Journal of Biosciences and Medicines, 2024, 12, 510-537
https://www.scirp.org/journal/jbm
ISSN Online: 2327-509X
ISSN Print: 2327-5081

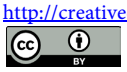
Pediatric Pain Management Practice among Nursing Students at Gateway to Better Living and Monze College of Nursing in Zambia

Royd Apuleni[1], Patricia Katowa Mukwato[2], Febiano Phiri[3], Laura Lubinda[3]

[1]Gateway to Better Living Nursing School, Monze, Zambia
[2]School of Nursing Sciences, The University of Zambia (UNZA), Lusaka, Zambia
[3]Department of Nursing Sciences, South Valley University, Mazabuka, Zambia
Email: roydapuleni@gmail.com

How to cite this paper: Apuleni, R., Mukwato, P.K., Phiri, F. and Lubinda, L. (2024) Pediatric Pain Management Practice among Nursing Students at Gateway to Better Living and Monze College of Nursing in Zambia. *Journal of Biosciences and Medicines*, **12**, 510-537.
https://doi.org/10.4236/jbm.2024.1212039

Received: July 12, 2024
Accepted: December 24, 2024
Published: December 27, 2024



Abstract

Introduction: Pain management in pediatric patients is a critical aspect of healthcare delivery, yet it remains a significant challenge globally, particularly in low- and middle-income countries like Zambia. **Aim:** To evaluate the practices of pediatric pain management among nursing students at Gateway to Better Living and Monze College of Nursing in Zambia, identifying associated factors and areas for improvement. **Design and Methods:** A quantitative analytical cross-sectional design was used. A sample of 197 students was selected using a stratified proportional simple random method from the two schools. Data were collected through a self-administered questionnaire using validated scales extracted from the Pediatric Nurse's Knowledge and Attitude Survey. The collected data were entered into SPSS version 27 for analysis of descriptive and inferential statistics. The Chi-square, and binary logistic regression tests were employed to statistically analyse the data. A confidence interval of 95% with a significance level of 5% was set. **Results:** Analysis of pediatric pain management practices among 197 nursing students revealed a mixed picture. While adherence to institutional policies and supportive measures was high, areas for improvement were identified in the utilization of pain assessment tools and reassessment post-medication. Attitudes were generally favorable, with 62.4% exhibiting positive attitudes. However, knowledge levels varied, with 63.5% deemed to have adequate knowledge. Chi-square tests indicated significant associations between practices and knowledge levels ($p < 0.001$) and year of study ($p = 0.047$). Logistic regression highlighted the significant impact of knowledge ($p < 0.001$) and attitude ($p = 0.017$) on practice, emphasizing the need for targeted interventions to improve pediatric pain management practices among nursing students. **Conclusion and Recommen-**

dations: The study underscores the importance of addressing gaps in pediatric pain management among nursing students in Zambia. Recommendations include curriculum revisions, interdisciplinary training, and policy advocacy to bridge these gaps. Targeted interventions are essential to enhance pediatric pain management practices and ensure holistic care for pediatric patients.

Keywords

Paediatric Pain Management, Nursing Education, Nursing Students, Knowledge-Practice Gap, Clinical Practice

1. Introduction

The International Association for the Study of Pain revised the definition of pain in 2020 to "An unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage" [1]. Acute and chronic pain are common in children seeking medical attention but are frequently misdiagnosed and mismanaged [2]. Recent studies indicate that 12% to 84% of hospitalized children experience pain, with 27% to 40% experiencing moderate-to-severe pain [3]-[7]. Pain in children can result from trauma, injury, or medical interventions.

Effective pain management in children depends on accurate assessment. A child's self-report is the most reliable measure of pain, but assessing pain in children is difficult due to developmental factors and differing responses to pain assessment tools compared to adults [8]. Behavioral and physical indicators, alongside self-report tools, are used to assess pain in children [9]. Nurses must accurately assess and manage pain, understanding a child's communicative capacity to avoid misdiagnosis and mismanagement [10]-[12]. Studies have shown that nurses globally have poor knowledge and attitudes towards basic pain assessment and management principles [13]-[17]. Nursing students similarly demonstrate poor knowledge and attitudes towards pain assessment and management [18]-[20]. Lack of knowledge about pain and evaluation tools is a significant barrier to effective pain management in children [14] [17]. Mismanaged pain in infants can have long-term consequences, influencing sensory, affective, and behavioral responses [21].

Nursing students undergo comprehensive training, including clinical placements in pediatric units, to prepare for their careers. However, literature indicates unsatisfactory levels of pediatric pain knowledge and attitudes among nursing students [22]. Self-efficacy, essential for effective pain management, is enhanced through comprehensive pain education programs [23]. Despite its importance, limited information exists on the impact of pediatric pain education on nursing students' knowledge, attitudes, and self-efficacy [14] [17]. This study investigated the practices of pediatric pain management among nursing students in Monze,

Zambia, identifying gaps between classroom learning and practical application. Addressing these gaps can improve future nurses' practices and enhance pediatric pain management and assessment, previously reported as suboptimal [14] [17].

2. Materials and Methods

2.1. Study Design, Time Frame, Setting and Participants

The research study utilized an analytical cross-sectional study design to investigate the relationship between nursing students' practices of pediatric pain assessment and management and several independent variables. The study participants were 197 second- and third-year nursing students from Gateway to Better Living Nursing School and Monze College of Nursing in the Monze district of Zambia's Southern Province.

The sample size of 197 nursing students was determined from a total population (universe) of 320 using Taro Yamane's formula with a 95% confidence level and a ±0.05 margin of error. Initially calculated to be 180, this number was adjusted for a 10% non-response rate, resulting in a total of 198, with one incomplete questionnaire yielding a final sample of 197. This sample was proportionally allocated between Monze Nursing School (n = 96) and Gateway to Better Living Nursing School (n = 101) using a stratified proportional simple sampling technique. Specific numbers were selected from each school's 2nd and 3rd-year student intakes: Gateway to Better Living January 2022 intake (2nd year: 43), Gateway to Better Living July 2022 intake (2nd year: 77, 3rd year: 24), Monze Nursing School 2nd year (37), and 3rd year (62).

The research was conducted at these two nursing schools due to identified gaps in pain assessment and management in pediatric patients by student nurses from these institutions. The study spanned from March 2023 to May 2024, covering the entire research process from the initial development of the research proposal to the final stages of report writing and dissemination.

The inclusion criteria for the study were all second- and final-year students at the two nursing schools who consented to participate. Exclusion criteria included nursing students who had never completed a clinical placement in a pediatric unit or were unable to participate due to illness or other justifiable reasons. Participants were chosen using a stratified proportional simple sampling technique, ensuring that students from each intake had an equal chance of participating in the study. A sampling frame was created using class registers, with random sampling performed using Excel to generate the sample.

2.2. Data Collection Procedure

Ethical approval was obtained from the University of Zambia Biomedical Research Ethics Committee (UNZABREC) under reference number 4726-2023, and a certificate for researcher recognition was obtained from the National Health Research Authority (NHRA) under reference number NHRA-R-1048/03/11/23. The purpose of the study was explained to each participant before giving out the questionnaire,

guided by voluntary participation, anonymity, and assured confidentiality of the collected data. The questionnaire was accompanied by a printed sheet that included a brief description of the study as well as a consent request. Those who agreed to take part in the study signed a consent form and completed a questionnaire.

2.3. Data Collection Tool

A research questionnaire was used to assess nursing students' practices regarding pediatric pain management, utilizing an adapted version of the Pediatric Nurses' Knowledge, Attitudes, Self-Efficacy, and Practice Survey Regarding Pain (PNKAS) questionnaire. The adaptation process included incorporating validated questions on knowledge and attitude from previous studies by Tagela *et al*. (47) in Ethiopia, and by other scholars (22, 14, 19, and 24) which provided evidence of face, content, and consensual validity. The reliability of the PNKAS questionnaire was established in a study by Wumi *et al*., (16)), which reported a Kappa coefficient of 0.78 and a reliability coefficient of 0.93 (93%). To further ensure validity and reliability, a pilot study was conducted with 20 nursing students from Mazabuka School of Nursing Sciences, representing 10 percent of the total sample size. The pilot study confirmed the questionnaire's quality and content, requiring no modifications and thus validating it for the actual data collection phase.

