





Treatment Trends in Paediatric Dentistry with Evolving Training and Education of Postgraduate Students in India: A Retrospective Study

Khadeeja Kulood Mazhuvanchery¹, Rishi Tyagi¹, Namita Kalra¹, Amit Khatri²

¹Department of Pedodontics and Preventive Dentistry, University College of Medical Sciences, University of Delhi, New Delhi, India.
²Department of Pedodontics and Preventive Dentistry, University College of Medical Sciences, Guru Teg Bahadur Hospital, University of Delhi, New Delhi, India.

Corresponding author: Rishi Tyagi

E-mail: tyagi_rishidoc@hotmail.com

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ABSTRACT

Objective: To assess and analyse the pattern of dental treatment services and their characteristics provided to children by evaluating the clinical use of materials and prevalence in material research in a major postgraduate paediatric tertiary care hospital in India over three years. **Material and Methods:** Institutionally approved retrospective analysis was conducted by auditing the clinical records of 2644 patients who visited and had treatment in the Outpatient and Inpatient Department of Paedodontics and Preventive Dentistry from January 2017 to December 2019. Clinical logbooks of postgraduate students were analysed by crosschecking with the department's data warehouse. **Results:** Out of the 2644 children who had treatment, more than two-thirds of them were in the age group of 4–7 years old. Around 5.6% of the patients were specially-abled children. Extraction (33.5%) was the most common treatment, followed by restorative treatment (29.1%). Endodontic treatment had a prevalence of 19.8%, with a reduced prevalence of preventive treatment care (0.5%). Patients who had traumatic tooth management included 2.8% of the study population. The prevalence of preventive care was found to be 2.1%. The teaching curriculum with theoretical and clinical skill practices was under the country's assigned authority. **Conclusion:** Despite advancements in paediatric dentistry, more children had extraction treatment with less observed utilization of preventive care. The widening of the training prospectus includes comprehensive care and an amplified focus on preventive care in the academic curriculum of paediatric postgraduates, which is the need of the hour.

Keywords: Dentistry; Education, Dental; Dentistry, Operative; Endodontics; Tooth Loss.

Introduction

Oral disease is one of the vexing problems in public health for its high prevalence and incidence, especially in low-income populations [1]. According to the WHO 2020, more than 530 million children suffer from ailments related to dental caries in primary dentition [2]. Caries prevalence and dental needs among children remain high in the Indian population also. Poor oral health impacts the quality of life of children with broader implications on child development [3]. As said by the American Academy of Paediatric Dentistry (AAPD), “Paediatric dentistry is an age-defined specialty that provides both primary and comprehensive preventive and therapeutic oral health care for infants and children through adolescence, including those with special health care needs” [4]. Marzo [5] remarked that the goal of paediatric dentistry includes treating young patients and fostering them in the inculcation of oral health free of pathologies in adulthood.

The Dental Council of India stated that the objective of the specialty is to provide excellent oral health to the child by understanding the principles of prevention. This body regulates the framework of the postgraduate academic curriculum and ensures a high standard of dental specialist education [6]. Didactic and clinical teaching skills are carried out to sculpt the postgraduate student competent enough for the clinical setting performance along with basic knowledge of the subject [7]. Eriksen et al. [8] focused on the importance of clinical teaching through a patient-centered approach.

Healthier emphasis on understanding the dental treatment care provided, considering the educational training in a postgraduate paediatric tertiary hospital, helps evaluate the prevalence of common dental disease patterns in children. It also forms the basis for setting how paediatric dentistry should proceed in the coming years. The regular prospective and retrospective surveys of patient distribution and treatment trends also significantly impact the implementation of recent advances at various levels of treatment. The diversity in oral disease treatment patterns and development trends across countries and regions reflects distinct risk profiles and the establishment of preventive and interventional oral health promotion programs for children. Over the past years, studies have been done in different countries to assess the quality and analysis of postgraduate teaching both clinically and theoretically [9]. To the best of the researchers' knowledge, we found no existing studies assessing the current treatment trends and teaching practices evolving in paediatric dentistry.

