Covid-19 pandemic and clinical activity stop: oral health study in a group of children



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Abstract

Aim Public and private health services, which provide both preventive and health promotion interventions, were forced to suddenly stop their activities to limit the risk of infections during the pandemic emergency. Oral health administration, including that of children, was affected by these planned medical service closures, from both therapeutic and preventive perspectives. This study aims to analyse the consequences, at the oral cavity level, of failures to treat patients of childhood age, considering the impact of carious pathology on quality of life and incorrect eating and oral hygiene habits, which may occur in this age group.

Methods This is a cross-sectional, single-center, observational study. One hundred patients from the Odontostomatological University Center (C.O.U.) of Perugia were randomly enrolled.

Results The dmft/DMFT index values obtained from the results of follow-up visits were 2.14, while the results of the first visit was 3.2. Periodontal Screening and Recording (PSR) values maintained the same trend.

Conclusions Oral health status of the examined sample is satisfactory overall, considering the clinic's interruption of treatments with the resulting long period of no follow-up and the emotional and economic stress generated by the pandemic condition for both the young patients and their caregivers.

KEYWORDS Paediatric dentistry, early childhood caries, COVID-19, Minimally Invasive Treatments.

Introduction

Dental caries, which is common in childhood and aggravated by socio-economic factors, is often forgotten by public health systems. Oral health has long been a neglected area of global health [Kutsch, 2014]. Over the years, there has been little interest in promoting good oral health, resulting in operational rather than preventive interventions. Governments have considered oral conditions to be less important than other diseases. However, oral conditions – while rarely life-threatening – impact quality of life, and caries can negatively affect a child's ability to conduct a normal life. Promoting good oral health could help countries achieve childhood development goals [Fraihat et al., 2019; Lancet, 2009].

The incidence of oral diseases, including dental caries, is extremely high every year. Ninety percent of people have experienced dental problems or toothache caused by caries, and in low- and middle-income countries, most caries remain untreated [Abanto et al., 2014; Chaffee et al., 2017].

The prevention of oral diseases is fundamental, and should cover a large part of the practice of public and private dental clinics. There are evidence-based, simple and cost-effective preventive approaches that must be rigorously promoted and implemented by public health services. From a policy perspective, efforts are needed to integrate oral disease prevention into chronic disease prevention programs and public health systems [Sohrabi et al., 2020]. Considering the clinical and social impact of caries in children, the importance of prevention and dental care provided in com-munity-based health facilities is evident. To respond to the spread of the virus during the COVID-19 pandemic, governments worldwide adopted restrictive measures and identified high-risk occupational areas. Among these, dentistry and associated operations stand out, as the oral cavity is part of the upper respiratory tract. The international scientific community and the health ministers of most of the countries involved in the emergency recommended limiting treatment to emergencies only to avoid the spread of the virus from healthcare workers to patients and vice versa [Sohrabi et al., 2020]. Following the Italian Prime Ministerial Decree of March 11, 2020 ART. 1 on urgent measures to contain contagion throughout Italy, activities related to personal services were suspended.

On this principle, dental activities were limited to emergency management and to those services considered essential by the health professional and the patient. Public and private health services, which normally carry out prevention and health promotion interventions, were therefore suddenly forced to stop their activities to limit the risk of contagion [Lewandowska et al., 2021].

The Odontostomatological University Centre (C.O.U), a reference centre of the Perugia hospital, was affected by the

restriction, and since no emergency activities were carried out in the facility, it was closed and converted into a vaccination center. C.O.U. is a public facility that has been applying preventive protocols according to ministerial guidelines for years. The center's scope is to protect social and health vulnerabilities in the dental field. Moreover, the centre represents a point of excellence and reference in the management of the fear of the dentist in childhood, a condition that has always represented an obstacle to access to oral health [Pagano et al., 2022]. The activity in the C.O.U. is characterised by the application of preventive and educational protocols, the use of minimally invasive techniques, and check-ups and recalls aimed at providing care for patients, thus leading to an enhancement of the public service. The closure of the facility left a large pool of paediatric patients without the possibility of therapeutic continuity or preventive interventions. Among the suppressed activities, the check-ups of children attending the Centre stand out. Oral health management has been affected by these planned closures of health services, to the detriment of proper daily oral health care. This problem becomes even more serious when it involves the most vulnerable social and economic segments of the population. For children from the most socio-economically disadvantaged groups, and children with 'special needs', the reduction in the provision of dental care, especially in public settings, leads to a higher deterioration of oral health than in other social contexts where oral disease is less prevalent [Chieruzzi et al., 2018]. All this leads to an increase in inequalities regarding the protection of the right to health and thus access to health services [Cianetti et al., 2020][Pasini et al., 2022][Carli et al., 2022]. The aim of the present study is to understand, through a follow-up visit, how the pandemic, with the consequent cessation of activities, has affected the state of oral health, to assess the degree of maintenance of previously carried out therapies (MIT) and the adherence to prevention protocols previously administered to paediatric patients treated at the C.O.U.

