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ASSESSMENT OF DENTAL STUDENTS' KNOWLEDGE AND CLINICAL DECISION-MAKING IN THE MANAGEMENT OF CARIOUS LESIONS IN PAEDIATRIC PATIENTS: A CROSS-SECTIONAL STUDY

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ABSTRACT

Objective: This study aims to assess dental students' knowledge and clinical decision-making abilities regarding the management of carious lesions in paediatric patients, highlighting gaps and areas for curriculum improvement.

Methods: A cross-sectional survey was conducted among final-year dental students and interns across five dental schools in Khyber Pakhtunkhwa, Pakistan. A validated questionnaire assessed knowledge of caries pathology, preventive strategies, and clinical decision-making scenarios. Data were analysed using descriptive statistics and inferential tests.

Results: A total of 312 students participated (response rate: 87%). While 81.4% correctly identified the etiology of early childhood caries, only 53.2% selected appropriate minimally invasive treatments for incipient lesions. Decision-making scores were significantly higher among students who had received additional paediatric dental training ($p < 0.01$).

Conclusion: While general knowledge of caries was satisfactory, notable deficiencies were observed in clinical decision-making regarding evidence-based management approaches. Integrating more case-based learning and hands-on clinical exposure in paediatric dentistry curricula is recommended.

Keywords: Dental Students, Clinical Decision, Carious Lesions, curriculum improvement

INTRODUCTION

Dental caries is one of the most prevalent chronic diseases affecting children worldwide, significantly impacting their overall health, development, and quality of life. According to the World Health

Organization, a substantial proportion of children suffer from untreated dental caries, particularly in low- and middle-income countries. Early diagnosis and appropriate management of carious lesions in paediatric patients are critical not only to alleviate pain and infection but also to ensure the long-term preservation of oral structures, facilitate proper nutrition, and enhance overall well-being.[1] Paediatric patients present unique challenges to dental professionals due to their developing dentition, anatomical differences, and behavioural factors. This necessitates specialized knowledge and a tailored approach to diagnosis, treatment planning, and management. Dental students, as future clinicians, must be equipped with a solid understanding of caries pathophysiology and competent in selecting the most appropriate and evidence-based treatment modalities suitable for young patients.[2]
Clinical decision-making, particularly in paediatric dentistry, is a complex process involving the assessment of caries risk, lesion activity, child behaviour, parental preferences, and available resources. Traditionally, dental education has focused heavily on theoretical knowledge, often underemphasizing the practical aspects of decision-making and patient-centred care.[3] The emphasis on restorative treatment over preventive and minimally invasive options remains a concern in many curricula, potentially leading to overtreatment and reduced patient compliance. In recent years, there has been a paradigm shift in caries management, with guidelines advocating for a minimally invasive and preventive approach.[4] Techniques such as the Hall technique, silver diamine fluoride application, and selective caries removal are gaining prominence. However, it remains uncertain how well these concepts are integrated into undergraduate training programs and how confidently students can apply them in clinical settings.[5]
Previous studies have highlighted varying levels of competency among dental students in managing carious lesions in children. For instance, research conducted in Europe and Asia has shown that students often struggle with identifying early carious lesions, assessing lesion activity, and choosing appropriate non-invasive interventions. Moreover, factors such as the extent of clinical exposure, quality of instruction, and presence of paediatric-focused modules significantly influence students' readiness for practice.[3-7]
This study seeks to contribute to the growing body of evidence by evaluating the current state of knowledge and clinical decision-making abilities among dental students in a representative cohort. By identifying specific strengths and weaknesses in paediatric caries management, the findings will inform recommendations for curriculum development and targeted educational interventions to better prepare dental graduates for paediatric clinical practice.

METHODOLOGY

A cross-sectional survey was conducted from January to March 2025 among final-year dental students and interns from five accredited dental institutions working in Khyber Pakhtunkhwa, Pakistan. Ethical approval was obtained from the relevant academic ethics committees. Informed consent was obtained from all participants. A 25-item questionnaire was developed based on literature and paediatric dental guidelines (AAPD, NICE, ICCMS™). The questionnaire included 10 items on foundational knowledge of caries etiology and prevention, 10 case-based clinical scenarios to assess decision-making, and 5 questions on self-reported confidence and sources of learning. The questionnaire underwent expert review (content validity index: 0.92) and was piloted on a cohort of 20 students (Cronbach's alpha: 0.84). Questionnaires were distributed electronically. Responses were anonymized and analysed using SPSS v26. Descriptive statistics summarized knowledge levels. Chi-square and t-tests assessed associations between training background and performance.