This study aims to investigate the pattern of dental treatment services and their characteristics provided to children, analyzing the clinical use of materials, prevalence, and resultant directions in material research in a significant postgraduate paediatric tertiary care hospital. This study also provides a strategic analysis of dental education evolving in its current form in the paediatric dentistry specialty with possible evolution that might be guided towards better serving the need for child oral health.

Material and Methods

Ethical Approval

The Institutional Ethics Committee-IECHR/2020/PG/46/79-R1 granted ethical approval for the research protocol. The study was conducted per the World Medical Declaration of Helsinki and conformed to the STROBE statement for observational studies.

Study Group

The present study is a retrospective observational study conducted among 0–14-year-old children treated in the Department of Paedodontics and Preventive Dentistry. The study audited the records of 2644 patients. The eligibility criteria include patients who visited and had treatment in the Outpatient and Inpatient

Department from 01 January 2017 to 31 December 2019. Patients with incomplete documentation of treatment records were excluded from the study.

Study Design

The demographic and procedure data were recorded monthly and analyzed collectively using a prepared data collection form.

The department provides child-centered dental treatment for children from various social backgrounds. This study utilized the logbook linked to the patient treatment records of eight postgraduate students, with the clinical work recorded and crosschecked with the hospital's data warehouse. The students undertook clinical treatment for patients for one session of 3 hours, six days per week. Postgraduate students maintained a logbook detailing patient name, age, sex, gender, date of procedure, chief complaint, and the treatment carried out, which were duly monitored, verified, and countersigned by teaching staff regularly who supervised the work. The logbook also recorded data on theoretical and clinical skill practices, including preclinical hands-on exercises and academic teaching sessions.

Treatment received by the patients was categorized. Variables evaluated to ascertain the treatment pattern include subject demographics, type of tooth, treatment-supporting condition, the material used, and the indicated reason for the procedure. Data collected include the name, age, gender, locality, inpatient and outpatient details, reason for visit, investigation, diagnosis, treatment supporting condition, and treatment received.

Statistical Analysis

Data were collected, recorded, entered, and stored in a Microsoft Excel database. Later, they were imported and analyzed using SPSS software, version 20.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics and bivariate data analysis were done. The association between different variables was calculated using the Chi-square test. The level of statistical significance was set at $p < 0.05$.

Results

A total of 2644 children were treated during the study period by the postgraduate students. Methods employed for teaching didactic theoretical and clinical skill practice include preclinical hands-on exercises and academic teaching sessions (Table 1). Students were given step-wise clinical demonstrations before the patient exposure.

Table 1. Didactic teaching of theoretical and clinical skills in postgraduation specialization of paediatric dentistry.

Variables	In hrs (for three year Graduation Period)
Hands-on Exercises (Preclinical)	
Tooth carving	20
Wire bending basics	40
Endodontic and restorative exercises on extracted tooth mounted on phantom head	30
Teaching Methods	
Lectures	10
Hands-on model	10
Clinical demonstration	10
Group discussions (seminar, journal club, conferences - national and international)	30

Regarding the distribution according to age, the majority were between 4–7 years old (40.2%), followed by children aged 8–11 years old (39.6%), 12–14 years old (16.5%) and 0–3 years old (3.8%). Regarding gender predilection, males received more dental treatment (56.7%) than females (43.3%). Of the 2644 patients, 5.6% required special health care needs (SCHN). Most commonly, patients with SHCN who attended the outpatient were with haemopoietic disorders (37.5%) that include hemophilia, thalassemia, and anemic children and fall under the 4–11-year age group (Figure 1).

