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Original article

Pediatric dental emergency management and parental treatment preferences during COVID-19 pandemic as compared to 2019

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ABSTRACT

Pediatric dental emergency management were temporarily suspended during the COVID-19 pandemic, which worsened urgent dental needs. This retrospective study investigated the management of pediatric emergencies during COVID-19 lockdown and the trends in parental preferences from March to July in 2019 and 2020. Pediatric dental emergencies managed during pandemic was collated, procedures were categorized (emergency, restorative, preventive, elective) and trends in parental treatment preference was compared from March-July 2019/2020. Bivariate analysis was performed using fisher-exact test and statistical significance was set at 5%. Total 1081 children were treated during COVID-19 lockdown, and 1509 procedures were performed, of which 20.8% were emergency, 42% restorative, 24.4% preventive, 12.6% elective. In 2019, 7462 children were treated; and except for emergency (10.6%), other procedures were comparable to 2020. Extractions (267) predominated in 2020 followed by sealants (195); but in 2019, pulpectomy (1268), scaling (1251) were predominant. None of the residents who performed aerosol procedures got infected with COVID-19 during the lockdown. Emergency dental needs among pediatric patients were very high during the COVID-19 pandemic in South India, and there was not much change in the trend in parental treatment preference in 2019 and 2020. Further, aerosol procedures did not increase the risk of COVID-19 during the pandemic provided proper universal precautions were followed.

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1. Introduction

Corona virus disease 2019 (COVID-19) has crippled health care delivery throughout the globe. Pediatric patients pose unique challenge during the pandemic as they don't understand the basic tenets of COVID-19 safety protocols such as social distancing and

personal hygiene measures. Routine dental care was the worst affected among all services, and almost all the countries had posed severe restrictions towards dental procedures generating aerosol, fearing the spread of COVID-19. Indian government enforced national lockdown from the third week of March until June 2020, and the government of Tamil Nadu extended the state lockdown until July 2020 to prevent the spread of COVID-19 pandemic. By July 31, India had a total of 1,695,988 confirmed cases of COVID-19, and 35,747 individuals had succumbed to the virus (<https://coronavirus.jhu.edu/map.html>).

Impact of COVID-19 on children has been mild and pediatric cases in India have been relatively low (Balasubramanian et al., 2020). As of June 5, only 1506 cases below the age of 12 were reported in Tamil Nadu and in October, the cases had risen to 25,073 (<https://www.thehindu.com/news/national/tamil-nadu/covid-19-cases-continue-to-fall-in-tamil-nadu/article32896602>).

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ece). The largest COVID-19 study from south India reported higher prevalence among younger individuals and superspreading was predominant as 5% of infected persons attributed for 80% of cases. Furthermore, children are key spreaders of COVID-19 and they increased the risk of enhanced transmission (Laxminarayan et al., 2020); Indian council of medical research also reported children to be spreaders or super-spreaders of COVID-19.

Fear, ambiguity and lack of evidence regarding the risk of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) transmission during dental procedures caused state wide closure of dental care. Our institution was one of the very few tertiary oral health centers open during the pandemic and pediatric cases from all around Chennai and surrounding rural districts were referred for urgent care. Dental pain and unmet dental needs negatively impacted the oral health related quality of life of preschool children during the pandemic lockdown (Samuel et al., 2020a). Poor oral health is rampant among school children in Tamil Nadu and the prevalence of dental caries among 12–15-year-old is reported to be 61.4% (Veerasingam et al., 2016); among pre-schoolers it is 63.4% (Samuel et al., 2020b). Moreover, parents are reluctant to expose their kids to crowded spaces as the number of COVID-19 cases are still spiking in Tamil Nadu and India.

Hence, we wanted to assess the management of pediatric dental emergencies during the COVID-19 pandemic, and explore the parents' treatment preferences during the national lockdown in a tertiary dental care center in South India. Further, we wanted to compare the trends in pediatric treatment procedures performed during the pandemic with that of the preceding year, 2019.

2. Materials and methods

This retrospective study was conducted by inspecting data of all the pediatric dental cases managed in our institute from March–July in the year 2019 and 2020. Study protocol was approved by the institutional ethical committee (SDC/SIHEC/2020/0621-0101) and parental consent was obtained for all the patients included in the study prior to treatment. All the cases who were provided with dental care in our center were included. Children with incompletely filled case sheets, parents who were not willing for treatment, and children treated under general anaesthesia (as no cases were posted under GA during COVID-19 lockdown) were excluded from analysis.

