ORIGINAL RESEARCH

A Panoramic View of Various Modalities Used to Manage Evolving Dental Problems and Changing Oral Hygiene Patterns in Children during COVID-19 Pandemic

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Abstract

Background: COVID-19 has influenced billions of people, impacting all aspects of life, including healthcare needs. Pediatric dental needs were substantially affected during lockdown due to the limited dental care. The present study aim is to assess the dental problems experienced by children and methods adopted to resolve these problems with the help of local facilities through different communications/teledentistry.

Materials and methods: A cross-sectional study was conducted among 1,500 pediatric dental patients who were undergoing treatment before lockdown or who were previously visited to the dental department of a tertiary hospital in Delhi. The structured 15-item dental problems and treatment needs (DPTN) Questionnaire which was customized and validated for the study was employed for the assessment of dental needs of the children and how they managed during the pandemic.

Results: Participants were interviewed telephonically; and the findings indicated a significant trend of adverse impacts on children's oral health. The majority of the children, 83.47% suffered from toothache, 50.80% had tooth-related swelling whereas only 3.13% experienced dental trauma during COVID-19 pandemic. The majority of parents 64.1% opt for home management rather than consulting dental professionals in which more than 57.5% practiced self-medication for their children's dental problems. Regarding the brushing frequencies in children, significant differences were observed during prepandemic and between COVID-19 pandemic ($p < 0.5$). Moreover, additional oral hygiene measures were also adopted by their parents. The change in frequency of toothbrushing from pre- and between COVID-19 pandemic was associated with COVID-19 related consequences.

Conclusion: The pandemic has profoundly changed socioeconomic conditions with the oral health condition of the majority of Indian children being adversely impacted and neglected. Prevalence of self-medication for children's dental problems was high during pandemic. Furthermore, it had a detrimental influence on daily toothbrushing, resulting in lower brushing frequency in children during COVID-19.

Keywords: COVID-19, Oral health, Oral hygiene Pediatric dentistry, Toothbrushing.

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Introduction

The first identification of the novel coronavirus, widely referred to as COVID-19, occurred in Wuhan, Hubei Province, China in December 2019. The World Health Organization (WHO) officially elevated the status of COVID-19, recognizing it as a global pandemic on March 11, 2020. The novel coronavirus was the causative factor presenting as various outcomes ranging from mild, asymptomatic illness to life-threatening complications.[1,2] The COVID-19 spread rapidly across the globe with an overall worldwide census of 775,678,432 as documented. There has been a high number of reported deaths, i.e., 7,052,472 (as per WHO) as reported.[3] India had seen a high number of cases and deaths and was the second worst COVID-19 affected country across the globe.[4]

India had suffered tremendously from the pandemic with the cases surging through the country particularly affecting the older population with comorbidities.[5] During the first wave of the pandemic, the central government implemented a nationwide lockdown on March 25, 2020, as a crucial measure to curb the spread of the virus and satisfactory control of the infection rate was noted despite India being a high population dense country.[6] However, during the second wave, increased infectivity was observed. The contributing factors include observed mutant virus strains, efficient transmissibility and shorter incubation period with a new range of reported gastrointestinal symptoms. Moreover, there was also a disregard for the COVID appropriate behaviors or ''CAB'' by the people. This comprised of negligence to comply with the recommended health behaviors such as hand hygiene, social distancing and wearing masks.[5] With the unmet demand supply of oxygen due to rapid surge of cases, unprecedented loss of lives left many families scarred for a lifetime.

Under the burden of the pandemic, the country's healthcare system was challenged. Amidst this scenario, the priority of care was given to physical and psychological needs while the routine

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oral health and associated problems were consequently non prioritized.[7] Moreover, the spread of COVID-19 may take place via direct/indirect contact of infected individuals through respiratory droplets, aerosol and saliva.[8,9] The dental professionals were at a very high risk of infectivity due to their close proximity to intraoral region leading to potential viral transmission through saliva and aerosol-generating procedures.[10,11] Regulatory organizations such as American Dental Association (ADA) published guidelines for continuing only emergency/urgent dental care with directives to defer routine dental work. A number of dentists felt reluctant and fearful for treating patients at this situation.[12] This led to restrictions in dental services easily available to the general population aggravating dental neglect and leading to reduced access to the public.[13] The situation was a challenge to the dentists in providing oral healthcare and at the same time for patients in gaining access to their proper oral care.

Furthermore, to control the rampant spread of COVID-19, many governments had to prioritize regulatory restrictions and lockdowns including shutting down of shops, offices and schools for physical attendance. The economic crisis led to unprecedented job loss that shifted the prioritization towards basic necessities.[14] There is a limited knowledge regarding the degree of challenges faced by families and children with restricted dental services in Northeast Delhi which mainly comprises of low socioeconomic strata. To the author's best knowledge, few studies aim to assess and grade the impact of challenges faced by families and children with an emphasis on the oral health and associated problems during COVID-19 pandemic.