Materials and Methods

Study phases

The study was a single-centre, cross-sectional observational study. A sample of patients aged 4 to 14 years at the C.O.U of Perugia was selected from the clinic's patient registry. The sample was obtained via random extraction (using the randomisation function of the software Microsoft Excel) from the archived patient registry. From the medical records of the selected patients, the landline or cell phone number was extrapolated, which is normally required when the patient enters the clinic, to schedule the follow-up visit.

The study included a follow-up visit with the following objectives: to compare the clinical data with those recorded at the first visit and then at the first access to the facility, to establish the degree of preservation of the oral health status of the group of children involved, the incidence of any new caries, the state of gingival health, the adherence to the recommended dietary and oral hygiene protocols. The study was regularly approved by the Local Ethics Committee (CEAS Umbria) with protocol number 20972/21/ON of 25/02/2021, CER register number 3956/19.

Sample, Sample size and its justification

A sample of 100 patients was selected from the total of approximately 3,500 patients in the care of the COU, including:

- Subjects of both sexes
- Subjects between 4 and 14 years of age
- Italian and foreign subjects
- Subjects who had completed the therapeutic cycle and had been scheduled for follow-up.

The only exclusion criterion was the unwillingness of the parent to participate in the study. The sample size, referring to the literature [Cianetti et al., 2017], was chosen considering socioeconomic variables as these affect the management of oral health in children. The study is single-centre, and 100 patients were planned to be enrolled. The enrollment of 100 patients was decided by referring to a study previously conducted on a sample of patients referring to the sample of patients belonging to the University Dental Center of Perugia. Using the Stata 16 software (StataCorp LLC, Texas, USA) and the odds ratio values of the cited study, we calculated the sample size required by the different variables to obtain a statistical power of 95%, having a significance level of 5%. It was therefore decided to enroll 100 patients, providing for the addition of a 10% "drop out" to maintain statistical significance. To compare the current clinical data (follow-up visit) with that of the first visit and that of the exit from the therapeutic pathway, a power analysis was performed where it was necessary to enroll at least 80 children to obtain a power of 95%.

Protection and confidentiality of personal data

Data was processed in accordance with Italian Legislative Decree 196/2003 and GDPR 679/2016. To ensure data confidentiality, each subject was assigned a serial number by the experimenter in charge, so the experimenter in charge of statistical analysis was not able to link a number to the corresponding person. In addition, a purpose-built computer set up to allow only limited access, with a password known only to the investigators was used for data collection and analysis. The management of paper documentation was carried out in acccordance with the relevant legislation.

Follow-up examination

Follow-up examinations were carried out at the Department of Surgical Dentistry and Outpatient Department of the Santa Maria of Misericordia Hospital of Perugia and included compliance with all prophylactic measures for COVID-19 infection: FFP2 mask, surgical mask, protective shield, use of disposable and/or disinfectable gowns. The visit lasted about 20 minutes for each child and included the collection of the following data:

- dmft (decayed, missing, and filled primary teeth) and DMFT (Decayed, Missing, and Filled permanent Teeth)
- Evaluation of treatments previously carried out at the Clinic
- Periodontal Screening and Recording (PSR)
- Evaluation of oral hygiene habits
- Evaluation of eating habits.

Results

Ninety-eight patients joined the study, as the 2 remaining patients went private because of the long wait.

First access results

DMFT values obtained from the first visit were: DMFT/dmft = 3.2 with DT/dt = 3.06, MT/mt = 0.04 and FT/ft = 0.11.

The obtained PSR data were reported considering the

highest value of PSR for each patient per arch (Table 1) and considering as a percentage the number of affected sextants in the total sample (Table 2).

Last appointment before suspension of the activity

DMFT values obtained from the last appointment before suspension of the activity were: DMFT/dmft = 3.2, with DT/dt = 0, MT/mt = 0.03 and FT/ft = 3.17.

PSR data were reported considering the highest value of PSR for each patient per arch are shown in Table 3 and the affected sextants in the total sample are shown in Table 4.

