Impact of the COVID-19 pandemic on the timing of dental care in Peruvian children

María Claudia Garcés-Elías[1,A–F], César Eduardo Del Castillo-López[1,A–F], Roberto Antonio León-Manco[1,A–F], Andrés Alonso Agudelo-Suárez[2,A–F]

[1] Faculty of Dentistry, Cayetano Heredia Peruvian University, Lima, Peru
[2] Faculty of Dentistry, University of Antioquia, Medellín, Colombia

A – research concept and design; B – collection and/or assembly of data; C – data analysis and interpretation; D – writing the article; E – critical revision of the article; F – final approval of the article

Dental and Medical Problems, ISSN 1644-387X (print), ISSN 2300-9020 (online) *Dent Med Probl.* 2022;59(1):37–44

Address for correspondence
María Claudia Garcés-Elías
E-mail: maria.garces@upch.pe

Funding sources
None declared

Conflict of interest
None declared

Acknowledgements
None declared

Received on July 21, 2021
Reviewed on August 10, 2021
Accepted on August 23, 2021

Published online on February 15, 2022

Abstract

Background. Due to the high transmissibility of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which causes coronavirus disease 2019 (COVID-19), governments adopted preventive measures, such as social distancing and obligatory social immobilization, which negatively affected access to health services, including oral health services. Similarly, dental care restraint arose in this context, with the aim of reducing the possibility of cross-infection caused by aerosols, which notably restricted dental care activity.

Objectives. The aim of the study was to determine the impact of the COVID-19 pandemic on the timing of dental care in Peruvian children.

Material and methods. A cross-sectional study with a population of 42,115 respondents for 2019 and 20,510 for 2020 was conducted. The participants were children aged 0–11 years. The records of those who responded to the question on the time since their last dental care were considered, extracting a total of 22,166 (69.03%) subjects for 2019 and 9,945 (30.97%) subjects for 2020. The dependent variable consisted of the time since the last dental care measured in years; the variables of health, geographic and sociodemographic characteristics were grouped within 3 dimensions. Descriptive bivariate and multivariate analyses were applied by means of multiple linear regression in order to analyze the variables.

Results. The time since the last dental care during 2019 was 5.25 ±4.30 years, and it increased to 6.64 ±4.90 years in 2020. Within the multivariate analysis, the dimensions and their variables were ordered hierarchically for 2019 and 2020 separately, and as a whole. Each model was not significant when observed independently ($p > 0.05$); however, when evaluated as a whole, validity was observed only in model 1 of the year ($p = 0.018$), with $R^2 = 2.90$, a constant equal to 3.852, the non-standardized regression coefficient (β) of 1.653, and a 95% confidence interval (*CI*) of 0.289–3.018.

Conclusions. The 2020 COVID-19 pandemic year had a negative impact on the timing of dental care in Peruvian children, increasing it by 1.39 years as compared to 2019.

Keywords: delivery of health care, COVID-19, health service accessibility, dental care for children, cross-sectional studies

Cite as
Garcés-Elías MC, Del Castillo-López CE, León-Manco RA, Agudelo-Suárez AA. Impact of the COVID-19 pandemic on the timing of dental care in Peruvian children. *Dent Med Probl.* 2022;59(1):37–44. doi:10.17219/dmp/141521

DOI
10.17219/dmp/141521

Introduction

During its first months, the coronavirus disease 2019 (COVID-19) pandemic became the most complex socioeconomic problem of the last hundred years. It has disproportionately affected nations; Latin America has been one of the most affected regions during the period of the pandemic due to deficiencies in the infrastructure and response capacity of its health care systems, scarce investment in the health care systems by governments, and the pre-existing social disparities.[1,2] The risk of the spread of the virus led to the adoption of containment policies, such as social distancing and mandatory social immobilization, which had a negative influence on access to health services, without necessarily having a direct relationship with COVID-19. This problem also aggravated the health situation in vulnerable people and extreme age groups, especially in those with chronic conditions, reducing the possibility of timely diagnosis and treatment.[3] It is important to mention that the pandemic may have an adverse impact on health and medical care with regard to the acquisition of non-communicable diseases due to the lack of access to primary health services, especially in low- and middle-income countries.[4]

Taking into consideration dental services, it should be noted that it was recommended to delay or avoid visits, and treat only urgent cases in order to reduce the possibility of cross-infection caused by aerosols, which notably restricted dental care activity.[5,6] This was accompanied by high unemployment among oral health providers during the first months of the pandemic. However, practices and clinics were reopened with the incorporation of new biosafety standards, which in turn increased the cost of care. Even prior to the COVID-19 pandemic, there was an economic barrier in terms of access to oral health care. The new situation made it a major public health problem.[7]