Therefore, the objective of the present study is to thoroughly examine the effects of the COVID-19 pandemic on the oral health of children. This investigation seeks to identify the various ways in which the pandemic has influenced pediatric dental care, including access to services, changes in oral hygiene practices, and overall oral health outcomes among children. The study was done on participants who were previously registered dental patients in outpatient settings in the Pediatric and Preventive Dentistry Department of a Tertiary Care Hospital. The study also evaluated the methods adopted by parents to resolve their children's dental concerns through tele dentistry.

Materials and Methods

Ethical Considerations

Ethical clearance for the study was granted by the Institutional Ethical Committee of the University College of Medical Sciences and Guru Teg Bahadur Hospital, Delhi, India (IEC-HR-2020/PG/46/80-R1). Informed consent was secured from the parents or guardians of the children participating in the study. This process included obtaining telephonic consent, which was documented using a preapproved pro forma. This method was chosen to ensure that the consent was given freely and that parents were fully informed about the nature and purpose of the study.

For children aged 7–12 years, verbal assent was obtained. For older children aged 12–14 years, a more formal process was implemented. An assent form was utilized to gather their agreement over the phone. This form provided a clearer structure for the assent process and ensured that the children understood what participation entailed.

Additionally, the conversation was recorded to maintain a clear record of the assent given by the child, which adds a layer of accountability and transparency to the ethical procedures followed in the study. The local language, i.e., Hindi was used for informed consent as well as pediatric verbal assent. Teledentistry was employed to interview parents. The purpose and the nature of the study were explained, and patient confidentiality was maintained. All necessary telephonic recordings were also preserved.

Sample Size Determination

The Department of Pediatric and Preventive Dentistry had access to a comprehensive list of phone numbers belonging to previously registered pediatric patients, phone numbers of previously registered pediatric patients were accessible within the Pediatric and Preventive Dentistry department. A total of 1,800 phone numbers belonging to pediatric dental patients were meticulously searched to collect data on 1,500 children. This effort was aimed at identifying and reaching out to the parents of these children to assess their willingness to participate in a study. The research team specifically sought to account for those parents who chose not to participate, ensuring a thorough understanding of the overall participation rates and potential biases within the study population.

Questionnaire Design and Data Collection

A cross-sectional observational study was carried out using a telephonic interview questionnaire (tele-questionnaire) between April and October 2021, in adherence to the strengthening the reporting of observational studies in epidemiology (STROBE) guidelines. This study aimed to gather data on pediatric patients by conducting structured interviews over the phone. To facilitate this process, phone numbers of previously registered pediatric patients were sourced from the Department of Pediatric and Preventive Dentistry. The study's design aimed to ensure a comprehensive understanding of the participants' experiences and oral health outcomes through direct communication, allowing for a richer collection of qualitative and quantitative data. A total of 1,500 participants responses were collected.

The tele-questionnaire consisted of 15 items structured into two sections. In the first section, demographic details such as age and gender of the child, parent's age, gender, socioeconomic status with the level of education according to the Modified Kuppuswamy Scale 2020, and family's financial status before and during the COVID-19 pandemic were collected. In the second section, children's dental problems, dental trauma, and the management of such problems during the COVID-19 pandemic were recorded and analyzed using the Dental Problems and Treatment Needs (DPTN)-COVID-19 Questionnaire which were either dichotomous (yes/no) or multiple-choice questions.

Structuring the Questionnaire

A structured telephone questionnaire was created by the primary investigator with guidance from literature reviews and input from the supervising and co-supervising researchers in the specific field. To assess the reliability and functionality of the questionnaire, a pilot study was conducted. In this study, 121 participants were randomly chosen from records of patients who had previously visited and were interviewed via telephone. The internal consistency, measured by Cronbach's alpha, indicated a reliability and validity of the questionnaire data at 0.6 and 0.65. The telephone questionnaire was developed in line with the STROBE guidelines.

The questionnaire consisted of 15 items divided into two main sections. The first section gathered demographic information, including the child's age and gender, the parents' age and gender, and socioeconomic status, which was assessed using the modified

Kuppuswamy scale 2020. It also covered the family's financial situation before and during the COVID-19 pandemic. In the second section, the dental issues experienced by children during the COVID-19 period in India were recorded, focusing on any dental complaints or trauma. The parents' approaches to managing these dental problems were also evaluated. The questionnaire used was the DPTN-COVID-19. Responses included yes/no options, while some questions allowed for multiple-choice answers.

Interview

After pretesting the questionnaire, a list of 1,800 children was compiled from the Department of Pediatric and Preventive Dentistry's previous patient records. The primary investigator then initiated contact with each individual through telephonic interviews. Before administering the questionnaire, a preapproved introduction, written and validated in the local language (Hindi), was narrated to each participant. This introduction explained the purpose and nature of the interview process. The participants' willingness to participate was evaluated, and informed consent, along with assent, was recorded telephonically.