All the cases visiting the emergency were screened for body temperature using an infrared thermometer and peripheral oxygen saturation (SpO₂) was assessed for every case adult and pediatric alike and their accompanying caregivers at the reception. Following which they were requested to fill a COVID-19 self-declaration form, and only cases without fever, any apparent symptoms of COVID-19 and SpO₂ of 95% or above were allowed to enter the facility. Once cleared, the pediatric cases between 0 and 16-years were examined by trained dental residents and the children were triaged based on the nature of complaint, signs/symptoms and initial evaluation into emergency/non-emergency, and refer them to the department of Pediatric dentistry for complete assessment and treatment. The American dental association released a guideline in the last week of March 2020 classifying dental emergency and non-emergency during the COVID-19. There wasn't significant difference in nature of triage used in our institute and the one provided by American Dental Association (ADA, 2020); and it was easy to adopt ADA guidelines as we had already established a protocol to manage pediatric patients. Patients were tagged and referred as dental emergency, urgent dental care, other urgent dental care and routine/non-urgent dental care based on ADA guideline (Fig. 1; Appendix Table 1). Based on the nature of the treatment performed, procedures were categorized into emergency, restora-

tive, preventive and elective procedures and the same classifications were extended to compare parental treatment preference between March–July 201/20 and assess the trend.

They are as follows;

Emergency procedures: Patient reporting with severe pain, cellulitis, dentoalveolar fracture. Treatment procedures included extraction, opening of pulp chamber to relieve pressure/pain, draining of abscess or stabilizing fracture/bleeding and splinting of teeth following trauma.

Restorative procedures: Dental caries and its sequel requiring rehabilitation procedures which is not urgent can be rescheduled or managed with medication until appointment. Treatment included pulpectomy, pulpotomy, pulp capping, stainless steel crowns, strip crowns, composite restorations (LCR), glass ionomer cement restorations (GIC) and silver diamine fluoride application.

Preventive procedures: Includes all the treatment required to prevent future dental disease and to reduce the existing risk factors. Procedures included preventive resin restorations (PRR), pit and fissure sealants and topical fluoride gel/foam/varnish application and space maintainers.

Elective procedure: All procedures which is chosen by the patient or recommended by the dentist which benefits the patient and is not essential currently. Treatments included orthodontic procedures (jack screws, habit breaking appliances, bite plane), supra and subgingival scaling and aesthetic dental procedures.

2.1. Data retrieval

Saveetha dental college and hospital manages its patients' data using the dental information archival system (DIAS). Patient demographics (age/gender/annual family income), contact, address (rural/urban), chief complaint, treatment plan, consent, treatment performed, high definition pre/post-operative photographs are fed into the software to allow smooth inter-departmental coordination and have a single source of information portal to avoid delays and ambiguity. Two trained specialists Dr. Samuel and Dr. Mebin conducted the data assessment and retrieval. Each case is allotted a unique identification number by DIAS which prevents duplication of cases. Furthermore, each case was checked thoroughly for completeness with regard to details required for the study. Data was extracted, and treatments were categorized for each patient based on the ADA classification/nature of treatment and entered onto an excel sheet; and data was randomly checked at regular intervals for accuracy by two independent dentists to verify veracity and avoid errors.

2.2. Statistical analysis

Data was analyzed using SPSS V23 (IBM, IL, CH) and the dental procedures performed during 2019 and 2020 COVID-19 lockdown was compared using fisher exact test. The ratio of emergency, restorative, preventive and elective procedures was calculated by dividing the total procedures by the total no of patients treated in our centre. The level of statistical significance was set at 5%.