A similar situation can be observed in Peru. As of March 12, 2020, several decrees were issued, such as the declaration of a national state of emergency,[8] the suspension of flights and the establishment of exceptional provisions to prevent the spread of the virus within the national territory.[9,10] Despite all the strategies adopted by the government, the community quarantine to counteract COVID-19 did not work in Peru. At the beginning of the quarantine, there were 71 confirmed cases, but by June 2020, when the quarantine ended, there were 268,602 confirmed cases and 8,761 deaths.[11] In addition, the negative impact of the pandemic on the health care system was evident, reflected in the degree of occupation of intensive care unit (ICU) beds at the national level, estimated at 93% of the total capacity, while some services in the interior of the country were already at their maximum capacity.[12] In order to make figures transparent, the government ordered a review of the clinical records of people who died due to the pandemic; consequently, the official figures were updated, showing a considerable increase from 69,342 to 185,380. In addition, this value allowed the identification of a mortality rate of 5,551 deaths due to COVID-19 per million inhabitants, which is the worst official figure worldwide.[13]

Meanwhile, in the field of national oral health care, there was a significant reduction in search for dental services; such behavior could be attributed to the suspension of certain economic activities, like dentistry, due to the fear of contagion as well as to following the provisions of immobility and the postponement of dental treatment. Highlighting that, despite a significant reduction in the number of patients, it was high time to reactivate dental services, as expressed in May 2020 in Supreme Decree No. 094-2020-PCM of the Peruvian government, which included dentistry among the activities allowed in new social coexistence.[14–16] It should be noted that subsequently, through Health Directive No. 100-MINSA-2020-DGIESP, the Peruvian Ministry of Health established provisions to guarantee the continuity of care during the pandemic by means of dental consultations in Peruvian health facilities.[17] The aim was to contribute to the alleviation of the impact of COVID-19 in terms of dental profession through an approach that promotes the reduction of infections, the establishment of biosecurity measures and the specifications of personal protective equipment (PPE), the ratification of disinfection and sterilization protocols, and the identification of risk factors for dental health care personnel. Consequently, the abovementioned recommendations were implemented nationwide, both in public and private dental setups. It was emphasized that during the pandemic, the provision of on-site dental services should be prioritized to emergency and urgent cases.[17] Likewise, in order to reduce the risk of mortality from infection, the criteria for scheduling immunization in the population over 18 years of age were established, prioritizing within 3 phases the individuals who work in the first line of defense, including the health sector workers, in order to preserve the integrity and continuity of the health care system.[18]

There are populations that face greater disparities in the use of health services, such as ethnic minorities, immigrants and those with low economic income, all of whom are more likely to lack dental insurance.[19] At the national level, the use of dental services among Peruvian children shows geographic and socioeconomic discrepancies; dental services are accessed mainly in the quintile with the highest economic capacity and residing in the capital of the country.[20,21] There is a clear need to produce more scientific evidence on access to dental care, evaluated from the perspective of the drastic changes caused by the pandemic; in this sense, the purpose of this research was to determine the impact of the COVID-19 pandemic on the timing of dental care in Peruvian children.

Material and methods

This research used the databases of the 2019 and 2020 Demographic and Family Health Surveys (ENDES), developed by the National Institute of Statistics and Informatics of Peru (INEI). The ENDES is a survey applied annually through home interviews that has a stratified 2-stage cluster-sample design, representative at national, regional, urban, and rural levels. Additionally, it provides information on access to dental care in children aged 0–11 years. In 2019, a sample size of 36,760 dwellings was considered, with a total of 42,115 respondents, while in 2020, the sample size was 37,390 dwellings and 20,510 respondents. A decrease in the number of participants between the 2 years may be due to the COVID-19 pandemic. For the present study, only the records of those subjects who responded to the question about the time since their last dental care were considered, extracting a total of 32,111, with 22,166 (69.03%) subjects for 2019 and 9,945 (30.97%) subjects for 2020. For both years, the surveys were applied from January to December; however, the 2020 survey involved changes due to the health emergency situation and the need to reach the established sample, which led to the implementation of telephone interviews and the subsequent return to face-to-face interviews, maintaining the biosecurity of the field personnel.[22]