2.4. Data Analysis

Before collecting the questionnaires from the respondents, the collected data was thoroughly checked for completeness. Data analysis was performed using SPSS software version 26. Descriptive statistics were initially used to observe the basic characteristics of the variables. All responses and outcome variables were coded and converted into binary outcomes, and frequencies and percentages were calculated. For continuous variables, means and standard deviations were reported if they met the assumption of normal distribution. Categorical variables were presented using frequencies and percentages.

The relationship between nursing student practices of pediatric pain assessment and management and independent factors was examined using the Chi-square independence test and Fisher's exact test if the assumptions of the Chi-square test were not met. A significance level of 5% was used, corresponding to a 95% confidence level. A p-value less than 0.05 was considered statistically significant.

Binary logistic regression was applied for both bi-variate and multivariate analyses to assess the association between each variable category and the dependent variable. Continuous and categorical independent variables were included to evaluate the odds ratios. A bi-variate analysis was conducted with a significance level of 0.05 and a 95% confidence interval. In the multivariate logistic regression model, practices of pediatric pain assessment and management, knowledge about pediatric pain assessment and management, and attitude towards pediatric pain assessment and management were added as covariates. To determine the most accurate predictors of pediatric pain assessment and management practices, an

investigator-led stepwise regression was performed, considering the R^2-value. Only socio-demographic characteristics with a 10% effect on the R^2-value were included in the final regression model, ensuring control for confounding variables.

3. Results

The study's findings are effectively communicated through the use of frequency tables, charts, and contingency tables. These visual representations are organized in accordance with the order of questions and sections outlined in the standardized interview schedule developed for the study. The purpose of this presentation style is to offer a clear and concise summary of the results, enhancing the overall comprehensibility of the study's findings.The structured arrangement of visual aids aligns with the logical flow of the interview schedule, enabling readers to easily follow and interpret the presented information. Frequency tables provide a systematic breakdown of responses, charts offer visual insights into patterns or trends, and contingency tables contribute to a nuanced understanding of relationships between variables.

3.1. Socio-Demographic Characteristics (n = 197)

Table 1 shows the distribution of socio-demographic characteristics among the study participants, assessed to evaluate their potential impact on paediatric pain assessment and management. The variables taken into consideration in this analysis encompass gender, and year of study. This table provides a systematic breakdown of these socio-demographic factors, offering valuable insights into their distribution within the participant sample.

Table 1. Participants' socio-demographic characteristics (n = 197).

Variables	Frequency (n)	Percentage %
Gender		
Male	50	25.4%
Female	147	74.6%
Year of study		
2nd year	79	40.1%
3rd year	118	59.9%
Total	197	100%
Age (Years)		
Minimum	20	
Maximum	38	
Mean	24.37	
Standard deviation	4.062	

Table 1 shows that most participants were female (74.6%), with males comprising 25.4%. Regarding academic progression, 59.9% were third-year nursing students, and 40.1% were in their second year. The ages ranged from 20 to 38 years, with a mean age of 24.37 years and a standard deviation of 4.062.

3.2. Practices of Paediatrics Pain Assessment and Management (n = 197)

Practice was evaluated by considering various questions, as outlined in Table 2 attached to the study. The scores obtained from these assessments were subsequently aggregated and categorized into two groups: favorable and unfavorable practices. This categorization is presented in Figure 1.

Table 2. Questions under the variable practice and responses (n = 197).

Questions	Frequency (n)	Percentage %
Use of policy in hospital for paediatrics procedural sedation		
No	6	3.0%
Yes	191	97.0%
Use of pain medications/sedation during painful procedure		
No	195	99.0%
Yes	2	1.0%
Observation of side effects of pain medication after giving it to children		
No	189	95.9%
Yes	8	4.1%
Placing of children in comfortable positions to help relieve pain		
No	1	0.5%
Yes	196	99.5%
Use of self-reporting pain scale to assess children's pain		
No	170	86.3%
Yes	27	13.7%
Use of behavioral pain scale to assess children's pain		
No	182	92.4%
Yes	15	7.6%
Use of several techniques to distract children from pain		
No	2	1.0%
Yes	195	99.0%

Continued

Reassessing children's pain after given pain medication to evaluate the effectiveness of pain medication		
No	191	97.4%
Yes	5	2.6%
Administration of additional pain medication to relieve pain when needed		
No	22	10.8%
Yes	174	89.2%
Talking to children with a soft voice to comfort them when they are in pain		
No	8	3.6%
Yes	189	96.4%
Asking and helping children to support the painful areas when moving or coughing		
No	24	11.7%
Yes	173	88.3%
Total	**197**	**100%**

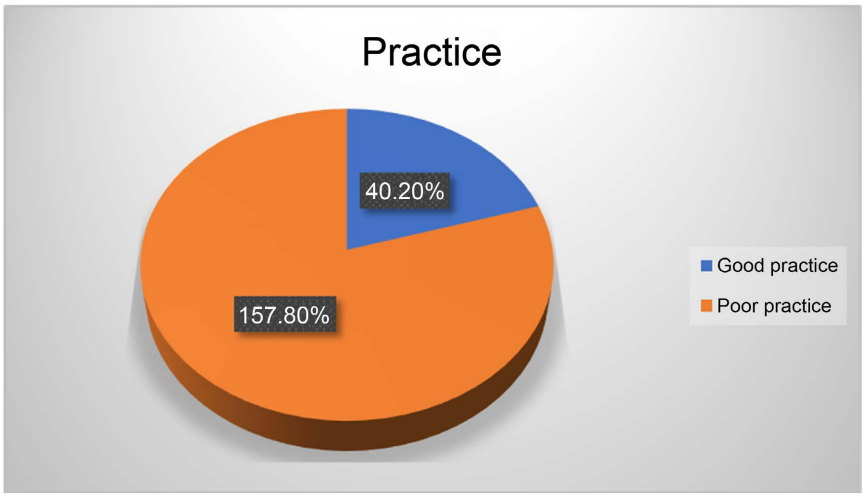


Figure 1. Practice categories (n = 197).

As shown in the figure, a significant majority of the participants, comprising 80% (157), were rated to have poor practice, while only 20% (40) were rated to have good practice.

3.3. Knowledge on Paediatric Pain Assessment and Management (n = 197)

The level of knowledge was evaluated through a series of 10 questions, with participants providing responses in the form of Yes or No. Subsequently, the collected

data was categorized into two groups: adequate and inadequate knowledge regarding paediatric pain assessment and management. The detailed results are presented in Table 3, offering a comprehensive breakdown of participants' responses to each question. Furthermore, Figure 2 visually represents the distribution of knowledge levels, illustrating the proportion of participants categorized as having adequate or inadequate knowledge.

Table 3. Questions on knowledge and their responses with frequencies and percentages (n = 197).

Variables	Frequency (n)	Percentage %
Narcotics on a regular schedule is preferred over 'PRN'* schedule for continuous pain		
No	38	19.6%
Yes	156	80.4%
Accurate judge of the intensity of the patient's pain is the patient		
No	31	15.9%
Yes	164	84.1%
Distraction by use of music or relaxation decrease feeling of pain		
No	14	7.2%
Yes	181	92.8%
Increasing narcotic analgesic requirement are signs, patient is becoming addicted		
No	26	13.2%
Yes	171	86.8%
Severe chronic pain often need higher dosages of pain medications than acute pain		
No	35	17.8%
Yes	162	82.2%
Narcotics for pediatric patients can cause respiratory depression		
No	16	8.1%
Yes	181	91.9%
Analgesics for chronic joint pain cases as needed		
No	22	11.2%
Yes	175	88.8%
Analgesic for cancer pain patients as needed		
No	28	14.2%
Yes	169	85.8%

Continued

Reports of patient/family, narcotic causing euphoria, should be given a lower dose of the analgesic		
No	33	16.8%
Yes	163	83.2%
Do children need better attention for managing their pain?		
No	3	1.5%
Yes	194	98.5%
Total	**197**	**100%**