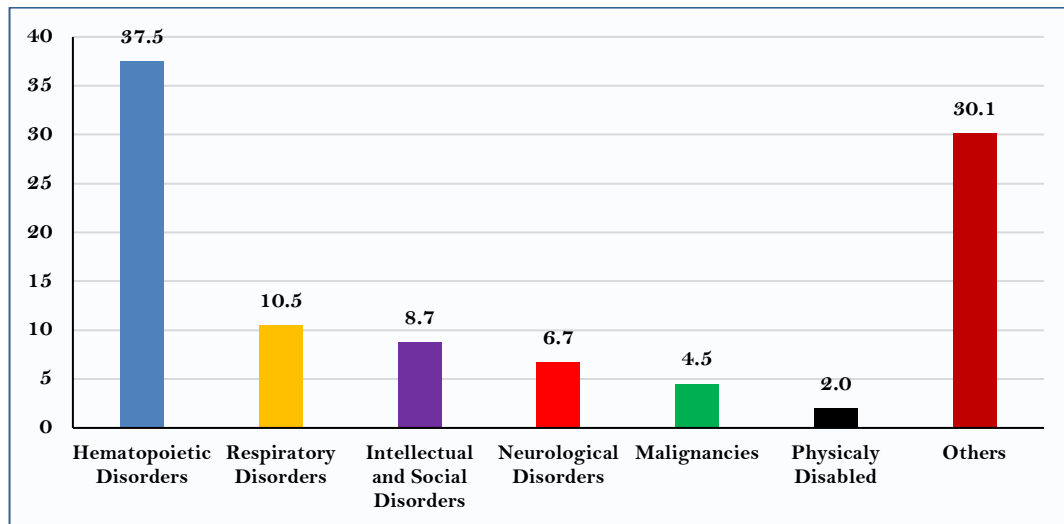


Figure 1. Distribution of children with special health care needs.

Extraction (33.5%) was the most common treatment, followed by restorative treatment (29.1%). Endodontic treatment had a prevalence of 19.8%. Patients who had traumatic tooth management represented 2.8% (Figure 2). Extraction was more common in primary teeth than permanent teeth in the age range of 0–14 years. Posterior tooth extraction (70%) had a higher frequency with more preference in the mandibular arch (49.7%). Most commonly, extraction was performed on the left side (48.4%). Single tooth extraction had a higher frequency (78.1%) compared to multiple tooth extraction on the same day visit. The extraction of 2 teeth in a single visit was observed more often among the 0–3 years age group (Figure 2).

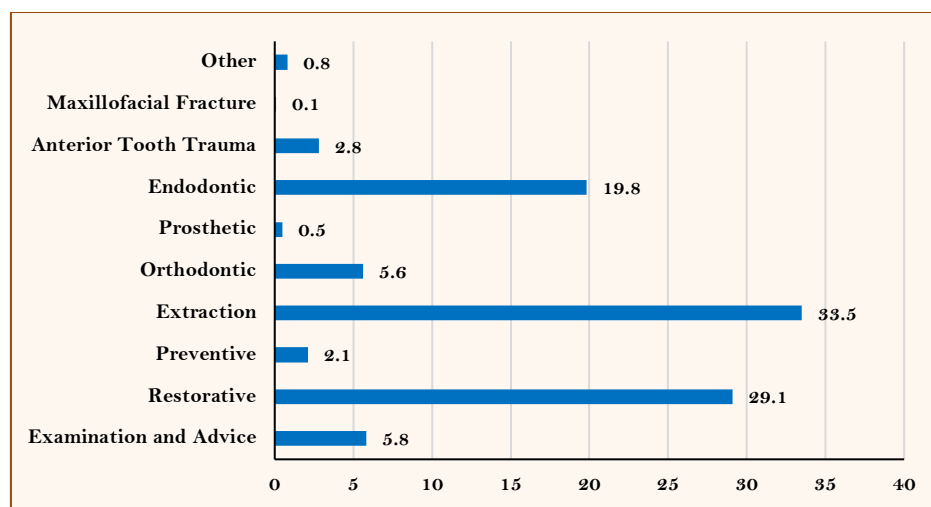


Figure 2. Distribution of the type of treatment with the support condition.

Advanced caries (66%) was the most frequent reason for tooth extraction. Retained primary teeth were the second leading cause of extraction in children. About 8.6% of children underwent extraction for orthodontic reasons, while 5.3% had extraction due to dental trauma. The posterior arch was affected significantly more among the 8-11 years and 12-14 age groups, with a prevalence of 67.6% and 70.4%, respectively. The anterior arch was affected significantly more among the 0-3 age group (65%), showing relevant statistical significance. Advanced Caries, Orthodontic Reasons, and Over Retained Teeth were the reasons for extraction significantly more among primary teeth. Supernumerary Teeth were the most significant reason for extraction among permanent teeth. Orthodontic Reasons, Over Retained Teeth, and Supernumerary Teeth were the most apparent reasons for extraction in the maxillary arch (Figure 3).