Regarding the definition of variables, the time since the last dental care measured in years was considered the dependent variable. For the independent variable, the year was categorized as 2019 and 2020, considering the latter as the period in which the COVID-19 pandemic developed in Peru. In addition, other covariates were incorporated into the analysis, which were grouped into 3 dimensions, namely health characteristics, geographic characteristics and sociodemographic characteristics. The first of these included the possession of health insurance and the place of dental care, categorized into care provided by the Ministry of Health, Social Security (ESSALUD), Armed Forces and Police (FFAA/PNP), and the private sector. With respect to geographic characteristics, the area of residence was categorized as urban, rural or natural region, which could be defined as the Lima metropolitan area (the capital of the country), the rest of the coast, highlands, and jungle. The place of residence was classified as capital, city, town, and countryside. Finally, altitude was dichotomized into less than 2,500 meters above mean sea level (MAMSL) and equal to or more than 2,500 MAMSL. Sociodemographic characteristics were catalogued in quintiles of wealth, a variable composed of the particularities and disposition to some consumption of goods and services that each household possesses. Later, through the methodology applied in the U.S. Demographic and Health Surveys Program,[23] a score was assigned to each household and the same score was assigned to each one of its residents, which allowed stratifying each household from the 1st quintile (the poorest) to the 5th quintile (the richest).[23,24] Age was grouped as 0–5 years and 6–11 years. Finally, the sex variable was considered. It is important to mention that these covariates were also analyzed in previous studies.[20,25,26]

Statistical analysis

The ENDES databases were extracted from the official INEI website (http://iinei.inei.gob.pe/microdatos/) through various modules, which were unified into a single database for the subsequent analysis with the use of the IBM SPSS Statistics for Windows software, v. 25.0 (IBM Corp., Armonk, USA). The analysis was carried out using the complex samples module, since ENDES is a national survey with possible representative estimates.

A descriptive analysis of the qualitative variables was carried out by means of absolute and relative frequencies. For the variable time since the last dental care, the mean and standard deviation ($M \pm SD$) values were obtained. In addition, the normality of the distribution of the dependent variable was evaluated according to other variables with the Kolmogorov–Smirnov test. Subsequently, nonparametric tests were applied – the Mann–Whitney U test for dichotomous variables and the Kruskal–Wallis test for polytomous variables. Next, hierarchical multiple linear regression was developed with the purpose of generating models between the independent variables and the time since the last dental care, according to the dimensions to be analyzed by years separately and together. It is important to mention that a logarithmic transformation was previously applied to the dependent variable due to the lack of normal distribution. The confidence level in the study was 95%, and $p < 0.05$ was considered an indicator of statistical significance in all tests.

Results

The time since the last dental care in 2019 was 5.25 ±4.30 years, and it increased to 6.64 ±4.90 years in 2020. This difference was statistically significant ($p < 0.001$) and represented an increase of 1.39 years. In 2019, the time since the last dental care differed significantly with regard to health insurance tenure, the area of residence, the natural region of residency, altitude, age, and sex ($p < 0.05$). In 2020, differences regarded the place of dental care and the natural region of residency ($p < 0.05$) (Table 1).

A hierarchical multiple linear regression analysis was also performed, considering the models in years

Table 1. Year, health, geographic and sociodemographic characteristics with reference to the time since the last dental care in Peruvian children in 2019 and 2020