3. Results

Total of 31,427 patients were treated from March to July 2020 (COVID-19 lockdown), and during the same time in 2019, 129,940 cases were provided with dental care in our institute. Almost 82% of the primary caregivers of children had only primary schooling; 73.2% were below the poverty line, and 68.6% were from suburban and rural areas. During the pandemic lockdown, 1081 pediatric cases (49.7% males) with mean age of 8.8 ± 4.03 years were managed in our hospital from March to July 2020; whereas

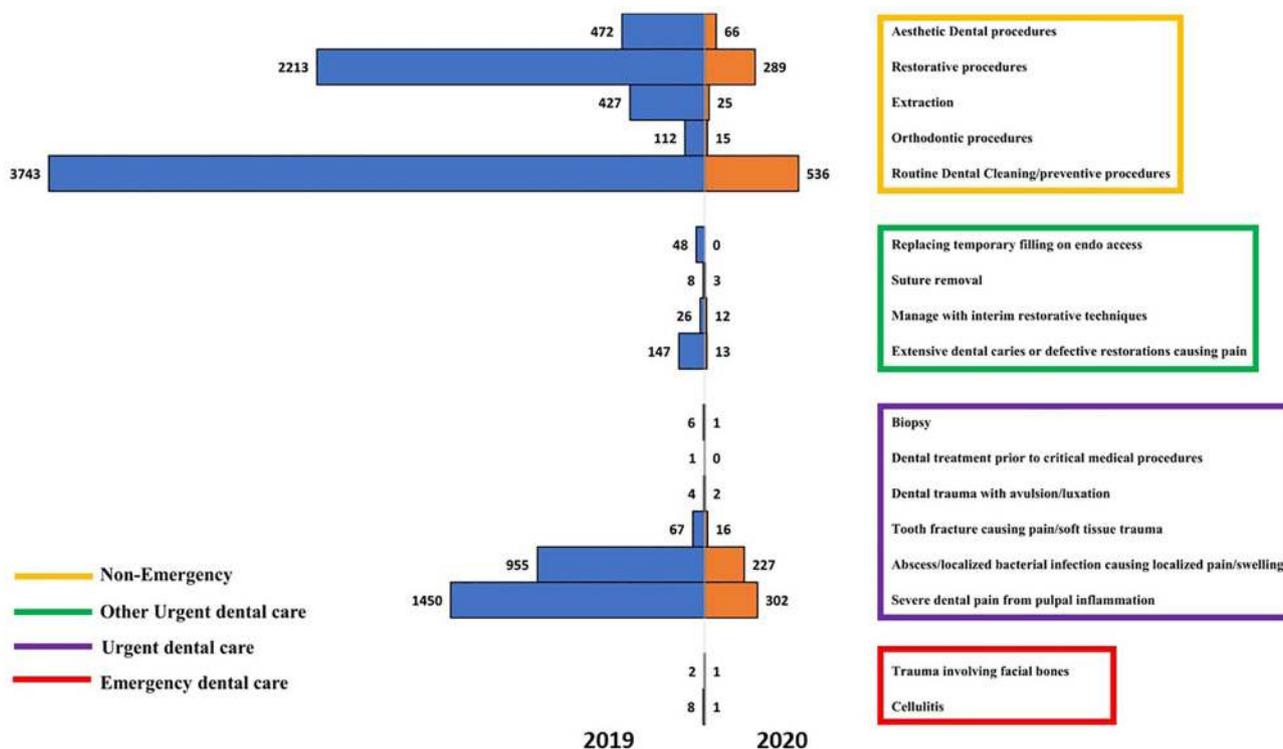


Fig. 1. Pediatric dental care based on ADA classification in the year 2019 and during the pandemic in 2020.

in 2019, a total of 7462 children were treated (mean age 7.4 ± 4.1 years; 52.8% males) (Fig. 2). Appendix Table 1 describes the total procedures performed after triage based on ADA classification during COVID-19 lockdown in 2020 in 2019. The treatment trend was similar in 2019/2020 with non-emergency procedures dominating, followed by urgent dental care procedures, and the least was emergency procedures (Fig. 2). However, the proportion of cases managed as emergency was higher in 2020 as compared to 2019 (Table 1; $P > 0.05$).

Table 1
Descriptive analysis of various dental emergency and non-emergency based on ADA classification in 2019 and during the COVID-19 pandemic.

ADA Classification	2019	2020	P value
Dental Emergency	10	2	0.079 ^a
Urgent Dental Care	2483	548	
Other Urgent Dental Care	229	28	
Non-Emergency	6907	931	

^a Fisher Exact test as one of the cells had value less than 5.