Each participant was interviewed for a duration of 15–20 minutes, and in a typical 3-hour session, around 6–7 patients were interviewed. While conducting the phone interviews, some participants did not initially respond to the calls. In such cases, follow-up calls were made at different times to maximize the likelihood of reaching them and obtaining their responses. A few respondents requested to reschedule their interview time, and their requests were accommodated by contacting them at their preferred time. Additionally, some contact numbers were found to be unavailable or disconnected. During the telephonic questionnaire interviews, the majority of parents were able to comprehend and respond to the questions. However, there were instances where some parents struggled to understand certain questions. For these cases, the interviewers made efforts to simplify the questions by repeating them two to three times and providing further explanations. If, despite these efforts, the communication barrier persisted, the child was excluded from the study. After excluding non-responders, poor responders, and those who did not provide consent, the interview process continued with the remaining eligible participants. Each interview lasted approximately 15–20 minutes, allowing for the completion of six to seven interviews within a 3-hour session. Overall, this systematic approach aimed to maximize participation and obtain quality data while ensuring that all participants were treated with respect and consideration throughout the process.

Validity and Reliability of the Questionnaire

A customized tele-questionnaire was developed by the primary investigator after reviewing the available related literature, and the questionnaire was face-validated by experts in the particular field. The questionnaire's face validity was checked by distributing it to 25 parents of the children who had visited the department, who were given certain revisions, and the time they took to complete the questionnaire was measured. The updated questionnaire was then sent to the expert panel, which was made up of academic members from the department, to examine the content validity. Common mistakes, such as confusing, misleading, or double-barreled questions, were discovered and corrected. Five questions were eliminated because their Aiken's index was <0.7. Internal consistency (Cronbach's alpha, which addressed the reliability and validity of the questionnaire data) was also assessed and was found to be 0.6 for the DPTN-COVID-19 Questionnaire and 0.65 for the DHLC-COVID-19 Questionnaire. The final version was then pilot tested among 121 participants.

Statistical Analysis

Data were entered on an Excel sheet and analyzed using the SPSS software, version 25.0, IBM Corp. Chicago, USA. Whereas continuous nonparametric data were presented as median and interquartile range, continuous parametric data were reported as mean and standard deviation. There were percentages provided for the category data. Using the Chi-square test, categorical data was compared between groups.

Results

In this descriptive observational study, 1,500 children aged 0–14 years were included. The mean age for male participants was 9.18 ± 2.6 years, while female participants had a mean age of 8.78 ± 2.4 years. The demographic characteristics and anthropometric data for the participants are summarized in Table 1. According to the modified Kuppuswamy Scale 2020, participants were classified

Table 1: Demographic details

	Sex	*N*	*Mean*	*Std. Deviation*	*Std. Error Mean*
Age	Male	922	9.18	2.600	0.086
	Female	578	8.78	2.478	0.103
	Socioeconomic status (Kuppuswamy scale 2020)		*Total*	*Gender*	
				Male	*Female*
Lower		*N*	237	161	76
		%	16%	67.9%	32.1%
Upper Lower		*N*	634	351	283
		%	42.2%	55.4%	44.6%
Lower Middle		*N*	537	349	188
		%	35.8%	65.0%	35.0%
Upper Middle		*N*	92	61	31
		%	6.1%	66.3%	33.7%

(Contd...)

Table 1: *(Contd...)*

Sex	*N*	*Mean*	*Std. Deviation*	*Std. Error Mean*
Upper	*N*	0	0	0
	%	0	0%	0%
			Gender	
Income		*Total*	*Male*	*Female*
Complete loss of income	*N*	172	102	70
	%	11.4%	59.3%	40.7%
Drastically reduced	*N*	834	515	319
	%	55.65%	61.8%	38.2%
Slightly reduced	*N*	367	229	138
	%	24.40%	62.4%	37.6%
Not affected	*N*	127	76	51
	%	8.46%	59.8%	40.2%
Increased	*N*	0	0	0
	%	0%	0%	0%
Total	*N*	1500	922	578
	%	100%	61.5%	38.5%

COVID-19 related consequences	*Number of family members with either consequence*	*Percentage %*
Family member lost their job during COVID -19	903	60.2
Family member get infected from COVID-19	1,175	78.3
Family member get hospitalized due to COVID-19	664	44.3
Family member lost their life from COVID-19	257	17.1