Variables			Total *n* (%)	2019			2020		
				n (%)	time since the last dental care [years] *M* ±*SD*	*p*-value	*n* (%)	time since the last dental care [years] *M* ±*SD*	*p*-value
Year of the COVID-19 pandemic *p* <0.001†*			32,111 (100.00)	22,166 (69.30)	5.25 ±4.30	–	9,945 (30.97)	6.64 ±4.90	–
Health characteristics	health insurance	yes	26,008 (80.99)	17,874 (80.64)	5.19 ±4.29	<0.001†*	8,134 (81.79)	6.62 ±4.89	0.475†
		no	6,103 (19.01)	4,292 (19.36)	5.48 ±4.32		1,811 (18.21)	6.73 ±4.97	
	place of dental care *n* = 31,990 (22,070/9,920)	Ministry of Health	19,315 (60.38)	13,479 (61.07)	5.23 ±4.28	0.155‡	5,836 (58.83)	6.76 ±4.89	<0.001‡*
		Social Security	4,990 (15.60)	3,486 (15.80)	5.34 ±4.36		1,504 (15.16)	7.30 ±5.06	
		Armed Forces and Police	106 (0.33)	89 (0.40)	4.36 ±3.83		17 (0.17)	8.94 ±5.08	
		private sector	7,579 (23.69)	5,016 (22.73)	5.24 ±4.31		2,563 (25.84)	5.96 ±4.83	
Geographic characteristics *n* = 21,434 (14,740/6,694)	area of residence	urban	15,558 (75.29)	10,631 (72.12)	5.41 ±4.35	0.006†*	4,927 (73.60)	6.66 ±4.87	0.790
		rural	5,876 (27.41)	4,109 (27.88)	5.19 ±4.26		1,767 (26.40)	6.66 ±4.86	
	natural region of residency	Lima metropolitan area	2,983 (13.92)	1,944 (13.19)	5.46 ±4.45	<0.001‡*	1,039 (15.52)	7.04 ±5.13	<0.001‡*
		rest of the coast	6,335 (29.56)	4,350 (29.51)	5.49 ±4.35		1,985 (29.65)	6.81±4.81	
		highlands	7,570 (35.32)	5,324 (36.12)	5.15 ±4.28		2,246 (33.55)	6.68 ±4.89	
		jungle	4,546 (21.21)	3,122 (21.18)	5.43 ±4.28		1,424 (21.27)	6.12 ±4.67	
	place of residence	capital	2,983 (13.92)	1,944 (13.19)	5.46 ±4.45	0.054‡	1,039 (15.52)	7.04 ±5.13	0.140‡
		city	6,599 (30.79)	4,509 (30.59)	5.41 ±4.39		2,090 (31.22)	6.52 ±4.79	
		town	5,976 (27.88)	4,178 (28.34)	5.39 ±4.27		1,798 (26.86)	6.59 ±4.81	
		countryside	5,876 (27.41)	4,109 (27.88)	5.19 ±4.26		1,767 (26.40)	6.66 ±4.86	
	altitude	<2,500 MAMSL	14,988 (69.93)	10,215 (69.30)	5.43 ±4.35	<0.001†*	4,773 (71.30)	6.62 ±4.88	0.300†
		>2,500 MAMSL	6,446 (30.07)	4,525 (30.70)	5.17 ±4.27		1,921 (28.70)	6.75 ±4.85	
Sociodemographic characteristics	quintile of wealth *n* = 20,381 (14,019/6,362)	1st quintile	4,689 (23.01)	3,326 (23.72)	5.27 ±4.27	0.567‡	1,363 (21.42)	6.59 ±4.86	0.794‡
		2nd quintile	5,336 (28.18)	3,748 (26.74)	5.36 ±4.26		1,588 (24.96)	6.71 ±4.76	
		3rd quintile	4,358 (21.38)	2,936 (20.94)	5.46 ±4.42		1,422 (22.35)	6.70 ±4.90	
		4th quintile	3,423 (16.80)	2,327 (16.60)	5.35 ±4.33		1,096 (17.23)	6.72 ±4.95	
		5th quintile	2,575 (12.63)	1,682 (12.00)	5.30 ±4.39		893 (14.04)	6.63 ±5.05	
	age [years]	0–5	14,607 (45.49)	10,237 (46.18)	4.95 ±4.29	<0.001†*	4,370 (43.94)	6.64 ±5.05	0.068†
		6–11	17,504 (54.51)	11,929 (53.82)	5.51 ±4.29		5,575 (56.06)	6.65 ±4.79	
	sex	male	18,643 (58.06)	12,860 (58.02)	5.31 ±4.32	0.019†*	5,783 (58.15)	6.65 ±4.90	0.778†
		female	13,468 (41.94)	9,306 (41.98)	5.17 ±4.28		4,162 (41.85)	6.63 ±4.91	

n – number; *M* – mean; *SD* – standard deviation; COVID-19 – coronavirus disease 2019; MAMSL – meters above mean sea level; † Mann–Whitney U test; ‡ Kruskal–Wallis test; * statistically significant.

separately and as a whole. When the analysis was done by separate years, the models were not statistically significantly different for any variable ($p > 0.05$) (Table 2); however, when analyzed as a whole and taking into account the year as a variable, only model 1 of the year was valid ($p = 0.018$), with $R^2 = 2.90$, a constant equal to 3.852, the non-standardized regression coefficient (β) of 1.653, and a 95% confidence interval (*CI*) of 0.289–3.018. Although other models were not significant, the statistical significance of the year variable was maintained in all of them ($p < 0.05$) (Table 3).