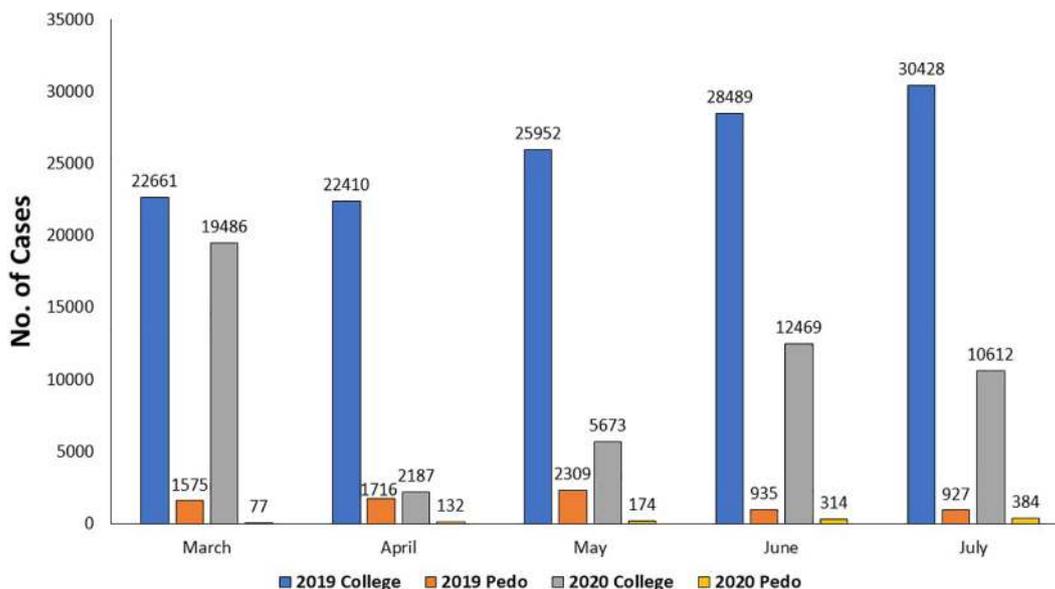


Fig. 2. Total number of dental and pediatric cases treated from March to July in the year 2019 and 2020.

Table 2
The various dental procedures performed on children during the COVID-19 pandemic in 2020, and correspondingly in 2019.

S. No	Dental treatment procedures performed	2019	2020
1	Pulp capping	159	19
2	Pulpotomy	83	10
3	Pulpectomy	1268	163
4	Stainless Steel Crowns	929	58
5	Pit and Fissure sealants + Preventive Resin Restoration	1406	285
6	Fluoride varnish/gel	893	41
7	Apexification	34	3
8	Space maintainer	193	41
9	Acrylic crowns	46	6
10	Composite Restorations (Class I, II, V)	548	86
11	Composite Restorations (Class III, IV)	129	18
12	Glass Ionomer Cement Restorations	883	158
13	Extraction	750	267
14	Root canal treatment	381	78
15	Scaling	1251	152
16	Pressure relieving (emergency access openings)	253	44
17	Strip crowns	317	45
18	Draining abscess	8	1
19	Stabilizing fracture/bleeding	2	1
20	Splinting of teeth following trauma	4	2
21	Silver Diamine Fluoride	26	12
22	Orthodontic appliances	112	15
23	Biopsy and Suture removal	14	4
Total		9689	1509

Table 2 describes the various pediatric dental procedures performed in 2019/20. Out of the 1509 procedures performed on children in 2020, 242 were emergency extractions, 195 sealants, 163 pulpectomy etc. and least was apexification (3) and acrylic crowns (3). In 2019, the total procedures performed were 9689, of which 1268 were pulpectomies, 1251 scaling, 929 stainless steel crowns etc. with apexification (34) being the least. Root canal treatment of permanent teeth was almost five times and pulpectomy was eight times higher in 2019 as compared to 2020. Parental prefer-

ence of treatment in March to July 2019/2020 was assessed using the ratio of emergency, restorative, preventive, and elective procedures performed in that particular year. In 2020, the predominant procedures were restorative (42.1%), and least was elective (12.6%); but in 2019 the least was emergency procedures (10.6%), and is described in Fig. 3. Appendix Table 2 describes the various procedures performed under each category for 2019/20.