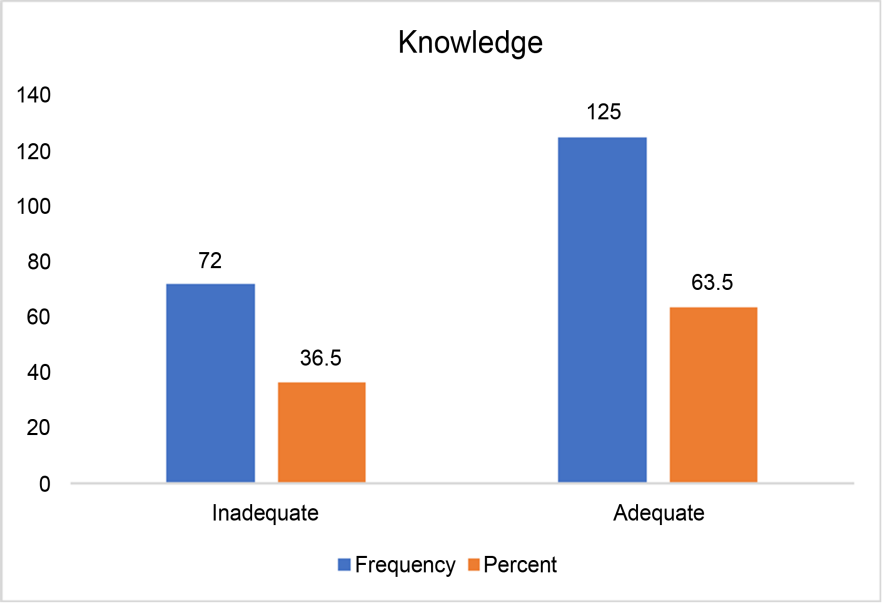


Figure 2. Knowledge categories (n = 197).

The data above indicates that most of the participants, 63.5% (125), were discovered to have adequate knowledge and 36.5% (72) had inadequate knowledge.

3.4. Attitude Towards Paediatrics Pain Assessment and Management (n = 197)

Attitude was evaluated through the questions presented in **Table 4**, and two categories were created based on the aggregated responses to these questions, as illustrated in **Figure 3**.

Figure 3 indicates that majority of the participants 62.4% (123) had a favourable attitude towards paediatrics pain assessment and management while 37.6% (74) were found to have unfavourable attitude towards paediatrics pain assessment and management.

Table 4. (a) Questions on the attitude towards paediatrics pain assessment and management for the first nine questions (n = 197); (b) Questions on the attitude towards paediatrics pain assessment and management for the last eight set of questions (n = 197).

(a)		
Variables	**Frequency (n)**	**Percentage %**
Neonates and children experience pain equal to that experienced by adults		
Disagree	9	4.6%
Not sure	15	7.6%
Agree	173	87.8%
Parents should not be present during painful procedures		
Disagree	19	9.6%
Not sure	22	11.2%
Agree	156	79.2%
Pain management and pain relief are of priority in neonates treatment		
Disagree	14	7.1%
Not sure	25	12.7%
Agree	158	80.2%
Neonates have the right to appropriate assessment and management of their pain		
Disagree	5	2.5%
Not sure	4	2.0%
Agree	188	95.4%
The most accurate judge of the intensity of the neonate's pain is the her/his primary nurse		
Disagree	0	0.0%
Not sure	5	2.5%
Agree	192	97.5%
Full treatment of pain is a humanitarian issue		
Disagree	2	1.0%
Not sure	17	8.7%
Agree	176	90.3%
To better assess neonate pain, the nurse can discuss with her/his parents		
Disagree	39	20.0%
Not sure	17	8.7%
Agree	139	71.3%

Continued

Assessment and control of neonate pain lead to improved his/her parents satisfaction		
Disagree	0	0.0%
Not sure	11	5.6%
Agree	186	94.4%
Failure to assess and manage the neonate's pain affects his body and mind in the long term		
Disagree	4	2.0%
Not sure	2	1.0%
Agree	190	96.9%

(b)

Variables	Frequency (n)	Percentage %
The nurse's physical and mental fatigue can affect neonate pain relief		
Disagree	11	5.6%
Not sure	4	2.0%
Agree	181	92.3%
Like other vital signs, pain scores should be documented		
Disagree	9	4.6%
Not sure	16	8.2%
Agree	171	87.2%
To ensure patient's comfort and pain relief is one of the most important tasks of nurses		
Disagree	42	21.4%
Not sure	24	12.2%
Agree	130	66.3%
Communicating with and educating neonate's parents play an effective role in relieving pain		
Disagree	10	5.1%
Not sure	12	6.1%
Agree	175	88.8%
Available tools for measurement of pain are the best for determining pain severity in neonate		
Disagree	39	19.8%
Not sure	22	11.2%
Agree	136	69.0%

Continued

When the necessary procedures have been done for the patient, the persistence of pain does not cause problems		
Disagree	6	3.0%
Not sure	11	5.6%
Agree	180	91.4%
Using pain assessment tools for determining neonate's pain lead to an appropriate method of pain relief		
Disagree	67	34.0%
Not sure	26	13.2%
Agree	104	52.8%
Measurement and control of neonate's pain can affect the healing process and reduces the hospital stay		
Disagree	8	4.1%
Not sure	6	3.0%
Agree	183	92.9%
Total	**197**	**100%**

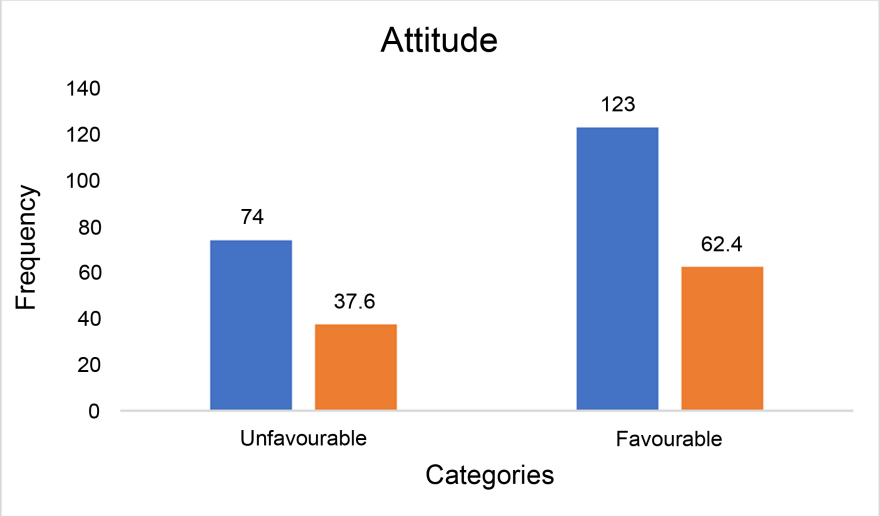


Figure 3. Attitude variable categories (n = 197).

3.5. Chi-Square test results of Association between Variables (n = 197)

Table 5 presents the results of the chi-square test, examining the associations between practices related to paediatric pain assessment and management and various independent variables, including gender, year of study, knowledge, and

attitude. The chi-square test is employed to assess the statistical significance of relationships between categorical variables.

Table 5. Chi square results results (n = 197).

	Practice				
Variable	**Good practice**		**Poor practice**		
Gender	**Frequency**	**Percentage**	**Frequency**	**Percentage**	**p-values**
Male	12	24.0%	38	76.0%	0.452
Female	28	19.0%	119	81.0%	
Year of study					
2nd year	21	26.6%	58	73.4%	0.073
3rd year	19	16.1%	99	83.9%	
Attitude					
Unfavourable	18	24.3%	56	75.7%	0.277
Favourable	22	17.9%	101	82.1%	
Knowledge					
Inadequate	28	38.9%	44	61.1%	0.001
Adequate	12	9.6%	113	90.4%	

Table 5 shows that knowledge and year of study are statistically significant in relation to practices of pediatric pain assessment and management, with p-values of 0.001 and 0.047, respectively. Other variables did not show a significant relationship, having p-values greater than 0.05. This indicates that participants' knowledge levels and their year of study significantly influence their practices, while other factors do not.