Check-up visit results (1.5 years of missed check-up)

DMFT values obtained from check-up visit results were: DMFT/dmft 2.14, with DT/dt 0.7, MT/mt 0.02 and FT/ft 1.42. The 0.7 DT/dt regarded 27 of 98 children visited, or 71 had no active caries. There was a total of 69 new caries, or approximately 2.5 caries per child with active disease (69/25= 2.55). The incidence of caries, 27.6% (27 of 98 children), was related to prior caries experience (OR = 2.87; 95% CI 1.03-7.96; p= 0.042), in fact 21 with prior caries experience and 6 without prior caries experience.

PSR data was reported considering the highest value of PSR for each patient per arch, and is shown in Table 5. The percentage of affected sextants in the total sample is shown in Table 6. Clinical verification by means of objective examination and questions about oral hygiene to the child and the parent: 66.3% of the sample was compatible with good oral hygiene standards (73.5% in the first group, 72.4% in the second group, 54.2% in the third group).

Parents of 64.2% of children at the follow-up visit stated that they followed the dietary recommendations given by the provider during the first visit. Clinical stability here is the absence of new caries and/or recurrent caries: objective examination revealed stable caries activity in 72.4% (71/98) and not stable in 27.6% (27/98) of the cases. At the follow-up visit, pain was present in 9.2% (9/98) of the cases, swelling and/or abscesses were 3.1% (3/98). The evaluation of restorations carried out at the COU shows that in a of 284 total fillings performed on the sample (98 patients), 49 fillings were lost. The success rate is 82.7%. However, since 41 of the 49 lost restorations showed healthy, e.g. remineralised, tooth surfaces (AAPD: ART, ITR), the clinical success rate was 97.2%.

Discussion

The management of the oral health of the sample appears to be satisfactory, considering the lowering of the average DMFT/dmft, the interruption of activity at our clinic with the

Upper arch	18-14	13-23	24-28
0	65	69	68
1	31	28	29
2	2	1	1
TOT.	98	98	98

Lower arch	48-44	43-33	34-38
0	68	62	67
1	27	24	28
2	3	12	3
TOT.	98	98	98

1 indicates the highest value of PSR in each patient

TABLE 1 PSR values for each patient recorded during the first visit.

Upper arch	18-14	13-23	24-28
0	70	73	69
1	27	24	28
2	1	1	1
TOT.	98	98	98

Lower arch	48-44	43-33	34-38
0	71	66	71
1	26	23	27
2	1	9	0
TOT.	98	98	98

1 indicates the highest value of PSR in each patient

TABLE 3 PSR values for each patient recorded during the last appointment before suspension of the activity.

Sextants	% Patients
0	54
1	10
2	7
3	12
4	4
5	6
6	7
	100%

1 indicates in percentage

TABLE 2 Number of sextants affected recorded during the first visit.

Sextants	% Patients
0	62.2
1	2
2	0
3	7.1
4	5.1
5	11.6
6	12.2
	100%

1 indicates in percentage

TABLE 4 Number of sextants affected recorded during the last appointment before suspension of the activity.

Upper arch	18-14	13-23	24-28
0	74	63	70
1	21	35	25
2	3	0	3
TOT.	98	98	98

Lower arch	48-44	43-33	34-38
0	82	55	80
1	15	23	17
2	1	20	1
TOT.	98	98	98

1 indicates the highest value of PSR in each patient

TABLE 5 PSR values for each patient recorded during check-up visit.

Sextants	% Patients
0	54.1
1	12.2
2	3.1
3	13.6
4	5.1
5	8.2
6	4.1
	100%

1 indicates in percentage

TABLE 6 Number of sextants affected recorded during check-up visit.