4. Discussion

India was the first county to enforce complete lockdown of 1.34 billion people from March until May 2020, and government of Tamil Nadu extended the lockdown until July 2020. Tamil Nadu is the southernmost state in India with an estimated population of 77 million people by 2020, and its capital city Chennai sustains a population of 10.9 million people. As of 2011 census, the population of children between 0 and 6 years in Chennai metropolitan area is 895024, and the child sex ratio was 951 (<https://censusindia.gov.in/2011census/dchb/Tamilnadu.html>). Wide spread panic and fear of SARS-CoV-2 infection had caused the closure of almost all the private oral care centers in Tamil Nadu during the national COVID-19 lockdown (Samuel et al., 2020a); further, the ministry of health and family welfare of the government of India enforced regulations to curb all dental procedures generating aerosols. Ours was the only institution which provided emergency dental care services to the people of Chennai and surrounding villages, immediately following the lockdown.

Recommendations for dental practice was provided by several reputed journals (Dave et al., 2020; Meng et al., 2020) and the international journal of paediatric dentistry released a special article to provide guidelines towards management pediatric patients during the COVID-19 pandemic (Mallineni et al., 2020). However, it was not realistically possible in a city like Chennai, to adhere to the rules and guidelines prescribed, as people thronged our facility from all parts of the city, and it was particularly difficult for us to enforce strict protocol, because the care-seekers were very poor

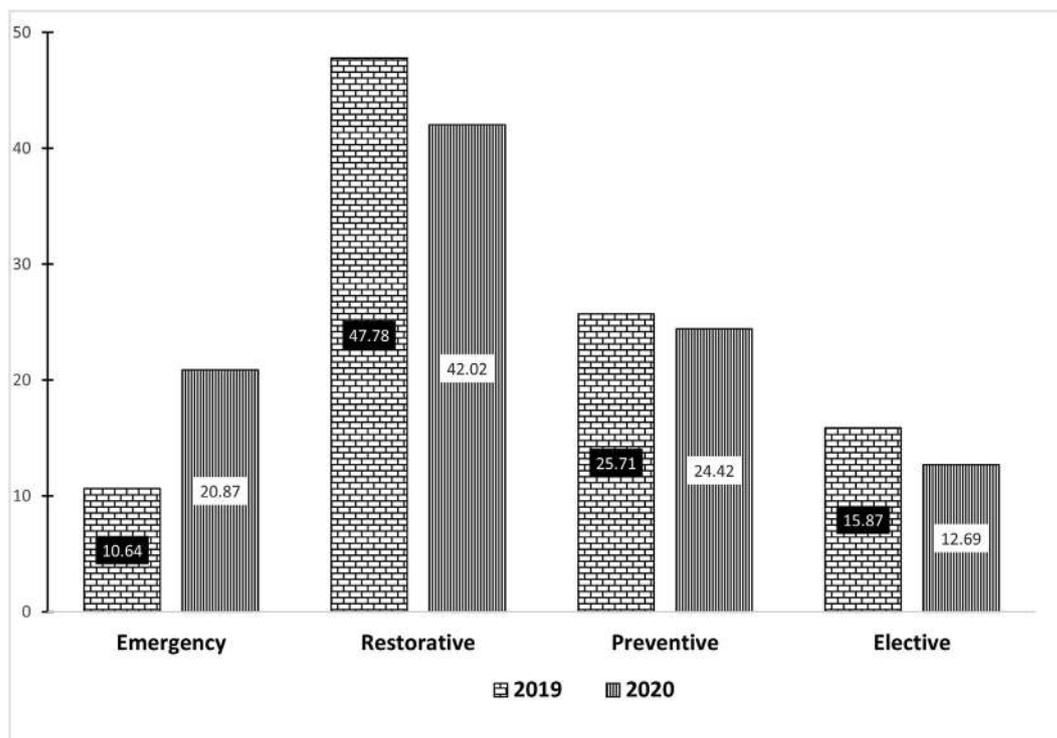


Fig. 3. Comparison of emergency, restorative, preventive and elective pediatric dental procedures performed between March-July 2019 and 2020.

with none/primary education at the best. The total number of patients provided with care in the month of March 2020 was 19486, of which 791 were pediatric cases; but after the lockdown was enforced only 77 were treated. Yang et al., in their paper report the frequency of online consult (N = 474) during the lockdown in Wuhan from Feb to March (59 days) (Yang et al., 2020); this is not possible in our institute as majority of poor people who seek care lack access to internet and smart phone.