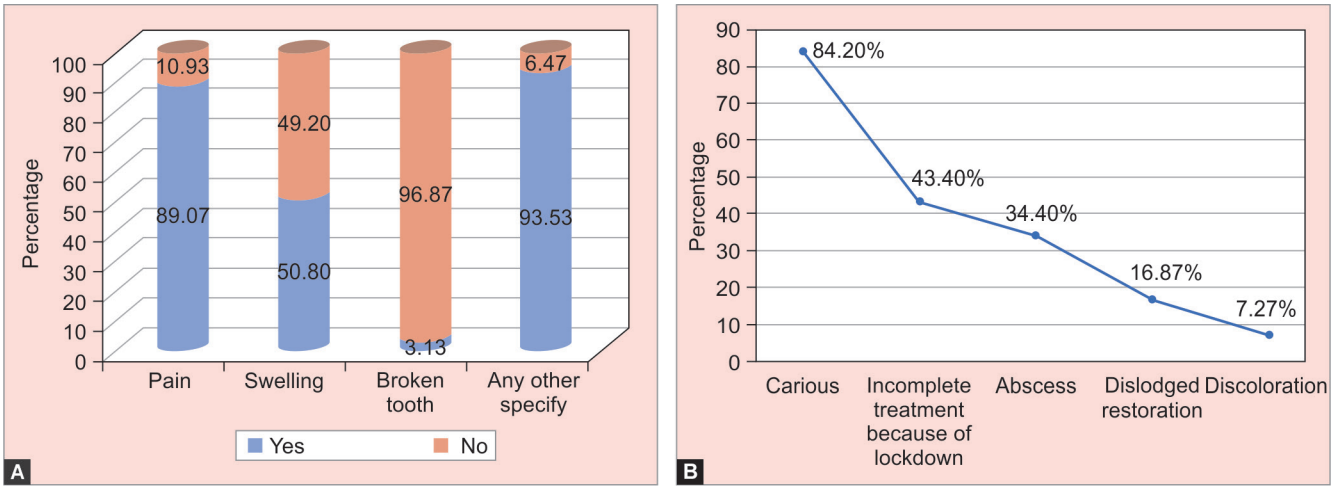
into socioeconomic categories, with 42.2% falling under the "upper-lower" class. The COVID-19 pandemic led to significant financial challenges, as 834 respondents reported a notable decline in income. Regarding employment, 60.2% of participants experienced job loss as a result of the pandemic. Furthermore, 78.3% of participants reported that family members had been infected with COVID-19, with 44.3% requiring hospitalization and 17.1% tragically losing their lives to the virus (Table 1).

Regarding the child's oral health status during COVID-19 pandemic, more than half of the children 89.07% (n = 1,336) suffered pain or toothache, followed by swelling in 50.80% (n = 762) respectively. The pain or toothache and swelling are exacerbated by cumulative effect of other various factors with high percentage 84.2% (n = 1,263) reported with carious teeth, followed by 43.4% of children reported incomplete previous treatment and 16.87% (n = 253) reported dislodged restoration. Some children were also reported of having abscess 34.4% (n = 516) with respect to the tooth and few of them 7.27% (n = 109) had reported discoloration of the tooth (Table 2 and Fig. 1). Interestingly, out of 1,500 participants only 46 of them, i.e., 3.1% have reported dental trauma during COVID-19 pandemic. Out of them, the type of injury was knocked out tooth in 0.8% loosened or displaced tooth in 0.7% and around 1.7% have other various type of getting injured to the tooth. (Table 2).

Regarding the methods adopted by the parents to manage their child's dental problems it was observed that most of the parents 64.1% managed it at their home, 12.3 and 5.1% obtained private dental and medical consultation. Small percentage of 8.1% went for treatment and consultation at government hospital and 10.2% do not avail any management for the same. Most of the parents managed their child's dental problems at their home in which high percentage of parents 57.5% (n = 862) self-medicated their children. Of the parents who practiced self-prescribed medicine to their children, used previous prescriptions or over the counter from the pharmacist. Some of the parents also utilized home-based

Table 2: Analysis of dental complaints reported by parents of their children during COVID-19 pandemic

	Yes		*No*	
Dental complaints	*N*	*%*	*N*	*%*
Pain	1,336	(89.07%)	164	(10.93%)
Swelling	762	(50.80%)	738	(49.20%)
Broken tooth	47	(3.135)	1,453	(96.87%)
Other dental problems	1,403	(93.53%)	97	(6.47%)
Other dental complaints/ problems			*N*	*%*
Carious tooth			1,263	(84.20%)
Incomplete treatment because of lockdown			651	(43.40%)
Abscess			516	(34.40%)
Dislodged restoration			253	(16.87%)
Discoloration			109	(7.27%)
Dental trauma		*N*		*%*
Knocked out tooth		11		0.8
Loosened or displaced tooth		10		0.7
Chipping of tooth		25		1.7
Total dental trauma during COVID-19		46		3.1



Figs 1A and B: Analysis of dental complaints reported by parents of their children during COVID-19 pandemic

remedies like clove oil 35.5% (n = 532) and 8.3% salt water to mitigate their child's dental pain. Over 5.7% of them increases the brushing frequency of their children to lessen the dental pain (Table 3 and Fig. 2).