3.6. Binary Logistic Regression Results of Factors Associated Practice of Pain Assessment and Management (n = 197)

Data analysis was conducted to assess factors associated with good practice, encompassing age, gender, year of study, marital status, knowledge, and attitude. The results are presented in the tabular diagram below.

Table 6 indicates that both attitude and knowledge are significantly associated with good practices in pediatric pain assessment and management. The year of study also shows a significant association, while gender and age do not demonstrate statistically significant relationships.

Table 6. Logistic regression results of factors associated practice of pain assessment and management (n = 197).

Variables	AOR	95% C.I. for EXP (B)		p-value
		Lower	Upper	
Attitude				
Favourable	1			
Unfavourable	0.815	0.366	1.816	0.017
Knowledge				
Adequate	1			
Inadequate	0.179	0.080	0.404	<0.001
Gender				
Male	1			
Female	0.435	0.177	1.071	0.070
Year of study				
3rd year	1			
2nd year	0.541	0.243	1.205	0.013
Age	1.110	0.982	1.254	0.094

Table 6 indicates that both attitude and knowledge are significantly associated with good practices in pediatric pain assessment and management. The year of study also shows a significant association, while gender and age do not demonstrate statistically significant relationships.

4. Discussion

4.1. Introduction

The discussion in this Section is on the demographic characteristics, knowledge, attitude and practice of the nursing students from GBL and Monze Mission Schools of Nursing in the assessment and management of pediatric pain. The outline of the findings to be discussed in this chapter, will consist the study variables in comparison to the existing literature.

4.2. Socio-Demographic Characteristics

The study cohort was predominantly female, comprising 74.6% of the participants. This gender disparity may be influenced by societal expectations steering women towards nursing professions or nurturing inclinations [26]. While not reaching statistical significance, it was observed that women had a 56.5% lower likelihood (AOR = 0.435; 95% CI, 0.177 - 1.071) than men to engage in good practices.

The identification of participants in their second year demonstrating a 45.9%

reduction in the odds (AOR = 0.541; 95% CI, 0.243 - 1.205) of exhibiting good practice compared to their third-year counterparts emphasizes the significant impact of academic progression on the development of practical skills in pediatric pain assessment and management. Advanced students typically possess a more extensive theoretical foundation, having traversed a broader range of nursing topics throughout their academic journey [27]. This advanced theoretical understanding likely contributes to a more comprehensive grasp of pediatric care concepts, including the effective utilization of pain assessment tools. In contrast, second-year students may find themselves in the midst of transitioning from theoretical learning to practical application, resulting in a more theoretical than experiential understanding of pediatric pain assessment tools. This dynamic may influence their confidence and proficiency in the effective use of these tools in clinical scenarios.

Additionally, the minimum age was 20 years, the maximum age was 38 years which represents a young cohort and is expected of nursing students as highlighted by [28] that many individuals choose to pursue nursing as a career early in their adult lives. These findings are similar to that of Aydın and Bektaş [29] Mediani *et al*. [25] in Turkey and Indonesia respectively.

4.3. Discussion of Each Variable

4.3.1. Practice

The overwhelming majority of nursing students in the present study, comprising 80%, were assessed as having inadequate proficiency in utilizing pediatric pain assessment tools, while a mere 20% demonstrated proficient practice. This striking imbalance raises inquiries regarding the effectiveness of existing educational methodologies and the integration of pediatric pain management principles into nursing education programs. This concern is substantiated by Small [30], who identified the ineffectiveness of nurse education as a root cause for incompetence in child pain assessment and management.

Similarly, the competence of nurses regularly employing pain assessment scales in their practice was found to be lacking, as indicated by studies conducted by Popowicz *et al*. [31] in Poland and Collados-Gómez *et al*., [32] in Spain. Nearly half of the study participants exhibited a lack of confidence in identifying pain indications using such scales. Additionally, the authors stated that only close to 40% of nurses reported the utilization of instruments facilitating pain intensity measurement and pain perception assessment in intensive care unit patients. Echoing these findings, a study in Rwanda by Uwimana *et al*., [33] revealed sub-optimal practices among student nurses in managing pediatric pain, attributing the challenges raised by participants to the difficulty in translating theoretical knowledge into practical application. It was also highlighted that challenges faced by nurse educators and preceptors in implementing national guidelines and procedures on pain management in the clinical realm may impact students' practices negatively. Collectively, the findings show that a widespread challenge of inadequate competence and confidence among nurses in effectively utilizing pain assessment tools and translating

theoretical knowledge into practical application exists.

In contrast, studies conducted by Miftah *et al*. [34] in Ethiopia and Wuni *et al*., [16] in Ghana provided contrasting results, indicating that a significant proportion of nurses in their respective studies demonstrated commendable practices in pediatric pain management. The Ethiopian study reported a 55.8% rate of good practices among participating nurses, while the Ghanaian study classified the level of practice regarding pediatric pain management as generally good. These positive outcomes were attributed to the substantial subject-matter expertise possessed by many nurses, with higher practice levels associated with increased education and experience which could be the reason for the discrepancy with the current study's findings. This entails that enhanced education and experience in pediatric pain management lead to better practices among nurses, suggesting that increased training and subject-matter expertise can significantly improve the quality of care provided.

Addressing inefficient pain treatment practices can be effectively achieved through pain education, as emphasized by a Ghanaian study conducted by Kusi *et al*. [35]. However, despite its critical importance, pain education, especially for undergraduate students, is still inadequately covered in nursing courses, as highlighted by Smeland *et al*. [36]. This highlights the need for a comprehensive and targeted approach to pain education within nursing curricula to bridge the observed gaps in pediatric pain management practices among nursing students. Significant gaps in the Zambian nursing education system exist and this deficiency points to a need for substantial improvements in how pediatric pain management is taught and implemented within nursing programs. The findings suggest that current educational methodologies may not effectively translate theoretical knowledge into practical skills, and there may be a lack of focus on hands-on training with pain assessment tools. To address these issues, the Zambian teaching system should incorporate more rigorous and practical training on pediatric pain assessment, ensure that educational programs align closely with clinical practices, and provide adequate resources and support for both students and educators to enhance competency in this critical area.

4.3.2. Knowledge

A majority of the participants in the study, accounting for 63.5%, were found to possess adequate knowledge, while 36.5% exhibited inadequate knowledge. These results, although slightly higher than the findings of Jira *et al*. [37] in Ethiopia where 51.7% of nurses demonstrated adequate knowledge in pediatric pain assessment and management, are slightly lower than those reported in a study conducted in Saudi Arabia by Samarkandi [38] where 69.5% exhibited adequate knowledge. Similarly, Aydın and Bektaş [29] noted moderate levels of knowledge among intern pediatric nurse students, though it fell short of being deemed satisfactory due to the parameters set in the study. Consistent findings were also observed in the work of Kusi *et al*. [35] in Ghana, indicating that while most nursing students and nurses had adequate knowledge regarding pain management in children, it was considered insufficient relative to an 80% cutoff mark in the study.

Notably, nursing students enrolled in Bachelor's degree programs displayed significantly higher pediatric pain knowledge compared to their counterparts pursuing Diploma programs, a difference attributed to variations in the content and duration of training. Hence, while many nursing students and nurses possess adequate knowledge of pediatric pain management, there are notable gaps that need to be addressed through enhanced and more comprehensive educational programs that cover both theoretical knowledge and practical skills effectively.

On the contrary, Mediani *et al*. [25] in Indonesia identified weaknesses in the knowledge of nursing profession program students concerning pain assessment and pharmacology treatment. Their understanding of the three dimensions of pain assessment self-report, behavioral observations, and physiological measures was deemed inadequate, along with a deficiency in general knowledge related to child pain assessment. This deficiency was possibly linked to infrequent use of pain measurement tools among the students. In another study by Kusi *et al*. [35], final year nursing students were found to have overall insufficient knowledge in children's pain management. While topics such as pharmacodynamics, pain assessment, preventive analgesia advantages, personalized and multifaceted nature of pain experience, and pain evaluation demonstrated good pediatric pain knowledge, understanding lagged in areas like pain perceptions, opioid drug usage, effective painkillers, pain physiology, and non-pharmacological pain management techniques. Factors affecting knowledge acquisition, as suggested by Aydın and Bektaş [29], included the limited time allocated to pediatric pain management in the nursing undergraduate curriculum. Similarly, Şimşek and Gözen [17], in Turkey, reported insufficient knowledge among nursing students and graduate nurses regarding the implementation of non-pharmacological interventions, indicating a gap in understanding interventions considered as non-pharmacological. These findings entail that despite some students and professionals demonstrating good knowledge in certain aspects of pediatric pain management, notable gaps remain, especially in the application of pain assessment tools and non-pharmacological interventions.