Discussion

Due to the COVID-19 pandemic, inequalities in terms of equitable health care have increased, disadvantaging certain minority communities that face barriers in access to health services.[27] This situation may have indirect detrimental effects, such as an increase in morbidities due to the lack of preventive services, untimely diagnoses and the cessation of treatment for chronic pathologies, impacting more significantly fragile economies, like those of developing countries.[28]

Table 2. Hierarchical multiple regression models for health, geographic and sociodemographic characteristics with reference to the time since the last dental care in the study sample ($N = 32,111$)

Variables				R^2 [%]	Change of R^2	*p*-value (change of R^2)	Constant	Non-standardized regression coefficient	Standardized regression coefficient	95% *CI*	*p*-value	*p*-value (model)
2019	model 1	health	health insurance	0.20	0.20	0.885	5.880	–0.311	–0.028	–2.155 to 1.534	0.740	0.885
			place of dental care					0.113	0.031	–0.498 to 0.724	0.715	
	model 2	health	health insurance	3.20	3.00	0.382	6.995	1.821	0.148	–1.606 to 5.247	0.290	0.616
			place of dental care					0.009	0.002	–1.131 to 1.148	0.998	
		geographic	area of residence					–1.731	–0.146	–4.677 to 1.216	0.247	
			natural region of residency					0.080	0.019	–0.758 to 0.918	0.851	
			place of residence					0.808	0.183	–0.361 to 1.978	0.174	
			altitude					–0.970	–0.099	–2.829 to 0.888	0.304	
	model 3	health	health insurance	6.40	3.20	0.492	8.818	–0.413	–0.038	–2.346 to 1.520	0.641	0.633
			place of dental care					0.158	0.044	–0.512 to 0.829	0.641	
		geographic	area of residency					–1.953	–0.165	–5.188 to 1.282	0.234	
			natural region of residency					0.179	0.044	–0.721 to 1.079	0.695	
			place of residence					0.692	0.157	–0.535 to 1.919	0.266	
			altitude					–1.427	–0.146	–3.387 to 0.534	0.152	
		socio-demographic	quintile of wealth					0.295	0.095	–0.510 to 1.100	0.470	
			age					–4.869	–0.101	–13.289 to 3.497	0.251	
			sex					–0.091	–0.011	–1.580 to 1.398	0.904	
2020	model 1	health	health insurance	2.20	2.20	0.571	3.746	1.803	0.147	–1.649 to 5.254	0.299	0.571
			place of dental care					0.083	0.021	–1.050 to 1.216	0.883	
	model 2	health	health insurance	12.70	10.40	0.258	9.213	1.821	0.148	–1.606 to 5.247	0.290	0.371
			place of dental care					0.009	0.002	–1.131 to 1.148	0.998	
		geographic	area of residence					–2.656	–0.187	–9.044 to 3.732	0.407	
			natural region of residency					–1.178	–0.242	–3.037 to 0.680	0.208	
			place of residence					–0.011	–0.002	–2.624 to 2.603	0.993	
			altitude					0.319	0.029	–3.380 to 4.018	0.863	
	model 3	health	health insurance	20.00	7.40	0.435	7.957	1.451	0.118	–2.127 to 5.028	0.418	0.420
			place of dental care					–0.160	–0.040	–1.366 to 1.046	0.790	
		geographic	area of residence					–4.511	–0.318	–11.813 to 2.791	0.219	
			natural region of residency					–1.609	–0.330	–3.679 to 0.460	0.124	
			place of residence					0.511	0.103	–2.226 to 3.248	0.708	
			altitude					–0.505	–0.045	–4.328 to 3.319	0.791	
		socio-demographic	quintile of wealth					–0.746	–0.195	–2.499 to 1.006	0.395	
			age					–5.130	–0.980	–13.181 to 3.245	0.224	
			sex					1.253	0.125	–1.699 to 4.206	0.393	

R^2 – determination coefficient; *CI* – confidence interval.