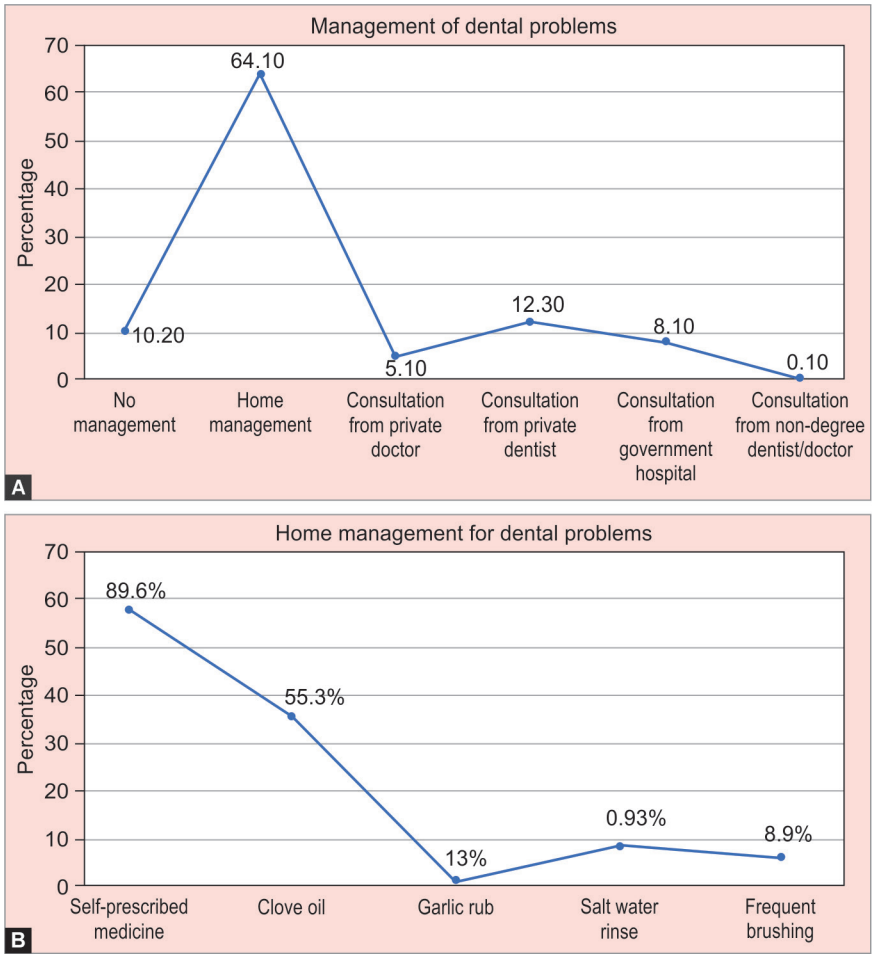
Considering, the change in pattern in the oral hygiene measures in children during lockdown period, it was observed that before COVID-19 there were high percentage 90.5% (n = 1,358) of children brushing their teeth once daily in the morning which showed drastic reduction during COVID-19. There was a dropped from 90.5 (n = 1,358) to 39.3% (n = 589). Importantly, children who were brushing irregularly was 1% prior to COVID-19, a negative trend emerged during COVID-19 where irregular brushers increased from 1 to 49.2%. Another slight negative trend that appeared was that children with good habit of brushing morning and evening declined by 2.6%. Interestingly, number of children brushing twice daily increase by 2% were shown in Figure 3A. The observation of additional oral hygiene aids practices by the parents for their child's oral health showed that a very few percentages of parents practice oral hygiene aids in their children in which positive trend was observed. There was an increased percentage in the utilization of warm water from 0.8 (n =12) before COVID-19 to 14.8% (n = 222) during COVID-19. Before COVID-19, 2.4% (n = 36) participants who used to practice mouthwash in their child oral hygiene routine that also got slight increase in percentage 2.7% (n = 40) during COVID-19. Furthermore, slight increase in usage of tongue cleaner in their child's oral hygiene routine were also observed during COVID-19 (Fig. 3B).

The comparison between different dental symptoms amongst children with relation to family member got infected with COVID-19, lost their job and lost their life during COVID-19 were done using Chi-square test. This showed a high significant difference between the study participants who reported pain, swelling and other dental problems with those family members who got infected with COVID-($p < 0.001$*) 19. Therefore, it was evident that COVID-19 infection in the family member had greater relation with the dental symptoms. Similarly, a high significant difference were observed between the study participants who reported pain, swelling and other dental problems with those family members who had lost their job and lost their life during COVID-19 (<0.001*). A very large number of the children who had lost a family member had complaints of pain and swelling. There was no significant difference between broken tooth with COVID-19 infection and loss of life due to COVID-19 amongst family members (Table 4).