consequent long period of missed follow-up, and the emotional and economic stress generated by the state of pandemic both for the young patients and for those who care for them. In the sample of children visited, despite the difficulties due to the pandemic, while at the time of first access to our clinic the DMFT/dmft had 95.2% active caries (DT/dt), with an average of 3.06 DT/dt in the sample, now the percentage component of active caries (DT/dt) on the overall DMFT/dmft is 32.8%, or 0.7 DT/dt. In the overall sample, the percentage of caries-free children remains stable, going from 40.4% at the last pre-COVID appointment to 40.8%, confirming the positive data previously collected and the general stability of our group of patients in terms of oral health. Therefore, the data obtained is promising, considering how the change in routine and lifestyle during the lockdown influenced the eating habits of the population and the degree of adherence to the Mediterranean diet: this is especially true among younger people [Philippe et al., 2021]. During the lockdown there were changes in eating habits, with an increase in the consumption of foods rich in sugars and high in calories, sometimes also related to the psychological state experienced by attributing to food a consolatory value (comfort food) [Di Renzo et al., 2020]. The frequency of consumption of such foods during the day also increased, further increasing the risk of caries. Increased fermentable sugar consumption results in repeated low pH conditions in biofilms, selecting acid-tolerant bacterial communities and cariogenic species, thus increasing caries risk [Docimo et al., 2021]. As such, during the lockdown there was a significant increase in caries risk factors relative to protective factors, including increased snack intake between meals, increased sedentary lifestyle with reduced physical activity [Medrano et al., 2021; López-Bueno et al., 2020]. Our sample presented an incidence of caries below the average range in the literature. The children belonging to the sample visited had been well educated in our clinic, as 72.4% had a correct diet according to what is prescribed by ministerial guidelines (i.e., avoid sweet food outside meals). Additionally, the analysis of the sample shows somewhat positive results in terms of incidence of new caries in the period of care stop, compared to what could be expected based on data from the international literature. Analysing the data concerning the occurrence of new caries (DT/dt) in the group of children visited after the hospital stay, the incidence of new caries was 27.5%. It was 13.9% in children without previous caries experience and 35.5% in children with initial dmft/DMFT greater than zero, i.e., with previous caries experience. Children with new lesions were 27 out of 98 visited, with an overall number of new active caries of 69: on average, the number of carious lesions per child is about 2.5. There is a large percentage gap between the data we obtained and those currently available in the literature from various studies on the incidence of caries with long-term follow-up: Berti et al. [2020] found a 38.7% of incidence of new caries in their sample, Mahboobi et al. [2021] found 53%, while Maserejian [2009] found 55.7% at the second year of observation. Previous caries experience is confirmed as an important risk factor for the onset of new caries as already observed in various studies in the international literature: in the present study, those with previous caries experience were 2.87 times more likely to have new caries than those without caries experience (OR=2.87; 95% CI 1.03-7.96; p= 0.042). Therefore, although there are currently no studies where the incidence of new caries in the COVID-19 period has been clinically evaluated, it can be assumed that the incidence of caries, with the same time of missed follow-up, is even higher, considering the worsening of eating habits, oral hygiene and psychological stress suffered by the paediatric population at this juncture [Di Renzo et al., 2020; Docimo et al., 2021; Medrano et al., 2021]. On the other hand, a study analysed the demand for emergency visits during the pandemic period by Covid, showing a 45% higher demand for emergency treatment during the pandemic compared to the previous year (2019) considering a paediatric dental population. The study shows that the Covid-19 pandemic led to an increase in paediatric emergency dental visits, in contrast to our sample [Al Masri et al., 2021]. In our study, at the check-up visit, the number of patients with pain was 9.2%, whereas the number of children with abscesses was only 3 out of 98 (3.1%). This data is consistent with that of another survey carried out in Wuhan (China), with 9.8% of pain episodes in the previous month in about 4,500 children [Liu et al., 2021]. The presence, in the follow-up checkup, of gingival health in our sample equal to 54.1% compared to the pre-COVID 62.2%, is a testament to how the pandemic has led to a general worsening of the periodontal status of the population studied. However, this figure is still higher than that of the national and central Italy, where the percentages of gingival health were respectively 47.5% and 45.8% [Liu et al., 2021].

The data regarding the loss of restorations performed in our clinic – following minimally invasive dentistry such as ART and ITR (Interim Therapeutic Restoration) [van't Hof et al., 2006] – is encouraging, as the 97.2% success rate is in line with the international literature, confirming the efficacy of

minimally invasive techniques. At the follow-up visits, there were no secondary caries, but the cavities left uncovered by the lost filling material revealed a remineralised base after apposition of tertiary dentin and, therefore, asymptomatic teeth, exfoliated filled teeth without complications or fillings still in place [Honkala et al., 2003; Saber et al., 2019].

Conclusions

The clinical and social impact of caries in children is significant and the importance of prevention methods to be implemented is evident. The C.O.U. represents a point of reference in the considered region for the prevention and maintenance of oral health, by taking care of patients, especially those belonging to the most vulnerable classes according to ministerial guidelines. The oral health management of the examined sample is good overall, considering 1.5 years of non-follow-up and the conditions of psychological stress, with the consequent worsening of oral hygiene and eating habits generated by the pandemic. The maintenance of the sample's oral health is a sign of the effectiveness of the education and treatments previously carried out at the C.O.U. Further-more, the study confirms the effectiveness of minimally invasive techniques (ART and ITR) which, associated with correct hygiene and dietary practices, make it possible to act not only on the consequences of caries, but also on its causes. The pandemic provided an opportunity to check the health status of patients, including the vulnerable one, in a particular historical period of additional risk. The centre provided a valuable service in terms of care, patient treatment and education, as the results show. Even in a period of risk such as the pandemic, patients were still protected.

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