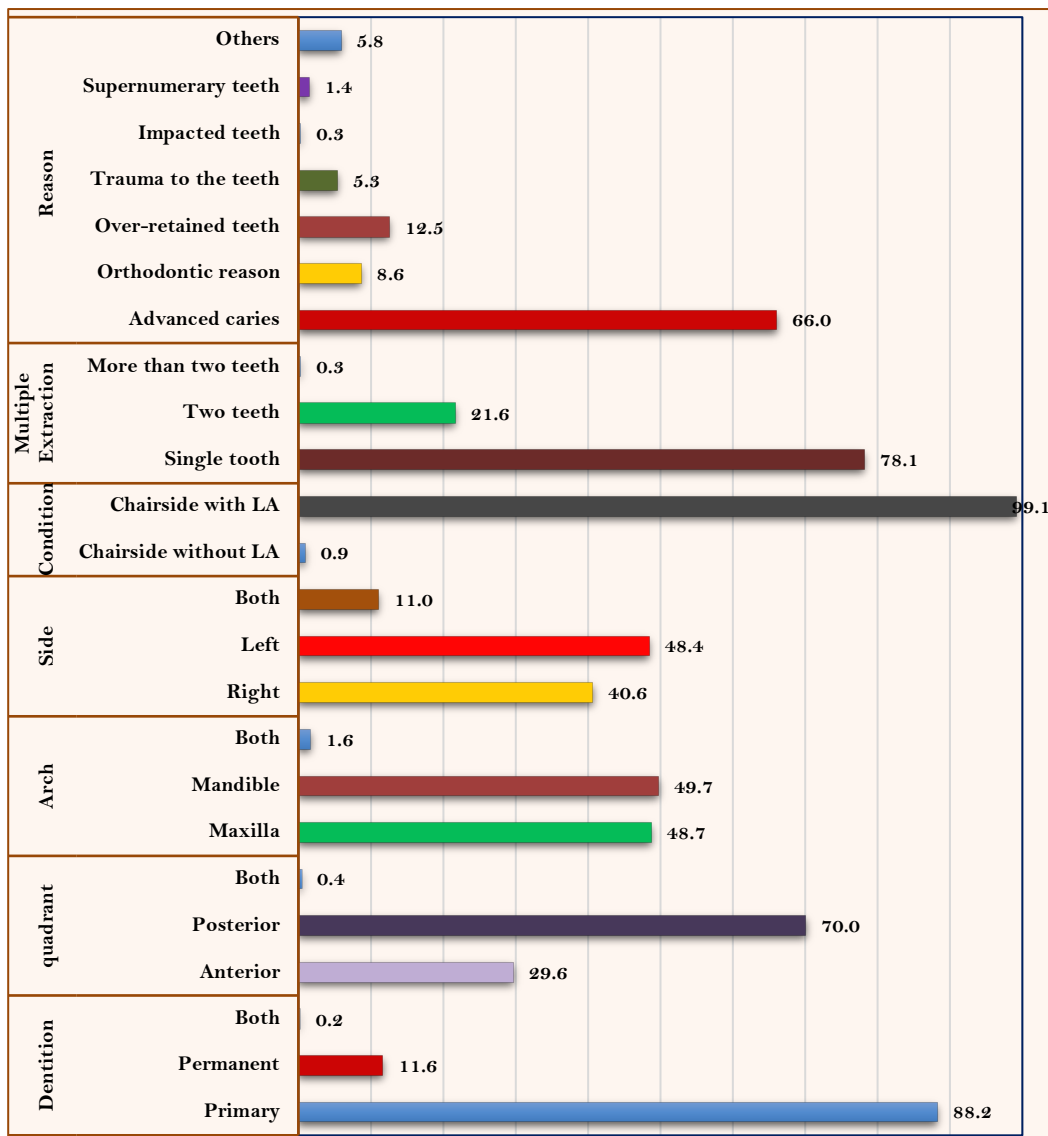


Figure 3. Distribution of deciduous and permanent tooth extraction procedures.