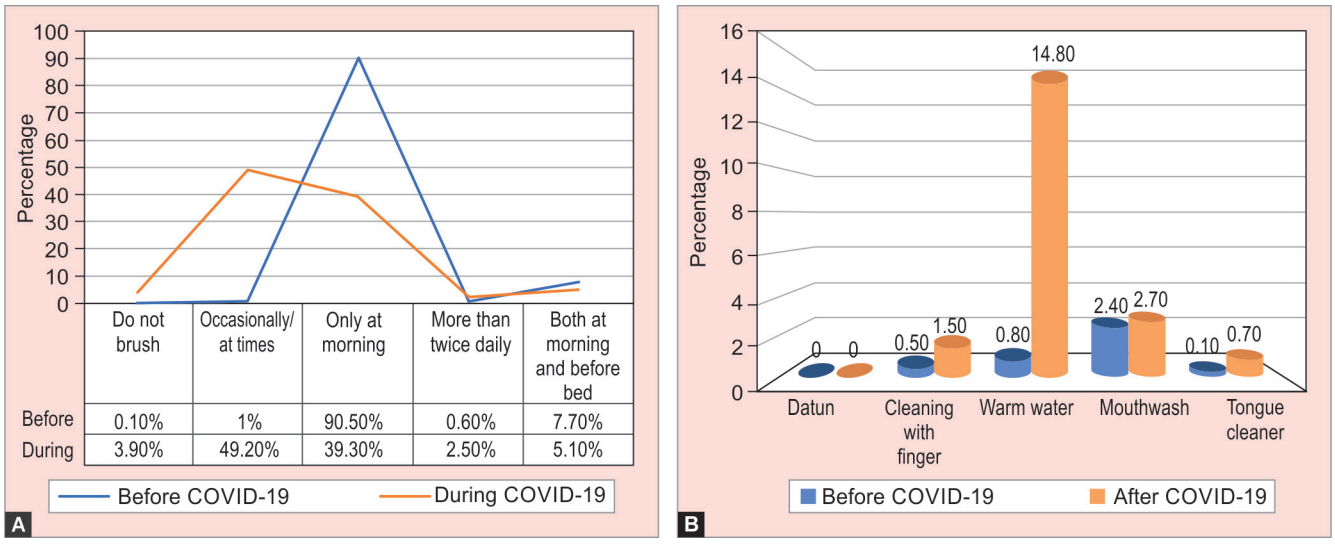
Association between brushing pattern in relation to loss of job, COVID-19 infection and lost of life amongst family member during COVID-19 was compared using Chi-square test. It was observed that the occasional/irregular brushers that were having very high percentage during COVID-19 were also depicted more in children whose family member had lost their job during COVID-19.

Table 3: Methods adopted by the parents for their child's dental management during COVID-19 pandemic

Management of dental problems	*N*	*%*
No management	153	10.2
Home management	961	64.1
Consultation from private doctor	77	5.1
Consultation from private dentist	185	12.3
Consultation from government hospital	122	8.1
Consultation from non-degree dentist/doctor	2	0.1
Home management	*N*	*%*
Self-prescribed medicine	862	(89.6)%
Use of clove in tooth	532	(55.3)%
Salt water	125	(13)%
Garlic rub	9	(0.93)%
Any other specify (Frequent brushing)	86	(8.9)%
Dental trauma management	*N*	*%*
No management	6	0.4
Home management	5	0.3
Consultation from private doctor	2	0.1
Consultation from private dentist	23	1.5
Consultation from Government hospital	8	0.5
Consultation from non-degree dentist/doctor	2	0.1



Figs 2A and B: Methods adopted by the parents for their child's dental management during COVID-19 pandemic



Figs 3A and B: Comparison of oral hygiene measures before COVID-19 and during COVID-19 pandemic

Similarly, non-brushers were observed more in children whose family member had lost their job. Whereas the morning brushers, more than twice daily and both morning and before bed were increased in number whose family member do not lose their job during COVID-19. Overall, there was significant difference between study participants using various oral hygiene measures during COVID-19 with families who had lost their job during this period. ($p < 0.001$*) (Table 5).

Table 4: Analysis of different dental symptoms amongst children with respect to COVID-19 related consequences

Dental problems during COVID-19		*Family member did not lose job during COVID-19 (n = 597)*	*Family member lost a job during COVID-19 (n = 903)*	
Symptoms	*Number*	*N*	*N*	*p-value*
Pain	*N* =1,336	499	837	0.001*, sig
Swelling	*N* = 762	225	537	0.001*, sig
Broken tooth	*N* = 47	15	32	0.001*, sig
Other dental problems*	*N* = 1,403	560	738	0.001*, sig
Dental problems of children during COVID-19		*Children whose family member not infected with COVID-19 (n = 325)*	*Children whose family member infected with COVID-19 (n = 1,175)*	
Symptoms	*Number*	*N*	*N*	*p-value*
Pain	*N* =1,336	218	1,118	0.001*, sig
Swelling	*N* =762	68	694	0.001*, sig
Broken tooth	*N* = 47	15	32	0.065, ns
Other dental problems*	*N* =1,403	260	1,175	0.001*, sig
Dental problems of children during COVID-19		*Children whose family member did not lose life due to COVID-19 (n = 1,243)*	*Children whose family member lost life due to COVID-19 (n = 257)*	
Symptoms	*Number*	*N*	*N*	*p-value*
Pain	*N* = 1,336	1,082	254	0.001*, sig
Swelling	*N* = 762	551	211	0.001*, sig
Broken tooth	*N* = 47	37	10	0.587, ns
Other dental problems*	*N* = 1,403	1,150	253	0.001*, sig

*Statistically significant; ns, nonsignificant

Table 5: Analysis of variation in oral hygiene measures in relation to COVID-19 related consequences