This study reveals an increase of 1 year in the time since the last dental care as compared to the year prior to the outbreak of the COVID-19 pandemic in children under 12 years of age. Previous research by Azañedo et al.,[29] Hernández-Vásquez et al.,[21] and Aravena-Rivas and Carbajal-Rodríguez[20] identified certain determinants of access to oral health services, such as the natural region of residency, living in an urban or rural area, the wealth quintile, the educational level of caregivers, and age. It was observed that the Peruvian population under 12 years of age had limited access to dental services.[20,21,29]

Table 3. Hierarchical multiple regression models for year, health, geographic and sociodemographic characteristics with reference to the time since the last dental care in the study sample (N = 32,111)

Variables			R^2 [%]	Change of R^2	p-value (change of R^2)	Constant	Non-standardized regression coefficient	Standardized regression coefficient	95% CI	p-value	p-value (model)
Model 1	year of the COVID-19 pandemic		2.90	2.90	0.018*	3.852	1.653	0.170	0.289 to 3.018	0.018*	0.018*
Model 2	year of the COVID-19 pandemic		3.00	0.20	0.858	3.080	1.657	0.170	0.286 to 3.029	0.018*	0.117
	health	health insurance					0.315	0.027	−1.311 to 1.942	0.703	
		place of dental care					0.109	0.028	−0.429 to 0.646	0.691	
Model 3	year of the COVID-19 pandemic		5.20	2.20	0.378	5.584	1.755	0.180	0.364 to 3.146	0.014*	0.184
	health	health insurance					0.278	0.024	−1.383 to 1.938	0.742	
		place of dental care					0.050	0.013	−4.970 to 0.596	0.858	
	geographic	area of residence					−1.925	−0.151	−4.618 to 0.769	0.160	
		natural region of residency					−0.208	−0.048	−0.980 to 0.563	0.595	
		place of residence					0.470	0.102	−604 to 1.544	0.389	
		altitude					−0.718	−0.069	−2.381 to 0.946	0.396	
Model 4	year of the COVID-19 pandemic		8.40	3.10	0.291	9.522	1.922	0.198	0.487 to 3.357	0.009*	0.182
	health	health insurance					0.148	0.013	−1.538 to 1.834	0.862	
		place of dental care					0.111	0.029	−0.456 to 0.677	0.700	
	geographic	area of residence					−2.732	−0.215	−5.681 to 0.216	0.069	
		natural region of residency					−0.269	−0.061	−1.093 to 0.556	0.521	
		place of residence					0.395	0.086	−0.707 to 1.497	0.480	
		altitude					−1.101	−0.106	−2.814 to 0.611	0.206	
	socio-demographic	quintile of wealth					−0.048	−0.015	−0.762 to 0.666	0.894	
		age					−5.690	−0.094	−14.372 to 2.991	0.198	
		sex					0.285	0.031	−1.035 to 1.606	0.670	

* statistically significant.

It is important to consider that during 2019 there were significant differences in the timing of dental care according to health insurance tenure, the area of residence, the natural region of residency, altitude, age, and sex. Understanding that, under normal conditions, i.e., without the COVID-19 pandemic, these characteristics determined disparities in relation to the time it took for an individual to be attended. However, for 2020, there were modifications in factors that produced these differences in previous years, as is the case of the place of care, where the contribution of the Ministry of Health, Armed Forces and Police facilities considerably increased the time since the last dental care. Private health care institutions, however, did not present major changes in this aspect as compared to a previous period. Regarding the natural region of origin, there was a generalized increase in temporality, which would indicate that persons under 12 years of age stopped receiving care at the national level.

Although the results show an increase in all of the variables studied, it can be said that there are no longer significant differences between them. In addition, it is understood that of all the characteristics evaluated in the year 2020, the only one that shows great relevance is the year of analysis, which presents significant differences as a variable and as an explanatory model in itself. In this sense, the year had a negative impact on the timing of dental care in Peruvian children under 12 years of age. Also, some other studies mention access to dental care during the pandemic. Firstly, Brian and Weintraub stated that accessibility had been limited, especially in populations with a higher risk of COVID-19, and they also emphasized the measures that were advised, such as avoiding dental care unless it was an emergency, and in cases of COVID-19, delaying it until recovery.[30] Likewise, Kranz et al. reported that 74.7% of adults delayed their dental visits for any type of preventive or recuperative care due to the pandemic.[31]

In accordance with the findings of the present study, it is important to mention that multiple legal provisions and strategies to contain the spread of the virus and strengthen the quarantine were implemented in Peru[8–10]; however, these did not produce the expected results, with a disproportionate increase in both the number of infections and the number of deaths.[11] In addition, the national health care system faced one of the most critical scenarios ever experienced, such as the deficit of ICU beds. The correction of the underreporting of positive cases and deaths

provided hopeless figures that showed the magnitude and severity of the problem, as it translated into the worst global case fatality rate.[12,13] From a dental perspective, the pandemic led to the abrupt interruption of activities, which were allowed and resumed much later within the context of new normality, through policies that ratified biosecurity and the prioritization of care for emergency and urgent cases.[14–17] Subsequently, with the aim of protecting and strengthening the health care human resources, the program of immunization against COVID-19 was initiated, benefiting the health care personnel, including dentists.[18]

Limitations

As for the limitations in the development of this research, its cross-sectional design stands out, which makes it impossible to infer causal relationships with regard to the results.