Restorative treatment was carried out more in posterior permanent teeth (74.1% and 76.7%, respectively) (Figure 4). Nearly fifty percent of restoration included teeth in the mandibular arch (49.7%), with a preference for the left side (44.2%). Most teeth had extensive cavitated lesions, constituting 32.6% - an ICDAS 6 score. The most preferred material for restoration was conventional GIC (55.3%), followed by composite

material (17.5%). Multisurface caries (64.2%) was the most common reason for treatment, followed by restoration after pulpal therapy (24.8%). Stainless Steel Crowns and Resin-Modified GIC were preferred among subjects requiring restoration of the mandibular posterior teeth. Multisurface caries and developmental anomalies were the most common reasons for restorative treatment in the mandibular arch. Fractured teeth were observed more among subjects requiring maxillary teeth filling.

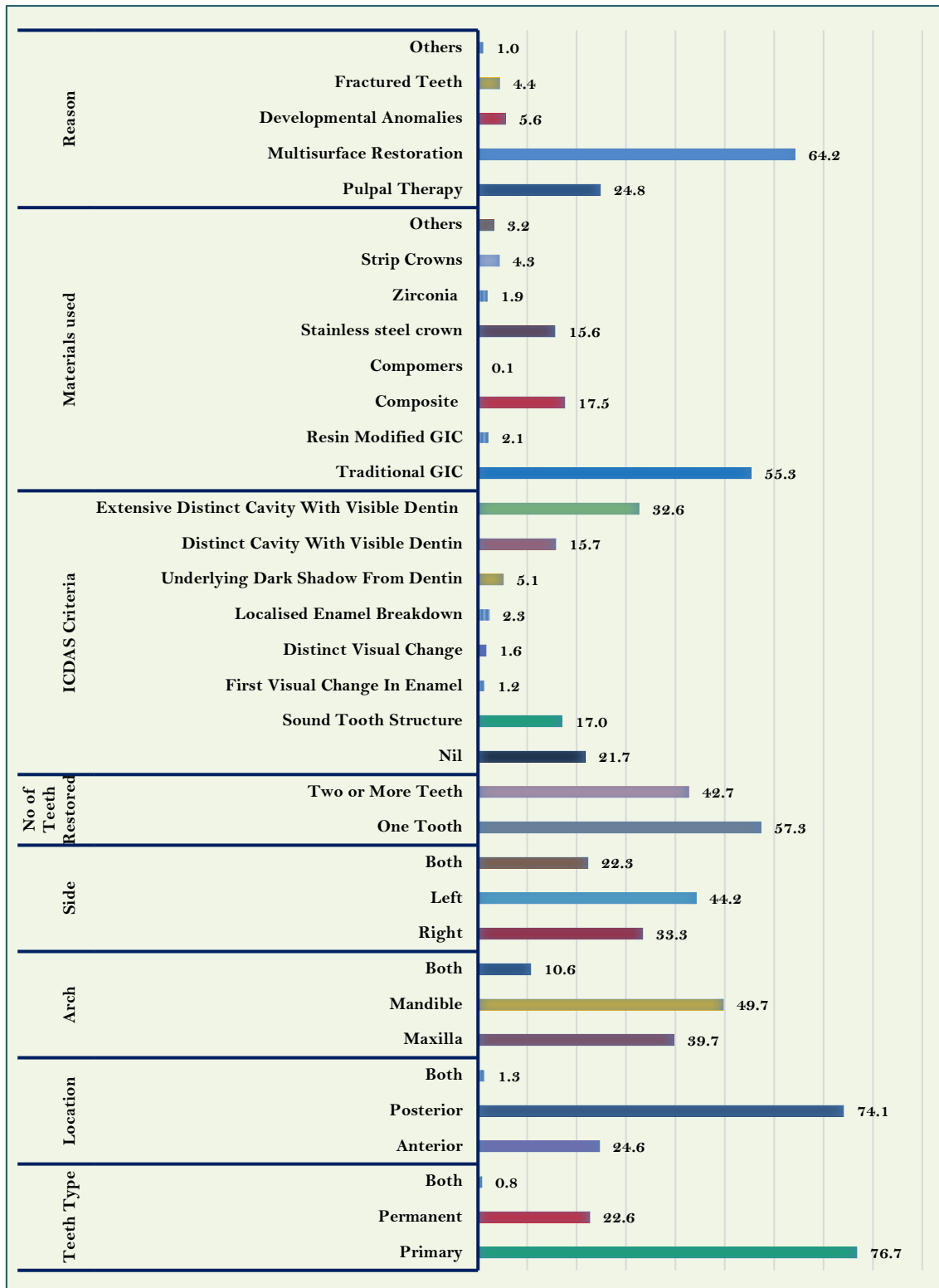


Figure 4. Distribution and pattern of restorative treatment received by the participants.