Adequate knowledge empowers nursing students to accurately assess and manage pediatric pain, ensuring the application of best practices in clinical settings. The findings suggests the need for curriculum enhancements, particularly in Diploma programs, to ensure comprehensive coverage of pediatric pain management among nursing students. The observed gaps in understanding pain assessment and management indicate a requirement for increased practical exposure and a balanced emphasis on both pharmacological and non-pharmacological approaches. Addressing these areas through curriculum reform and enhanced clinical training can improve the overall preparedness of nursing students in Zambia, ensuring they are well-equipped to manage pediatric pain effectively.

4.3.3. Attitude

A significant portion of the participants, comprising 62.4%, demonstrated a positive outlook toward pediatric pain assessment and management, while 37.6%

exhibited a less favorable attitude. Consistent with these findings, studies by Carrol *et al*. [39] in The United Kingdom and Mukoka, Olivier, and Ravat [40] in South Africa also identified favorable attitudes toward pain management among student nurses. Additionally, several prior investigations, including those by Kusi *et al*. [35] and Mukoka, Olivier, and Ravat [40], indicated an enhancement in healthcare professional students' attitudes from their initial to final academic years. Recognizing the importance of a positive attitude in providing patient-centered care, especially in the sensitive realm of pediatric pain management, where compassion, understanding, and proactive measures are vital, holds paramount significance. Positive clinical outcomes are often correlated with care that is delivered with empathy and centers around the needs of the patient. Encouraging medical students to cultivate empathy and compassion serves as a precursor not only to their mental well-being and emotional stability but also to the delivery of patient-centered treatment, as highlighted by Menezes, Guraya, and Guraya [41]. Furthermore, Oliver *et al*. [42] highlights the importance of staff nurses acting as role models for the student nurses as the way they approach pediatric patients, communicate with them, and collaborate with interdisciplinary teams sets a standard and contributes significantly to the development of favorable attitudes in pediatric pain management among the nursing students. Collectively, these findings highlight that fostering a positive attitude towards pediatric pain management is crucial and that enhancing empathy and compassion through role modeling and supportive educational practices can significantly improve the effectiveness of pain management in clinical settings.

On the contrary, findings from Mediani *et al*. [25] in Indonesia unveiled a contrasting perspective. Specifically, 52% of the students demonstrated inappropriate attitudes toward pain management. Notably, a considerable majority of these students (64.3%) exhibited unfavorable attitudes toward pain assessment, more than half (53.1%) toward pain management, and a significant proportion (64.3%) toward procedures inducing pain. The attitudes of final year nursing students concerning pediatric pain assessment and management were found to deviate significantly from the optimal standards. Agyemang *et al*. [24] further emphasized that nursing students were inadequately prepared during their training to effectively assess and manage pain in pediatric patients. This inadequacy in preparation during training was identified as a significant factor contributing to the unfavorable attitudes observed in pediatric pain assessment and management among the nursing students. The disparities in attitudes noted between the current study and the aforementioned studies could be attributed to variations in the characteristics of the study populations, encompassing factors such as geographical location, cultural backgrounds, and educational systems.

Favorable attitudes are often associated with a higher level of commitment to applying learned knowledge and a greater tendency to adopt evidence-based practices, thereby improving patient outcomes. Unfavorable attitudes, on the other hand, can lead to reluctance in following best practices, potentially resulting in

inadequate pain management and poorer patient outcomes. It is essential to enhance clinical training environments in Zambia and ensure consistent positive reinforcement of best practices as this will culminate into favourable attitudes of students nurses towards pain management. This emphasizes the need for enhancing the nursing educational curriculum to better address pediatric pain management and reinforce positive attitudes among nursing students. This could involve integrating more comprehensive training, including empathy and patient-centered care approaches, and providing robust clinical experiences. By doing so, Zambia can foster more favorable attitudes among nursing students, leading to improved pediatric pain management and better overall patient care.

4.4. Associations between Variables

4.4.1. Relationship between Knowledge and Practice

The correlation between knowledge and practice in the realm of pediatric pain assessment and management yielded a statistically significant outcome, as evidenced by a p-value of <0.001. This discovery highlights the pivotal role that knowledge plays in influencing behaviors related to the assessment and management of pediatric pain. Participants with inadequate knowledge exhibited a substantial 82.1% lower likelihood (Odds Ratio = 0.179, 95% CI = 0.080 - 0.404) of engaging in good practices compared to their counterparts with sufficient knowledge. This robust association emphasizes the fundamental premise that a strong knowledge foundation is a critical determinant of effective and evidence-based practices within the clinical setting. This finding aligns with the results obtained by Carlsen *et al*. [43] in Sweden, who observed a parallel relationship where individuals possessing knowledge about pain assessment demonstrated a higher frequency of pain instrument utilization. In their study, 74% of nurses reported employing pain evaluation scales multiple times during a work shift.

In the healthcare domain, knowledge stands as a foundational pillar of competence, as corroborated by Kwangmuang *et al*. [44]. Similarly, Agyemang's [24] study in Ghana established a statistically significant connection between the knowledge and practice of student nurses concerning pediatric pain assessment and management, with those having more knowledge being more likely to practice pediatric pain management efficiently. Notably, there was no significant mean difference between nursing college students and university-trained students in their cohort, as both adhered to identical curricula and completed their studies in the same time frame (3 years).

Understanding the principles and best practices of pediatric pain assessment is deemed indispensable for nursing students to navigate the intricacies of caring for pediatric patients. Inadequate knowledge, as suggested by Pouralizadeh *et al*. [45], may lead to uncertainties, misconceptions, or suboptimal decision-making in recognizing, assessing, and managing pain in pediatric populations. The study posits that the knowledge-practice gap in nursing is a formidable challenge, as possessing good knowledge does not always translate into enhanced practical skills,

as evidenced by the lack of a significant relationship between overall scores of knowledge and practice.

Graf *et al*. [46] highlight the importance of practical training opportunities in addressing this gap, asserting that limited exposure to clinical settings and hands-on experiences during nursing education contributes to the observed disparity. Moreover, Graf *et al*. [46] emphasize that a mismatch in assessment methods may lead to situations where nursing students excel in theoretical exams but encounter difficulties in practical settings. Conversely, Cirik, Çiftçioğlu, and Efe [47] in Turkey found that nurses exhibited a low level of general knowledge about pain management in children, coupled with poor performance in the assessment, measurement, and relief of pain. These collective findings underscore the interconnected nature of knowledge and practice, emphasizing that a pediatric nurse lacking sufficient education in pain management is likely to exhibit inadequate skills in assessing and managing pain, as supported by the work of Peirce *et al*. [48]. In the context of Zambia, nursing education incorporates a comprehensive curriculum designed to equip students with the necessary skills and knowledge for effective clinical practice. However, the gap identified in pain management practices may stem from variability in the quality of practical training and resource availability across different institutions. Both GBL and Monze College of Nursing follow a standardized curriculum, yet the application of theoretical knowledge into practice might be hindered by limited clinical exposure and inadequate supervision during clinical rotations. Addressing these educational and practical gaps is crucial for improving the competency of nursing students in pediatric pain management, thereby enhancing the overall quality of pediatric care in Zambia

4.4.2. Relationship between Attitude and Practice

The significant finding, which indicates that participants with an unfavorable attitude had an 18.5% lower likelihood (Odds Ratio = 0.815, 95% CI 0.366 –1.816) of engaging in good practices compared to those with a favorable attitude, emphasizes the crucial role of attitudes in influencing behaviors, particularly in the realm of pediatric pain assessment practices. Tagele, Berhe, and Lema's [49] findings in Ethiopia also support the correlation between nurses' attitudes and their practices in pain management, revealing that a majority of nurses (89.3%) with a favorable attitude demonstrated enhanced practices. Similarly, a systematic review by Cousins *et al*. [50] observed a relationship where nursing students with inappropriate attitudes experienced challenges in the practice of pain management over time. Lulie, Berhanu, and Kassa [51] identified factors such as good knowledge about pediatric pain management, increased working experience, and in-service training, which were positively associated with attitudes toward pain management. This observed association aligns with psychological theories emphasizing the connection between beliefs, attitudes, and behaviors, as highlighted by Bechler, Tormala, and Rucker [52]. In healthcare, a positive attitude often precedes the adoption and implementation of related behaviors. Participants with favorable attitudes are likely more inclined to integrate effective pediatric pain assessment

practices into their clinical routines.