Furthermore, secondary data from ENDES was used, and there could be a possible emergence of memory bias due to the self-reported information provided by the respondents as well as the loss of information for data analysis.

Finally, it is important to consider that in previous years there were already circumstances that complicated and delayed access to dental care in the country; however, the drastic changes resulting from the COVID-19 pandemic had a preponderant influence on all health care systems and multiple sectors that make up society, with negative repercussions on the accessibility of dental care, either because of the measures implemented by the government or because of the consequences they brought with them. It is evident that within the context of COVID-19, both personal habits and health services underwent important modifications to control the number of infections; however, a radical change in the timing of dental care suggests that the pre-existing problems with access to dental care have increased, especially in vulnerable populations, such as children, even though the state has implemented and strengthened contingency strategies, like teledentistry.

Conclusions

The 2020 COVID-19 pandemic year negatively impacted the timing of dental care in Peruvian children, increasing it by 1.39 years as compared to 2019.

Ethics approval and consent to participate

The study was developed with the open access information provided by the National Institute of Statistics and Informatics of Peru (INEI). Therefore, no ethical approval was required, with regard to the secondary analysis of anonymous information about the study subjects.

Data availability

All data generated and/or analyzed during this study is included in this published article.

Consent for publication

Not applicable.

ORCID iDs

María Claudia Garcés-Elías https://orcid.org/0000-0003-4873-7661
César Eduardo Del Castillo-López https://orcid.org/0000-0001-6831-897X
Roberto Antonio León-Manco https://orcid.org/0000-0001-9641-1047
Andrés Alonso Agudelo-Suárez https://orcid.org/0000-0002-8079-807X

References

1. Bański J, Mazur M, Kamińska W. Socioeconomic conditioning of the development of the COVID-19 pandemic and its global spatial differentiation. *Int J Environ Res Public Health*. 2021;18(9):4802. doi:10.3390/ijerph18094802
2. Santander-Gordon D, Iturralde GA, Freire-Paspuel B, et al. Crucial contribution of the universities to SARS-CoV-2 surveillance in Ecuador: Lessons for developing countries. *One Health*. 2021;13:100267. doi:10.1016/j.onehlt.2021.100267
3. Bambra C, Riordan R, Ford J, Matthews F. The COVID-19 pandemic and health inequalities. *J Epidemiol Community Health*. 2020;74(11):964–968. doi:10.1136/jech-2020-214401
4. Bullen C, McCormack J, Calder A, et al. The impact of COVID-19 on the care of people living with noncommunicable diseases in low- and middle-income countries: An online survey of physicians and pharmacists in nine countries. *Prim Health Care Res Dev*. 2021;22:e30. doi:10.1017/S146342362100030X
5. Nair AK, Mathew P, Sreela LS, Prasad TS, Jose M. Knowledge and attitude toward COVID-19 and dental treatment – its availability and treatment satisfaction during the pandemic among adult population – an online survey. *J Educ Health Promot*. 2021;10:77. doi:10.4103/jehp.jehp_800_20
6. Lundberg A, Hillebrecht AL, McKenna G, Srinivasan M. COVID-19: Impacts on oral healthcare delivery in dependent older adults. *Gerodontology*. 2021;38(2):174–178. doi:10.1111/ger.12509
7. Elster N, Parsi K. Oral health matters: The ethics of providing oral health during COVID-19. *HEC Forum*. 2021;33(1–2):157–164. doi:10.1007/s10730-020-09435-3
8. Government of Peru, Ministry of Health. DS No. 008-2020-SA. Decreto Supremo que declara en Emergencia Sanitaria a nivel nacional por el plazo de noventa (90) días calendario y dicta medidas de prevención y control del COVID-19. Lima, Peru: Government of Peru; 2020. https://cdn.www.gob.pe/uploads/document/file/605928/DS_008-2020-SA.PDF. Accessed June 15, 2021.
9. Government of Peru, Ministry of Transport and Communication. DS No. 008-2020-MTC. Suspenden los vuelos provenientes de Europa y Asia, y desde el territorio nacional hacia dichos destinos, por el plazo de treinta (30) días calendarios a partir del 16 de marzo de 2020. Lima, Peru: Government of Peru; 2020. https://cdn.www.gob.pe/uploads/document/file/565943/DS_008-2020-MTC.pdf. Accessed June 17, 2021.
10. Government of Peru. DS No. 044-2020-PCM. Decreto Supremo que declara Estado de Emergencia Nacional por las graves circunstancias que afectan la vida de la Nación a consecuencia del brote del COVID-19. Lima, Peru: Government of Peru; 2020. https://cdn.www.gob.pe/uploads/document/file/566448/DS044-PCM_1864948-2.pdf. Accessed June 17, 2021.
11. Lossio J. Covid-19 in Peru: State and social responses [in Spanish]. *Hist Cienc Saude Manguinhos*. 2021;28(2):581–585. doi:10.1590/S0104-59702021005000001