Discussion

The present study investigated the pattern of dental treatment services and their characteristics provided to children in a major postgraduate paediatric tertiary care hospital. Evidence suggests an increased disparity in accessing oral health care for young children with significant unmet dental care needs. This might be attributed to the dentist's reluctance to treat young children, cultural and linguistic barriers, as well as socioeconomic status of the parents [10]. The current study analyzed 2644 patients who had rendered treatment in the department of paediatric dentistry during the study period of 3 years. This study also analyses the didactic and clinical teaching skills teaching practices in postgraduate paediatric dentistry in the college. Institutions follow the basic guidelines of the Dental Council of India, which is the governing body, even though mild individual variations may be observed with the academics of different colleges.

In our study, about 5.6% of patients who had undergone treatment had a medical condition, which is lower than the study findings reported by Pani et al. [11], who showed a prevalence of 15.8%. This may be due to the fact of ignorance and neglect of the oral conditions of these children, with an increased burden on the family due to the prevailing medical condition of the child.

This study demonstrated that the most common treatment rendered to the children was extraction, followed by restorative treatment and low prevalence of preventive and other therapies, which denotes the poor oral health status and concern for oral health among the children. The prevalence of extraction in the study agrees with the study findings of Chukwamah et al. [12] (33.1%) but showed a higher variation from the observation by Ockell and Bågesund [13], which would reflect the poor socioeconomic status and late access to dental care services.

It could be observed that there is an increased prevalence of primary (88.2%) posterior teeth (70.2%) extraction with a slight predominance of the mandibular arch (49.7%), which is in line with the findings of the previous investigator [14]. Children aged 0 to 3 years had a higher frequency of extraction in the anterior arch. It could influence the designated first window of the infectivity period during infants' early acquisition of mutans streptococci over this defined age range [15]. In agreement with a previous study [16], 8-11-year-old children had more primary teeth extracted than permanent teeth, whereas, in older children, permanent teeth were extracted with higher frequency involving the posterior arch. This might be explained by the difference in the chronology of tooth development and the negative attitude of the parents towards the restoration of deciduous teeth. The posterior mandibular tooth showed a higher propensity for extraction, which its disadvantageous location could elucidate. It would contribute to the easier food accumulation and difficult plaque removal added to its highly variant morphology. The left side of the jaw had an increased prevalence of extraction, paralleling the study findings of Baginska et al. [17]; however, this is contradictory to the study reported by Ahamed et al. [18], which could be explained by the accumulative caries pattern theory [19]. Younger-age children had increased frequency for multiple extractions in a single visit, which might be emphasised by the increased concern of parents about reducing dental chair visits for children.

In our study, advanced caries and its sequela are the most common reasons that necessitated teeth extraction in children in age groups of 4–14 years old, but with a higher prevalence noted by Salim et al. (75.3%) [14]. In light of global epidemiology, untreated dental caries is reported as the most chronic disease of childhood in developed countries like the United States and China [20]. In India, though the literature authenticating the dental caries prevalence is scarce, the prevalence in a survey conducted by the Dental Council of India (DCI) in 2004 also showed an increased prevalence (51.9%) in 5-year-old children [3]. Nevertheless, a significant cause for tooth loss arose from over-retained teeth (12.5%), closely followed by orthodontic reasons (8.6%), which is in

accordance with the reporting of previous investigators [12]. Over retained tooth, when solely considered as a reason for extraction, was common among older age groups, whereas trauma (7.6%) as a reason for extraction was found more in younger children than older children (4%), which is in line with findings of Chukwumah et al. [12]. The most common reasons for primary tooth extraction include advanced caries, over-retained teeth, and orthodontic reasons. Though the most common reason for extraction in permanent teeth remained advanced caries, significant tooth loss also came from other reasons (17.1%), including developmental anomalies and periodontal reasons. It might be elucidated based on the prevalence and severity of these clinical conditions in permanent teeth, which is agreeable with the findings of previous investigators [21,22].