Oral hygiene measures during COVID-19		*Family member lost job during COVID-19 (n = 903)*		*Family member did not lose job during COVID-19 (n = 597)*		
Habit	*Number*	*(N) %*	*Out of 903*	*(N) %*	*Out of 597*	*p-value*
Non-brushers	*N* = 59	49	5.4 %	10	1.7%	0.001*, sig
Occassionally/at times	*N* = 738	551	61.1%	187	31.3%	0.001*, sig
Morning brushers exclusively	*N* = 589	264	29.3%	325	54.3%	0.001*, sig
More than twice daily	*N* = 37	16	1.8%	21	3.5%	0.001*, sig
Both morning and before bed	*N* = 77	22	2.4%	55	9.2%	0.001*, sig
Oral hygiene measures during COVID-19		*Family member infected with COVID-19 (n = 1,175)*		*Family member not infected with COVID-19 (n = 325)*		
Habit	*Number*	*N %*	*Out of 1,175*	*N %*	*Out of 325*	*p-value*
Non-brushers	*N* = 59	59	5.0	0	0	0.001*, sig
Occassionally/at times	*N* = 738	647	55.1	91	28	0.001*, sig
Morning brushers exclusively	*N* = 589	406	34.5	183	56.3	0.001*, sig
More than twice daily	*N* = 37	26	2.2	11	3.38	0.001*, sig
Both morning and before bed	*N* = 77	37	3.14	40	12.3	0.001*, sig
Oral hygiene measures during COVID-19		*Family member lost life from COVID-19 (n = 257)*		*Family member had not lost life from COVID-19 (n = 1,243)*		
Habit	*Number*	*N %*	*Out of 257*	*N %*	*Out of 1,243*	*p-value*
Non-brushers	*N* = 59	7	2.7	52	4.18	0.001*, sig
Occassionally/at times	*N* = 738	176	68.4	562	45.2	0.001*, sig
Morning brushers exclusively	*N* = 589	65	25.2	524	42.1	0.001*, sig
More than twice daily	*N* = 37	9	3.5	28	2.25	0.001*, sig
Both morning and before bed	*N* = 77	0	0	77	6.19	0.001*, sig

*Statistically significant

Discussion

This study is a population-based observational analysis focused on assessing the types and frequency of dental problems encountered by children and the changes in their dental behaviors during the COVID-19 pandemic. The pandemic has had detrimental effects on public health, economic conditions, and social and psychological well-being across the globe. Amid the global turmoil, India witnessed a substantial increase in COVID-19 cases and deaths, especially during the second wave, which left profound and devastating impacts on the lives of its citizens.

In the present study, it was found that the 903 out of 1,500 parents lost their job during the pandemic. About 91% families disclose a reduction in their income. Overall, 91.45% of the participants has decreased family income during this pandemic. Similar study in Brazil showed 73% of participants lost income during the COVID-19 pandemic.[15,16] A high number of participants' family members belonged to low socioeconomic strata, i.e., 42% comes under the ''Upper-lower'' socioeconomic category, followed by 36% in the 'lower-middle' category, 16% belonging to ''lower'' category, and about 6% in "upper-middle" socioeconomic category. Majority of the participants belonged to the 'Upper-lower' socioeconomic category.

Chief Complaints (DPTN-COVID-19 Questionnaire)

Using the DPTN-COVID-19 Questionnaire self-prepared customized questionnaire, the preregistered children had varying dental symptoms in which it was found that as expected almost 90% of the children were found to be experiencing dental pain and 50% had swelling. Among them, 84.2% reported dental caries involvement, 43.4% incomplete treatment, 34.4% with abscess, about 16.87% reported dislodged restoration, and a few of them 7.27% had reported discoloration of teeth. Similar reports were made by Burgette J et al.[14] who gave the association of unmet dental healthcare in pandemic due to financial crisis. Similarly, Li Z et.al.[10] in Wuhan, China also reported 44.2% of school-age children suffered pain /discomfort related to teeth during the pandemic. In a study done on adults of Indonesia, pain and dental caries were the most common dental problems reported during COVID-19. In our study, only 3.1% of children reported traumatic dental injuries during this pandemic. Similarly, Wooley J and Djemal S[17] also found a 50% reduction in TDI's presenting in 2020 during COVID-19 compared to 2019. Our findings were similar to a study by Eggmann F et al.[18] from Swiss dental institution who found a decline in the number of dentoalveolar injuries. A significant association between different dental symptoms such as pain, swelling, and other dental problems amongst children concerning the loss of a job amongst family members during the COVID-19 pandemic. Economic burden especially self-reported financial problems were associated with financial barriers to dental care and adverse mental outcomes.[14,19] It is possible that the children of this study had dental problems which were further increased because of inaccessible dental care.

COVID-19-related Consequences

In the course of the present study, 1,175 participants family members got a COVID-19 infection, 664 got hospitalized and about 257 lost their life from COVID-19. Pain, swelling, and other dental problems were seen in more children where a family member was infected with COVID-19. This correlation was highly significant. University of Michigan study[20] reveals that during COVID-19, child dental care suffered with one of the 3 parents found it difficult to access dental care. Similarly, a large number of the children who had lost a family member had complaints of various dental symptoms of pain and swelling with other dental problems.