RESULTS

A total of 312 students participated (response rate: 87%). Of these, 62% were final-year students and 38% were interns. Female students comprised 58.3% of respondents. Table 1 shows the demographic profile of the participants, with a higher proportion of final-year students and a predominance of female respondents.

Table 1: Demographic Characteristics of Participants

Characteristic	Frequency (n)	Percentage (%)
Final-year Students	194	62.2
Interns	118	37.8
Female	182	58.3
Male	130	41.7

As shown in Table 2, most students demonstrated good theoretical knowledge of caries etiology and fluoride use but struggled with understanding lesion reversibility.

Table 2: Knowledge of Caries Etiology and Prevention

Question Topic	Correct Responses (%)
Etiology of Early Childhood Caries	81.4
Role of Fluoride	76.9
Reversibility of Enamel Lesions	42.7

Table 3 highlights varied performance across clinical scenarios. Less than half of the students correctly identified the Hall technique as an appropriate treatment option.

Table 3: Clinical Scenario Responses

Clinical Scenario Description	Correct Decision (%)
ICDAS 2 lesion in cooperative 5-year-old	53.2
Cavitated lesion in high-risk child	61.5
Use of Hall technique	45.8

Students with additional elective training in paediatric dentistry scored significantly higher (mean score: 16.7 vs. 13.2, $p < 0.01$). Only 34.6% of students felt "confident" managing caries in paediatric patients independently. The majority cited lectures (81%) and clinical observation (67%) as primary learning sources, with only 28% having direct clinical experience in paediatric restorative procedures.

DISCUSSION

This study provides valuable insights into the current competencies of dental students in managing carious lesions in paediatric patients. The findings reveal that while students possess a sound theoretical foundation regarding the causes and prevention of dental caries, their ability to translate this knowledge into practical, clinical decision-making remains limited. Notably, their understanding of lesion reversibility and the application of minimally invasive techniques such as the Hall technique is suboptimal.

The results align with similar studies conducted internationally. For instance, a study by Seifo et al. (2020)[8] found that dental students had limited confidence and knowledge in managing early carious lesions, with a preference for invasive procedures. Similarly, a study in the by Ramayasinpong et al. (2025)[9] demonstrated that only 48% of final-year students correctly identified non-invasive approaches for early lesions. These parallels highlight a global educational gap in the clinical application of paediatric caries management guidelines. Several factors may contribute to this gap. Traditional dental curricula tend to prioritize didactic teaching over experiential learning, with limited opportunities for hands-on practice in paediatric settings. This may explain why only a minority of students in our study reported direct experience with paediatric restorative procedures. Moreover, the

emphasis on restorative over preventive care persists despite the availability of evidence-based, minimally invasive treatment protocols.[10-12]

Encouragingly, students who had undertaken elective rotations or additional training in paediatric dentistry performed significantly better. This suggests that targeted clinical exposure and case-based learning can enhance competence and confidence. Incorporating simulation exercises, objective structured clinical examinations (OSCEs), and integrated paediatric care modules into the curriculum may further support skill development.[13] Furthermore, the low confidence levels reported by many participants raise concerns about their preparedness for independent practice. Professional readiness not only involves technical knowledge but also encompasses communication skills, behavioural management, and ethical decision-making. These dimensions must be adequately addressed in dental education to ensure holistic patient care.[1]

CONCLUSION

The study underscores the need for curriculum reform that balances theory with practice and emphasizes preventive, patient-centred care in paediatric dentistry. Future research should explore longitudinal outcomes of educational interventions and assess their impact on clinical performance post-graduation.

CONFLICT OF INTEREST

None

AUTHOR CONTRIBUTION

Concept or Design	Usman Nazir, Arooj Irfan, Maamoor Irfan
Acquisition, Analysis or Interpretation of Data	Noor Wajiha, Raima Bilal
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