In our study, the occurrence and distribution of filled teeth showed a percentage (29.1%) higher than the reported prevalence by the investigator, which the difference in target population characteristics might explain as a confounding factor. It showed that the restored primary tooth (88.2%) was higher than the permanent tooth (11.6%) in the mandibular posterior left side of the jaw. This agreed with the results of the previous observation [23]. Evidence from studies on pooled caries prevalence of dental caries reported by Kale et al. [24] in the Eastern Mediterranean region showed high caries levels in the deciduous dentition. Also, the morphological and histological assessment of the primary teeth, along with the findings of Kazemenia et al. [20] and Kassa et al. [25], explain the findings in our study as the primary molars with caries could reach pulp easier and subsequent pulpal inflammation. Arch and quadrant preponderance would be reflected either by the datum of manual dexterity and ease of dental practitioner in treating mandibular teeth than maxillary teeth or the increased caries rate in the mandibular molar teeth [26]. When the International Caries Detection And Assessment System (ICDAS) criteria for caries progression was assessed among the filled teeth, it was observed that ICDAS score 6 had the highest prevalence. It may reflect the lack of concern for oral health, poor oral health status with higher caries levels in children, delayed dental care during the disease, and poor attitude towards preventive and primary care. Resin-modified GIC was the most used filling material for restoring the primary tooth, which follows a previous study by Chisini et al. [27] but disagrees with the findings of Dias et al. [28]. It might be conferred to the superior physicochemical properties of GIC in terms of biocompatibility, chemical bond to the tooth structure, and, most notably, fluoride recharging properties [29].

Meanwhile, our findings reported composite resin as the second most used filling material, which may be attributed to the increased time consumption, marginal leakage, and technical sensitivity of composite restoration. Though stainless-steel crowns had the highest success rate (96.1%) as per findings of previous investigators [30], it might be due to the unesthetic element of the crown, which lessened its popularity in the study. As reported in our research, the main reason for restoration is multisurface caries (64.2%), followed by restorative treatment after pulpal therapy (24.8%). Fractured teeth were noted as the most common reason for restoration in the maxillary right side of the arch, consistent with recent studies on the prevalence and its site preference [31].





The prevalence of preventive care was found to be 2.1%, significantly lower than the care undertaken in the United States (72%), which sheds light on the austere neglect of oral health among the studied population [32]. Previous caries are the best predictor of future caries, and oral health status in childhood will influence oral health in adulthood [33].

However, the study has certain limitations. This being a retrospective study, more than three years could draw an evident picture, and follow-up of the treated patient helps reflect the quality of treatment and the practice. Nevertheless, our study provides primary data on the academic curriculum of the postgraduate in paediatric dentistry.

Conclusion

Despite advancements in paediatric dentistry, more children had extraction treatment with less observed utilization of preventive care. The widening of the training prospectus includes comprehensive care and an amplified focus on preventive care in the academic curriculum of paediatric postgraduates, which is the need of the hour.

Authors' Contributions

KKM		https://orcid.org/0000-0003-3838-740X	Conceptualization, Methodology, Validation, Formal Analysis, Investigation, Resources, Writing - Original Draft, Writing - Review and Editing and Visualization.
RT		https://orcid.org/0000-0003-2953-8077	Conceptualization, Methodology, Validation, Formal Analysis, Investigation, Resources, Data Curation, Writing - Original Draft, Writing - Review and Editing, Visualization and Supervision.
NK		https://orcid.org/0000-0001-6216-827X	Conceptualization, Methodology, Validation, Data Curation, Writing - Review and Editing and Supervision.
AK		https://orcid.org/0000-0001-8071-0501	Methodology, Validation, Investigation, Resources, Data Curation and Visualization.

All authors declare that they contributed to a critical review of intellectual content and approval of the final version to be published.

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None.

Conflict of Interest

The authors declare no conflicts of interest.

Data Availability

The data used to support the findings of this study can be made available upon request to the corresponding author.

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