We believe we may be the first to report the use high speed hand pieces and aerosol generating procedures among children during the COVID-19 pandemic. National SARS-CoV-2 lockdown was implemented from March 24 and we had to treat 77 children until March 31, 2020; and the number provided with dental care increased in subsequent months (Fig. 2). Standard COVID-19 protocol was established in the institute, and children, caregivers who passed the screening eligibility for body temperature and SpO₂ were allowed into the facility to avail care. Of all the cases treated during the pandemic only two had real dental emergency based on the emergency guideline released by ADA, and it is similar to the report by Yang et al. (2020). Early childhood caries is an endemic disease in India and majorly contributes to pulpal and periapical pathologies (Samuel et al., 2020a,b), and during the pandemic, majority of the pulpectomy procedures were performed on children between 4 and 6 years. Emergency extractions were common in ages between 5 and 10 years and emergency access opening to alleviate pain and pressure was also common among 5-year-olds. Majority of pit and fissure sealants were placed in children between 6 and 12 years corresponding to permanent teeth eruption; and preventive resin restorations were most common among 13-year-old. Tooth fracture was predominant among children between 3 and 6 years in our study which is in contrast to previous reports (Yang et al., 2020; Martens et al., 2018). However, because of the huge sample size in 2019 all the treatments were widely spread across age groups, but pulpectomies were particularly common among children between 2 and 6 years. The overall treatment trend indicates that the parents sought restorative care (42%) followed by preventive care (24.4%) during the lockdown, although the reverse is true, as they requested us to complete all procedures required to prevent any future disease during the pandemic. Prevalence of emergency treatment during the pandemic (21%) was greater than that of 2019 (11%) and this could be attributed to the lack of their usual oral care providers due to lockdown and government regulations. A total of 242 extractions, 163 pulpectomies, 61 root canal treatments and 44 access openings and 10 pulpomies were performed as part of emergency pain management.

Dental treatments such as pulpectomy, pulpotomy and non-surgical root canal treatment were recommended as non-urgent dental care during the pandemic, but our institute recommended continuation of these procedures following universal precautions for COVID-19. Evidence based reports have recommended the use of medication as first choice for home management of dental pain among children (Lockhart et al., 2019; Pain Management in Infants, 2018) but these recommendations invalid during a world-wide COVID-19 pandemic, and the sale of non-steroidal anti-inflammatory drugs were restricted in Tamil Nadu. Moreover, none of the children were tested for COVID-19 status prior to treatment as the test was expensive, time consuming, and parents were unwilling. Dental pain in children can worsen the quality of life of a child, especially during the pandemic (Samuel et al., 2020a). When normal children can experience emotional distress during the pandemic (Jiao et al., 2020), painful condition would only exacerbate the mental distress experienced by the child. Moreover, the child's dental condition would have affected the entire family as all were restricted inside their homes in a fragile emotional state due to the nation-wide lockdown (Samuel et al., 2020a).

The institutional COVID-19 protocol for pediatric management was almost similar to the one released by ADA; thus, we adopted the guidelines as soon as it was released, and reported the same. However, the emotional impact of dental pain and distress experienced by the child cannot be ignored based on a set of guidelines, and from first-hand experience we report that the pain reported by a child with tooth fracture was less compared to pain caused by decayed tooth with abscess or localized infection. Hence, we recommend to modify the existing guidelines to be inclusive of all those reporting with pain because localized infection reporting a numeric rating pain score above 5 as emergency. Furthermore, none of the residents who screened, and those who carried out aerosol generating procedures were infected with COVID-19. This further emphasizes the need for solid evidence base regarding the risk of COVID-19 transmission in dental office, and a recent report suggests the risk of transmission in dental office to be very low with proper precautions (Ren et al., 2020).

The number of procedures performed in 2019 and 2020 correspond to each other with respect to restorative, preventive and elective procedures, and only emergency procedures increased during the pandemic. Sadly, we cannot compare our finding with other studies as there are no previous reports of treatment provided to pediatric cases during the pandemic. The merits of our study involve the conduct of dental treatment during the COVID-19 pandemic when the whole world was afraid to alleviate dental pain and suffering, and we are the first to report the same. Secondly, use of electronic data management for routine patient care improves the reliability and validity of the data acquired, and further reduced direct/indirect contact while collecting data to a certain extent. Thirdly, accurate diagnosis was possible thorough clinical examination and x-ray evaluation to avoid misclassification as emergency or non-emergency care. The results of our study also provide some insights into the various dental problems encountered by children, the various procedures performed and treatment preferences of parents during a pandemic. This information could further mitigate the fear and ambiguity towards provision of oral care to children suffering from dental pain during a pandemic with appropriate necessary precautions. However, our study has some limitations as we were not able to follow-up the children to enquire regarding the COVID-19 status following treatment in a tertiary care institute. The study reports the findings only among pediatric cases, and cannot be generalized to adult population. Moreover, the severity of COVID-19 is varied in each country hence, their provincial dental regulatory authority should exercise appropriate caution when initiating full-fledged dental treatments.