Attitudes wield significant influence over decision-making and behavior. A positive attitude toward pediatric pain assessment shapes how nursing students approach their responsibilities in clinical settings. It motivates them to pursue continuous learning, seek skill development opportunities, and actively apply evidence-based practices in pediatric pain assessment and management.

Conversely, unfavorable attitudes can pose barriers, impeding the adoption of recommended practices. Negative attitudes may stem from factors like misconceptions, lack of awareness about the importance of pain assessment, or perceptions of time constraints in busy clinical environments, as noted by Mala, Forster, and Kain [53]. This shows that while educational programs contribute to pain knowledge, the clinical environment also plays a pivotal role in shaping attitudes and applying this knowledge among nursing students. In Zambia, nursing education emphasizes both theoretical knowledge and practical skills, yet the development of positive attitudes towards pediatric pain management among nursing students is heavily influenced by the quality of clinical training and mentorship they receive. Despite the comprehensive pain management training included in the curriculum at institutions like GBL and Monze College of Nursing, the effectiveness of these teachings in practice can be compromised by the clinical environment. Factors such as limited exposure to a variety of clinical cases, insufficient hands-on experiences, and the diverse attitudes of clinical instructors significantly impact the attitudes and subsequent practices of nursing students. To foster favorable attitudes and enhance the practical application of pediatric pain management, it is crucial to improve the clinical training environment. This can be achieved by providing more diverse and frequent clinical exposure, increasing opportunities for hands-on practice, and ensuring that clinical instructors consistently reinforce best practices. Additionally, incorporating simulation-based training and regular workshops on pediatric pain management can help bridge the gap between theory and practice and further. By prioritizing these enhancements, Zambia can better prepare nursing students to effectively manage pediatric pain, ultimately improving the quality of care provided to young patients.

5. Conclusion

This study delved into the demographic characteristics, knowledge, attitude, and practice of nursing students from GBL and Monze Schools of Nursing in pediatric pain assessment and management. There is a significant gap between the knowledge and attitudes of nursing students in pediatric pain assessment and their actual clinical practice. Despite having adequate knowledge and favorable attitudes, the poor practices observed suggest a disconnect between theoretical understanding and practical application. It therefore implies that a focus on factors influencing knowledge-attitude-practice gaps is crucial for nursing research. Administrators must invest in specialized training and mentor-ship, while nursing practice requires quality improvement initiatives and interdisciplinary collaboration. Nursing

education needs a shift towards practical skill development. Recommendations encompass curriculum revisions, collaborative training, policy advocacy, and longitudinal research.

6. Study Limitations

1) An analytical cross-sectional design was used in the investigation which makes it difficult to investigate how knowledge, attitudes, and practices evolve over time. The robustness of the findings would have been increased by a longitudinal approach, which would have provided a more nuanced picture by recording the growth of attitudes and practices throughout the students' academic experience.

2) The study was conducted in only two schools in the Southern Province of Zambia, the findings may not fully represent the diversity of nursing education programs and student populations in the entire country. Future research could involve a more extensive and diverse sample of nursing schools from various provinces in Zambia. However, the researcher included both second-year and third-year students in the study as a strategic decision that can help mitigate the limitation of generalizability. By incorporating students from different academic years, it allows for a broader spectrum perspectives within the selected nursing schools.

3) The study relied on self reported data which may be prone to response bias either intentionally or unintentionally due to social desirability, fear of judgment, or a desire to present oneself in a positive light. However, the researcher ensured that participant's responses are confidential and anonymous in order to reduce the fear of judgment and encourage more truthful answers.

Acknowledgements

First of all, let me thank God almighty for his unending love, care and blessing especially during the period of this study. The present study has been completed under the expert guidance of Professor Patricia Katowa Mukwato, the Dean in the School of Nursing Sciences at the University of Zambia. I express my sincere gratitude to her for the valuable guidance, constant support and encouragement given from the inception to the completion of the study. This study could not have been successful without her good advice.I also want to thank all the contributors, my fellow students, friends and family for the support and encouragements. Special thanks are extended to the management and students at Gateway to Better Living and Monze Mission Schools of Nursing for granting permission to conduct the study and for participation of the students in the study.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

[1] Raja, S.N., Carr, D.B., Cohen, M., Finnerup, N.B., Flor, H., Gibson, S., *et al.* (2020) The Revised International Association for the Study of Pain Definition of Pain:

Concepts, Challenges, and Compromises. *Pain*, **161**, 1976-1982. https://doi.org/10.1097/j.pain.0000000000001939

[2] Hurley-Wallace, A., Wood, C., Franck, L.S., Howard, R.F. and Liossi, C. (2019) Paediatric Pain Education for Health Care Professionals. *Pain Reports*, **4**, e701. https://doi.org/10.1097/pr9.0000000000000701

[3] Miao, N., Wang, T., Chang, F., Lee, C., Chi, H., Huang, L., *et al*. (2019) Prevalence and Association of Pain Experiences, Medication Literacy, and Use of Medication among Children and Adolescents in Taiwan Region. *Journal of Pediatric Nursing*, **46**, e64-e71. https://doi.org/10.1016/j.pedn.2019.03.002

[4] Nieswand, V., Richter, M., Berner, R., von der Hagen, M., Klimova, A., Roeder, I., *et al*. (2019) The Prevalence of Headache in German Pupils of Different Ages and School Types. *Cephalalgia*, **39**, 1030-1040. https://doi.org/10.1177/0333102419837156

[5] Onchong'a, C., Nyandiko, W. and Nabakwe, E. (2021) Prevalence of Pain and Adequacy of Analgesic Prescription among Children Admitted at Trans Nzoia County Referral Hospital, Kenya. *East African Medical Journal*, **98**, 3580-3589. https://www.ajol.info/index.php/eamj/article/view/207468

[6] Míguez-Navarro, M.C., Escobar-Castellanos, M., Guerrero-Márquez, G., Rivas-García, A. and Pascual-García, P. (2022) Pain Prevalence among Children Visiting Pediatric Emergency Departments. *Pediatric Emergency Care*, **38**, 228-234. https://doi.org/10.1097/pec.0000000000002580

[7] Quintero-Castellanos, J.M., Hernández, Á. and Parra, T. (2021) Pain Prevalence in Infants and Preschool Children in a Colombian Hospital. *Colombian Journal of Anesthesiology*, **50**. https://doi.org/10.5554/22562087.e1000

[8] Freund, D. and Bolick, B.N. (2019) CE: Assessing a Child's Pain. *AJN, American Journal of Nursing*, **119**, 34-41. https://doi.org/10.1097/01.naj.0000557888.65961.c6

[9] Twycross, A. (2017) Guidelines, Strategies and Tools for Pain Assessment in Children. Nursing Times. https://www.nursingtimes.net/clinical-archive/pain-management/guidelines-strategies-and-tools-for-pain-assessment-in-children-18-04-2017/

[10] Correia, M.D.L. and Duran, E.C.M. (2017) Conceptual and Operational Definitions of the Components of the Nursing Diagnosis Acute Pain (00132). *Revista Latino-Americana de Enfermagem*, **25**, e2973. https://doi.org/10.1590/1518-8345.2330.2973

[11] Royal College of Nursing (2009) The Recognition and Assessment of Acute Pain in Children. Clinical Practice Guidelines.

