .015*
	6 – 10	13.57	4.036	
	11 – 15	14.53	3.044	
Marital status	Single	14.20	2.394	$r^s = .122$ P-value= .562
	Married	14.07	4.066	
	Widowed	13.00	.000	
Nursing Qualification	Nursing high school	12.57	2.760	$r^s = .358$ P-value= .049*
	Diploma	13.43	1.813	
	Bachelor	15.45	4.034	

$r^s$  = Spearman Correlation coefficient,  $r^*$  = Biserial correlation coefficient, P-value= 0.05.

## DISCUSSION

The current study findings shows that 36% of pediatric nurses were aged 31 to 35. This aligns with earlier research indicating that the main age group of nurses in a study on vascular access devices ranged from 33 to 37

years old.<sup>12</sup> Another study found that age distribution across nursing specialties was consistent, with most participants falling between 29 and 39 years old.<sup>13</sup> Additionally, the majority of participants were female nurses and this align with previous study found that 63.7% of nurses were females. Another study context

indicates a female majority, with 59% and 65% of the participants in the other studies being female.<sup>14-16</sup> Furthermore, the current study found that less than half of pediatric nurses had between 6-10 years of nursing experience. Recent research showed that the largest number of midwife nurses had 5-9 years of experience.<sup>17</sup> Most studies emphasize early experiences, neglecting mid-career well-being, which relates to resignation rates and strategies.<sup>18</sup>

Regarding years of experience in hematology-oncology units, most of pediatric nurses had 1-5 years, and this similar to previous study found that 72% of participants had 1 to 5 years of hematology-oncology experience, while fewer than half of the nurses in CCUs had similar experience.<sup>16,19</sup> Results also indicates that more than half of nurses were married, which aligning with a recent study of neonatal intensive care nurses with 52% of them were married. Another study found that 78% of the nurses were married, a higher percentage than in the analysis but still useful for comparison.<sup>20,21</sup> Another study showed that 44% of nurses held a bachelor's degree in nursing. The results of the current study align with the findings of another study, 41.4%.<sup>22</sup> This shows that more nursing staff were bachelor's degree graduates or have upgraded their nursing education. In contrast, another study reported that most nurses held a diploma in nursing.<sup>23</sup>

The findings of current study based on observation indicates that pediatric nurses were exhibited insufficient practice levels regarding nursing procedures while assisting children undergoing LP, signifying overall inadequate nursing performance. Further analysis illustrated that the majority of nurses demonstrated poor procedural competency, while only few of them performed at a fair level, and only less than ten percentages attained a good level of practice. These results supported by a study revealed significant deficiencies in pediatric nurses' procedures for children with meningitis, which improved following the intervention of the educational training unit.<sup>7,24</sup> Furthermore, a study conducted in Iraq revealed inadequate patient safety during LP, indicating broader nursing practice issues.<sup>25</sup>

The current study findings indicate significant correlation between nurses' practices and their years of experience in nursing. This result agrees with the previous study of hemodialysis care, which presented a strong positive correlation between nurses' practices and their years of nursing experiences in hospitals.<sup>26</sup> In contrast, another study found no significant link between nurses' years of experience and their practices.<sup>27</sup> Collectively, these studies suggest that years of nursing experience positively influence nurses' practices. Moreover, the current study results demonstrated a highly significant correlation between nurses' practices and their years of experiences in oncology-hematology units. This finding agrees with the study on nurses' practices when caring for poisoned children, which also showed a significant connection between nursing practices and their experiences in the

emergency department.<sup>28</sup> However, this result contrasts with another study that examined nurses' practices regarding chemotherapy-induced peripheral neuropathy, which reported no significant relationship between nurses' experiences and their practices in the hematology center.<sup>29</sup>

Another significant correlation was found in the current study between pediatric nurses' practices and their nursing qualifications. This finding aligns with a study conducted in Iraq among oncology nurses that reported a significant correlation between nurses' qualifications and their clinical performance.<sup>30</sup> In contrast, another study found no significant relationship between nurses' education levels and practices in specific burn care.<sup>25</sup>

## CONCLUSION

The significant relationship between nurses' experience and education level, socio-demographics, and the quality of nursing practices for children during LP were noted. Also, age, gender, and marital status had no significant impact on nurses' practice. Experienced nurses demonstrated advanced practices, emphasizing the importance of continuous education in nursing training, educational intervention programs, and procedural care for pediatric oncology-hematology.

### Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Jamal Abdunnasser Ahmed, Zaid W. Ajil
Drafting or Revising Critically:	Jamal Abdunnasser Ahmed, Zaid W. Ajil
Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

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