Dental Problems and their Management

Most parents preferred to manage their child's dental problems at their home itself (64.1%). It was observed that a substantial percentage, i.e., 57.5% of self-medication by parents was reported in children in this study. A recent study by Tunc et al.[21] has also reported with high preference (70.2%) for self-medication in children with dental problems in Northern turkey during the COVID-19 pandemic. The vast majority of parents in the current study reported that the self-medication practices have been done using previously prescribed medicine to their children and some based on the advice from pharmacists. In our study, some parents also preferred home management for dental problems by using clove, salt water rinses and garlic rub as a home-based remedies measure for relieving a child's dental pain. Few of them also increase the brushing frequency of their children to lessen the dental pain. These findings may be attributed to the difficulties in accessing healthcare providers during the COVID-19 pandemic. A study by the University of Michigan in[22] also reveals the difficulty faced by parents in access to dental care during the pandemic. A study by Onchonga D[23] reveals increased internet searches in the context of self-medication during COVID-19. Other than home management, very few parents obtained doctor's consultation from the private and government sector for their child's dental treatment needs due to fear of contracting COVID-19 which may increase the risk of serious health and oral health issues in the coming future is substantiated by other studies as well.[21,22,24]

Oral Hygiene Practices

The oral hygiene practice of children was affected by a change in pattern in the oral hygiene measures during the COVID-19 pandemic. In this study, the brushing frequency decreased from pre-COVID-19 to during COVID-19. It was observed that a high percentage of children who were morning brushers exclusively during pre-COVID-19 times showed drastic reduction during the COVID-19 pandemic, i.e., 90.5–39.3%. A negative trend was also observed amongst occasional brushers. Occasional brushers increased from 1 to 49.2% during COVID-19. The number of non-brushers also increased. Another slight negative trend that appeared was those children with the good habit of brushing both mornings and before bed declined by 2.6%. Interestingly, few children took up the habit of brushing more than once. They were probably those who found relief in pain by brushing.

This alteration in children's toothbrushing regime was explained by Baptista et al.[2] from Brazil and the reasons found contributory were lack of social interaction due to suspension of schools, changes in the family routine, and parents working from home thus leading to poor oral hygiene during this pandemic. On the other hand, our findings were in contrast to, Campagnaro R et al.,[16] where they have reported an 83.5% increase in child's teeth brushing during the pandemic. Another study was done on school-age children in Wuhan, China also reported an increase in the frequency of tooth brushing during COVID-19 times.[10] In our study, it was also observed an additional oral hygiene aids practices by the parents for their child's oral health with an increased percentage in taking rinses of warm water during the COVID-19 period were popular (0.8–14%). A slight increase in the utilization of mouth wash and tongue cleaners was also observed in their child's oral hygiene routine.

A pattern was observed amongst oral hygiene measures used by participants whose family member had lost his/her job. Children whose parents had lost their job revealed brushing irregularly/occasionally. This pattern had a significant association with the loss of job of parents ($p < 0.001$). Children who did not brush at all were also more frequently observed in group where family member had lost their job. A strong association was found by the Chi-square test ($p < 0.001$). A pattern on same lines was also observed where a family member had lost their life due to COVID-19. Loss of job of parents, COVID-19 infection in family and loss of life of family member due to COVID-19 was strongly associated with poor oral hygiene measures. A similar report was made by centres for disease control and prevention (CDC) in 2020 wherein COVID-19 complication and poor oral hygiene were strongly associated. Centres for disease control and prevention had commented that population with poor oral hygiene had disproportionately have high incidence of COVID-19 related infection and death.[7] Similar observation was made by Sampson et al.[25] wherein he stated that interbacterial exchanges occurring between mouth and lung are responsible for the increase of superinfection. Poor oral hygiene is in a way probably related to COVID-19 associated loss of life in our study also. Researchers also quoted that improved oral hygiene may reduce the risk of respiratory complications related to COVID-19.[26] It may be viewed in another way also; mental health disturbances or emotional disturbances were possibly there in families where death occurred which may have led to decreased oral hygiene.

Conclusion

To control the spread of (COVID-19) pandemic, many governments worldwide, declared a state of emergency, lockdowns, social distancing, self-isolation and restrictions were imposed. These measures led to economic crisis for many with unprecedented job loss that shifted the prioritization towards basic necessities. In the health sector, it involved extensive restrictions for general public with the availability of only emergency services. In the dental care sector, various organizations and association such as ADA, Dental Council of India (DCI) and MOHFW generated the guidelines for only emergency and urgent dental care to be performed in the organized manner.

Due to enforced lockdown and its resultant situation, it was anticipated that oral health of children would be affected. In order to have a clear picture of what were the oral health difficulties faced by these children and how their parents tackle their problems in the lockdown period, the study was envisaged. As per our knowledge no such comprehensive data in Indian scenario for children was available in the literature, making this study of strategic value.

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