[12] Laures, E., LaFond, C., Hanrahan, K., Pierce, N., Min, H. and McCarthy, A.M. (2019) Pain Assessment Practices in the Pediatric Intensive Care Unit. *Journal of Pediatric Nursing*, **48**, 55-62. https://doi.org/10.1016/j.pedn.2019.07.005

[13] Kholowa, E.T., Chimwaza, A.F., Majamanda, M.D. and Maluwa, A.O. (2017) Nurses' Knowledge and Attitudes Towards Pain Management in Children Admitted in the Paediatric Department of Queen Elizabeth Central Hospital, Blantyre, Malawi. *Journal of Biosciences and Medicines*, **5**, 46-59. https://doi.org/10.4236/jbm.2017.56005

[14] Alotaibi, J.S. (2019) Pediatric Pain Management: Knowledge and Attitudes among Nursing Students in Saudi Arabia (A Cross-Sectional Study). *International Journal of Advanced and Applied Sciences*, **6**, 64-70. https://doi.org/10.21833/ijaas.2019.09.010

[15] Peng, N., Lao, A.H., Chen, C., Lee, M., Chiang, L., Chang, Y., *et al*. (2020) Knowledge and Attitudes of Pediatric Clinicians Regarding Pediatric Pain Management. *Journal for Specialists in Pediatric Nursing*, **25**, e12302. https://doi.org/10.1111/jspn.12302

[16] Adams, S.M., Varaei, S. and Jalalinia, F. (2020) Nurses' Knowledge and Attitude

towards Postoperative Pain Management in Ghana. *Pain Research and Management*, **2020**, Article ID: 4893707. https://doi.org/10.1155/2020/4893707

[17] Şimşek, A. and Gözen, D. (2021) A Study on Pediatric Nurses' Pain Management Knowledge and Practices in Turkey. *Trends in Pediatrics*, **2**, 159-164. https://doi.org/10.4274/tp.galenos.2021.35229

[18] Ung, A., Salamonson, Y., Hu, W. and Gallego, G. (2015) Assessing Knowledge, Perceptions and Attitudes to Pain Management among Medical and Nursing Students: A Review of the Literature. *British Journal of Pain*, **10**, 8-21. https://doi.org/10.1177/2049463715583142

[19] Hroch, J., VanDenKerkhof, E.G., Sawhney, M., Sears, N. and Gedcke-Kerr, L. (2019) Knowledge and Attitudes about Pain Management among Canadian Nursing Students. *Pain Management Nursing*, **20**, 382-389. https://doi.org/10.1016/j.pmn.2018.12.005

[20] Liljedahl, M., Boman, L.E., Fält, C.P. and Bolander Laksov, K. (2015) What Students Really Learn: Contrasting Medical and Nursing Students' Experiences of the Clinical Learning Environment. *Advances in Health Sciences Education*, **20**, 765-779. https://doi.org/10.1007/s10459-014-9564-y

[21] Manocha, S. and Taneja, N. (2016) Assessment of Paediatric Pain: A Critical Review. *Journal of Basic and Clinical Physiology and Pharmacology*, **27**, 323-331. https://doi.org/10.1515/jbcpp-2015-0041

[22] Gadallah, M.A., Hassan, A.M. and Shargawy, A.A. (2017) Pediatric Pain Management among Nursing Students: Knowledge and Attitudes. *Journal of Nursing Education and Practice*, **10**, 111-118.

[23] Manworren, R.C. (2001) Development and Testing of the Pediatric Nurses' Knowledge and Attitudes Survey regarding Pain., Pediatric Nursing. https://www.scholars.northwestern.edu/en/publications/development-and-testing-of-the-pediatric-nurses-knowledge-and-att

[24] Agyemang, J.B., Kusi-Amponsah Diji, A., Adongo Afaya, R., Boakye, H., Oduro, E., Amagyei, A. and Kyei-Dompim, J. (2020) Nursing and Midwifery Students' Knowledge and Attitudes Regarding Children's Pain. *Journal of Research Development in Nursing and Midwifery*, **17**, 7-10.

[25] Mediani, H.S., Windiany, H. and Maryam, N.N.A. (2020) Undergraduate Nursing Students' Knowledge and Attitude Regarding Management of Children's Pain. https://www.researchgate.net/publication/342302603_Undergraduate_Nursing_Students%27_Knowledge_and_Attitude_Regarding_Management_of_Children%27s_Pain

[26] Ayaz, B., Hall, L.M., Martmianakis, M.A., Muntaner, C., Burnside, H. and Nelson, S. (2022) Women's Participation in the Health Workforce in Fragile and Conflict-Affected Countries: Application of a Gender Analysis Framework.

[27] Butts, J.B. and Rich, K.L. (2021) Philosophies and Theories for Advanced Nursing Practice. Jones & Bartlett Learning.

[28] Wakefield, M., Williams, D.R. and Le Menestrel, S. (2021) The Future of Nursing 2020-2030: Charting a Path to Achieve Health Equity. National Academy of Sciences.

[29] Aydın, B. and Bektaş, M. (2020) Pediatric Pain Management Knowledge Levels of Intern Nursing Students. *Pain Management Nursing*, **21**, 290-298. https://doi.org/10.1016/j.pmn.2019.06.012

[30] Small, G. (2021) The Knowledge, Attitudes and Barriers amongst Health Professionals Regarding Acute and Chronic Pain Management in Children: An Integrative Review. Ph.D. Thesis, Auckland University of Technology.

[31] Popowicz, H., Mędrzycka-Dąbrowska, W., Kwiecień-Jaguś, K. and Kamedulska, A. (2021) Knowledge and Practices in Neonatal Pain Management of Nurses Employed in Hospitals with Different Levels of Referral—Multicenter Study. *Healthcare*, **9**, Article 48. https://doi.org/10.3390/healthcare9010048

[32] Collados-Gómez, L., Camacho-Vicente, V., González-Villalba, M., Sanz-Prades, G. and Bellón-Vaquerizo, B. (2018) Neonatal Nurses' Perceptions of Pain Management. *Enfermería Intensiva*, **29**, 41-47. https://doi.org/10.1016/j.enfie.2017.08.001

[33] Uwimana, P., Mukamana, D., Babenko-Mould, Y. and Adejumo, O. (2022) Exploring Factors Affecting the Facilitation of Nursing Students to Learn Paediatric Pain Management in Rwanda: A Descriptive Qualitative Study. *PLOS ONE*, **17**, e0263609. https://doi.org/10.1371/journal.pone.0263609

[34] Miftah, R., Tilahun, W., Fantahun, A., Adulkadir, S. and Gebrekirstos, K. (2017) Knowledge and Factors Associated with Pain Management for Hospitalized Children among Nurses Working in Public Hospitals in Mekelle City, North Ethiopia: Cross Sectional Study. *BMC Research Notes*, **10**, Article No. 122. https://doi.org/10.1186/s13104-017-2446-7

[35] Kusi Amponsah, A., Kyei-Dompim, J., Kyei, E.F., Oduro, E., Afaya, R.A. and Ahoto, C.K. (2020) Final Year Nursing Students' Knowledge and Attitudes regarding Children's Pain. *Pain Research and Management*, **2020**, Article ID: 7283473. https://doi.org/10.1155/2020/7283473

[36] Smeland, A.H., Twycross, A., Lundeberg, S. and Rustøen, T. (2018) Nurses' Knowledge, Attitudes and Clinical Practice in Pediatric Postoperative Pain Management. *Pain Management Nursing*, **19**, 585-598. https://doi.org/10.1016/j.pmn.2018.04.006

[37] Jira, L., Weyessa, N., Mulatu, S. and Alemayehu, A. (2020) Knowledge and Attitude Towards Non-Pharmacological Pain Management and Associated Factors among Nurses Working in Benishangul Gumuz Regional State Hospitals in Western Ethiopia, 2018. *Journal of Pain Research*, **13**, 2917-2927. https://doi.org/10.2147/jpr.s265544

[38] Samarkandi, O. (2018) Knowledge and Attitudes of Nurses toward Pain Management. *Saudi Journal of Anaesthesia*, **12**, 220-226. https://doi.org/10.4103/sja.sja_587_17