In conclusion, pediatric patients world-wide are suffering with severe unmet dental needs due acute shortage of specialists who provide care, and pediatric dentists worldwide are facing serious dilemma towards COVID-19 transmission in a dental setting as management of children are not the same as adults. However, it is the primary duty of the doctor to alleviate pain and suffering of a patient; and with appropriate history, screening, triage and use of recommended personal protective equipment for COVID-19, we believe it is safe to practice pediatric dentistry as performed during the pre-pandemic era.

5. Statement of ethics

The study was approved by IEC (SDC/SIHEC/2020/0621-0101) and informed consent was obtained from the parent before the study.

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Author contributions

SRS designed the study, collected and analyzed data, drafter and critically revised the manuscript. MG, SS performed literature search and collected data. ESE, FA, YE analyzed the data and prepared the manuscript draft. SRV, NE, EK reviewed the scientific content and critically revised the manuscript.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A

Appendix Table 1. The various cases managed after triage using ADA classification of dental emergencies during the 2020 pandemic and comparison of the same with 2019

CATEGORY	TREATMENT	2019	2020
DENTAL EMERGENCY	Uncontrolled bleeding	0	0
	Cellulitis	8	1
	Trauma involving facial bones	2	1
URGENT DENTAL CARE	Severe dental pain from pulpal inflammation	1450	302
	Pericoronitis or third-molar pain	0	0
	Surgical post-operative osteitis, dry socket dressing changes	0	0
	Abscess, or localized bacterial infection resulting in localized pain and swelling	955	227
	Tooth fracture resulting in pain or causing soft tissue trauma	67	16
	Dental trauma with avulsion/luxation	4	2
	Dental treatment required prior to critical medical procedures	1	0
	Final crown/bridge cementation if the temporary restoration is lost, broken or causing gingival irritation	0	0
	Biopsy of abnormal tissue	6	1
	OTHER URGENT DENTAL CARE	Extensive dental caries or defective restorations causing pain:	147
Manage with interim restorative techniques when possible (silver diamine fluoride, glass ionomers)		26	12
Suture removal		8	3
Denture adjustment on radiation/ oncology patients		0	0
Denture adjustments or repairs when function impeded		0	0
Replacing temporary filling on endo access openings in patients experiencing pain		48	0
Snipping or adjustment of an orthodontic wire or appliances piercing or ulcerating the oral mucosa		0	0
NON URGENT DENTAL CARE	Routine Dental Cleaning and preventive procedures	3743	536
	Orthodontic procedures	112	15
	Extraction	427	25
	Restorative procedures	2213	289
	Aesthetic Dental procedures	472	66
Total		9689	1509

Appendix Table 2. Pediatric dental procedures classified based on nature of treatment performed in 2019 and pandemic lockdown 2020.

Categories	Procedures performed	2019	2020	
Emergency	Extraction	750	267	
	Opening Of Pulp Chamber To Relive Pressure/Pain,	253	44	
	Draining Of Abscess	8	1	
	Stabilizing Fracture/Bleeding	2	1	
	Splinting of teeth following trauma	4	2	
	Biopsy	6	1	
	Suture Removal	8	3	
	Restorative	Pulpectomy	1268	163
		Pulpotomy	83	10
		pulp capping	159	19
stainless steel crowns		929	58	
Strip crowns		317	45	
Composite restorations (only decay not aesthetic)		548	86	
Glass ionomer cement restorations (GIC)		883	158	
Silver diamine fluoride application.		26	12	
Root Canal Treatment		381	78	
Apexification		34	3	
Preventive	Preventive Resin Restorations	616	90	
	Pit and fissure sealants	790	195	
	Fluoride Varnish	278	30	
	Fluoride Gel	615	11	
	Space Maintainer	193	41	
Elective	Scaling	1251	152	
	Orthodontic appliance	112	15	
	Aesthetic Procedures	175	24	
Total		9689	1509	

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