[39] Carroll, S.P., Augeard, N., Tennant, J. and Seenan, C. (2020) How Do the Attitudes, Confidence, Knowledge and Understanding Differ in Pre-Registration Healthcare Students Towards Treating People with Chronic Pain: An Observational, Cross-Sectional Study. *European Journal of Physiotherapy*, **23**, 311-318. https://doi.org/10.1080/21679169.2020.1746830

[40] Mukoka, G., Olivier, B. and Ravat, S. (2019) Level of Knowledge, Attitudes and Beliefs towards Patients with Chronic Low Back Pain among Final Year School of Therapeutic Sciences Students at the University of the Witwatersrand—A Cross-Sectional Study. *South African Journal of Physiotherapy*, **75**, a683. https://doi.org/10.4102/sajp.v75i1.683

[41] Menezes, P., Guraya, S.Y. and Guraya, S.S. (2021) A Systematic Review of Educational Interventions and Their Impact on Empathy and Compassion of Undergraduate Medical Students. *Frontiers in Medicine*, **8**, Article 758377. https://doi.org/10.3389/fmed.2021.758377

[42] Oliver, T.L., Shenkman, R., Diewald, L.K. and Dowdell, E.B. (2020) Nursing Students' Perspectives on Observed Weight Bias in Healthcare Settings: A Qualitative Study. *Nursing Forum*, **56**, 58-65. https://doi.org/10.1111/nuf.12522

[43] Carlsen Misic, M., Andersen, R.D., Strand, S., Eriksson, M. and Olsson, E. (2021)

Nurses' Perception, Knowledge, and Use of Neonatal Pain Assessment. *Paediatric and Neonatal Pain*, **3**, 59-65. https://doi.org/10.1002/pne2.12050

[44] Kwangmuang, P., Jarutkamolpong, S., Sangboonraung, W. and Daungtod, S. (2021) The Development of Learning Innovation to Enhance Higher Order Thinking Skills for Students in Thailand Junior High Schools. *Heliyon*, **7**, e07309. https://doi.org/10.1016/j.heliyon.2021.e07309

[45] Pouralizadeh, M., Ghasemi Ghoreishi, M., Niknami, M. and Kazemnejad-Leili, E. (2021) The Relationship between Nurses' Knowledge and Perceived Practice Based on Clinical Practice Guidelines of Pediatrics' Pain in Guilan University of Medical Sciences. *International Journal of Africa Nursing Sciences*, **14**, Article ID: 100292. https://doi.org/10.1016/j.ijans.2021.100292

[46] Graf, A.C., Jacob, E., Twigg, D. and Nattabi, B. (2020) Contemporary Nursing Graduates' Transition to Practice: A Critical Review of Transition Models. *Journal of Clinical Nursing*, **29**, 3097-3107. https://doi.org/10.1111/jocn.15234

[47] Apaydın Cırık, V., Çiftçioğlu, Ş. and Efe, E. (2019) Knowledge, Practice and Beliefs of Pediatric Nurses about Pain. *The Journal of Pediatric Research*, **6**, 220-227. https://doi.org/10.4274/jpr.galenos.2019.48344

[48] Peirce, D., Corkish, V., Lane, M. and Wilson, S. (2018) Nurses' Knowledge and Attitudes Regarding Pediatric Pain Management in Western Australia. *Pain Management Nursing*, **19**, 707-717. https://doi.org/10.1016/j.pmn.2018.03.002

[49] Tagele, T.D., Berhe, Y.W. and Lema, G.F. (2023) Knowledge and Attitude Towards Pediatric Pain Management among Nurses at Ethiopian Tertiary Hospitals; a Multi-Center Study. *BMC Nursing*, **22**, Article No. 84. https://doi.org/10.1186/s12912-023-01234-8

[50] Cousins, M., Lane-Krebs, K., Matthews, J. and Johnston-Devin, C. (2022) Student Nurses' Pain Knowledge and Attitudes towards Pain Management over the Last 20 Years: A Systematic Review. *Nurse Education Today*, **108**, Article ID: 105169. https://doi.org/10.1016/j.nedt.2021.105169

[51] Lulie, E., Berhanu, M. and Kassa, S.F. (2022) Knowledge, Attitude, and Associated Factors toward Pediatric Pain Management among Nurses at the University of Gondar Comprehensive Specialized Hospital: A Cross-Sectional Study. *SAGE Open Medicine*, **10**. https://doi.org/10.1177/20503121221075163

[52] Bechler, C.J., Tormala, Z.L. and Rucker, D.D. (2021) The Attitude-Behavior Relationship Revisited. *Psychological Science*, **32**, 1285-1297. https://doi.org/10.1177/0956797621995206

[53] Mala, O., Forster, E.M. and Kain, V.J. (2023) Thai Nurses' and Midwives' Perceptions regarding Barriers, Facilitators, and Competence in Neonatal Pain Management. *Advances in Neonatal Care*, **24**, E26-E38. https://doi.org/10.1097/anc.0000000000001128

Appendix

Questionnaire

Section 1: Socio-demographic characteristics.

1) Age……..

2) Year of study

a) 2nd year

b) 3rd year

3) Marital status

a) Married

b) Unmarried

Section 2: Practices of paediatric pain assessment and management.

1) Use of policy in hospital for paediatric procedural sedation. Yes/No

2) Use of pain medications/sedation during painful procedure. Yes/No

3) Observation of side effects of pain medication after giving it to children. Yes/No

4) Placing of children in comfortable positions to help relieve pain. Yes/No

5) Use of self-reporting pain scale to assess children's pain. Yes/No

6) Use of behavioral pain scale to assess children's pain. Yes/No

7) Use of several techniques to distract children from pain. Yes/No

8) Reassessing children's pain after given pain medication to evaluate the effectiveness of pain medication. Yes/No

9) Administration of additional pain medication to relieve pain when needed. Yes/No

10) Talking to children with a soft voice to comfort them when they are in pain. Yes/No

11) Asking and helping children to support the painful areas when moving or coughing. Yes/No

Section 3: Knowledge about paediatric pain assessment and management.

1) Narcotics on a regular schedule is preferred over 'PRN'* schedule for continuous pain. Yes/No

2) Accurate judge of the intensity of the patient's pain is the patient. Yes/No

3) Distraction by use of music or relaxation decrease feeling of pain. Yes/No

4) Increasing narcotic analgesic requirement are signs, patient is becoming addicted. Yes/No

5) Severe chronic pain often need higher dosages of pain medications than acute pain. Yes/No

6) Narcotics for pediatric patients can cause respiratory depression. Yes/No

7) Analgesics for chronic joint pain cases as needed. Yes/No

8) Analgesic for cancer pain patients as needed. Yes/No

9) Reports of patient/family, narcotic causing euphoria, should be given a lower dose of the analgesic. Yes/No

10) Do children need better attention for managing their pain? Yes/No

Section 4: Attitude towards paediatric pain assessment and management.

Items	Agree	Not sure	Disagree
Neonates and children experience pain equal to that experienced by adults			
Parents should not be present during painful procedures			
Pain management and pain relief are of priority in neonates treatment			
Neonates have the right to appropriate assessment and management of their pain			
The most accurate judge of the intensity of the neonate's pain is the her/his primary nurse			
Full treatment of pain is a humanitarian issue			
To better assess neonate pain, the nurse can discuss with her/his parents			
Assessment and control of neonate pain lead to improved his/her parents satisfaction			
Failure to assess and manage the neonate's pain affects his body and mind in the long term			
The nurse's physical and mental fatigue can affect neonate pain relief			
Like other vital signs, pain scores should be documented			
To ensure patient's comfort and pain relief is one of the most important tasks of nurses			
Communicating with and educating neonate's parents play an effective role in relieving pain			
Available tools for measurement of pain are the best for determining pain severity in neonate			
When the necessary procedures have been done for the patient, the persistence of pain does not cause problems			
Using pain assessment tools for determining neonate's pain lead to an appropriate method of pain relief			
Measurement and control of neonate's pain can affect the healing process and reduces the hospital stay			
Evaluation and measurement of neonate's pain should be considered as one of the vital signs when examining the neonate			
Comparable stimuli in different people produce the same intensity of pain			
Measurement and control of pain in neonate leads to improved quality of neonate's life			