12. Benítez MA, Velasco C, Sequeira AR, Henríquez J, Menezes FM, Paolucci F. Responses to COVID-19 in five Latin American countries. *Health Policy Technol*. 2020;9(4):525–559. doi:10.1016/j.hlpt.2020.08.014
13. Dyer O. Covid-19: Peru's official death toll triples to become world's highest. *BMJ*. 2021;373:n1442. doi:10.1136/bmj.n1442
14. Guo H, Zhou Y, Liu X, Tan J. The impact of the COVID-19 epidemic on the utilization of emergency dental services. *J Dent Sci*. 2020;15(4):564–567. doi:10.1016/j.jds.2020.02.002
15. Xu S, Li Y. Beware of the second wave of COVID-19. *Lancet*. 2020;395(10233):1321–1322. doi:10.1016/S0140-6736(20)30845-X
16. Government of Peru. DS No. 094-2020-PCM. Decreto Supremo que establece las medidas que debe observar la ciudadanía hacia una nueva convivencia y prórroga el Estado de Emergencia Nacional por las graves ciurcunstancias que afectan la vida de la Nación a consecuencia del COVID-19. Lima, Peru: Government of Peru; 2020. https://cdn.www.gob.pe/uploads/document/file/730522/DS_N__094-2020-PCM.pdf. Accessed June 17, 2021.
17. Government of Peru. Directiva Sanitaria No. 100/MINSA/2020/DGIESP. Manejo de la atención estomatológica en el contexto de la pandemia por COVID-19. Lima, Peru: Government of Peru; 2020. https://cdn.www.gob.pe/uploads/document/file/716209/DIRECTIVA_SANITARIA_N_100-MINSA-2020-DGIESP.pdf. Accessed June 20, 2021.
18. Government of Peru. Directiva Sanitaria No. 129-MINSA/2021/DGIESP. Directiva sanitaria para la vacunación contra la COVID-19 en la situación de emergencia sanitaria por la pandemia en el Perú. Lima, Peru: Government of Peru; 2021. https://cdn.www.gob.pe/uploads/document/file/1645872/Directiva%20Sanitaria%20N%C2%BA129-MINSA/2021/DGIESP.pdf. Accessed June 20, 2021.
19. Kalash DA. How COVID-19 deepens child oral health inequities. *J Am Dent Assoc*. 2020;151(9):643–645. doi:10.1016/j.adaj.2020.05.015
20. Aravena-Rivas Y, Carbajal-Rodríguez G. Geographical and socioeconomic inequalities in dental attendance among children in Peru: Findings from the Demographic and Family Health Survey 2017. *Community Dent Oral Epidemiol*. 2021;49(1):78–86. doi:10.1111/cdoe.12580
21. Hernández-Vásquez A, Azañedo D, Díaz-Seijas D, et al. Access to dental health services in children under twelve years of age in Peru, 2014 [in Spanish]. *Salud Colect*. 2016;12(3):429–441. doi:10.18294/sc.2016.912
22. National Institute of Statistics and Informatics, Peru. Demographic and Family Health Survey. 2021. https://proyectos.inei.gob.pe/endes/. Accessed June 28, 2021.
23. United States Agency for International Development. The Demographic and Health Surveys Program. Wealth index. https://dhsprogram.com/topics/wealth-index/. Accessed July 19, 2021.
24. National Institute of Statistics and Informatics, Peru. Demographic and Family Health Survey. 2014. https://www.inei.gob.pe/media/MenuRecursivo/publicaciones_digitales/Est/Lib1153/libro.pdf. Accessed July 19, 2021.
25. Carbajal-Rodriguez G, Aravena-Rivas Y, León-Manco R. Social gradients in dental attendance among older adults: Findings from the National Survey on Demographics and Health in Peru. *Community Dent Health*. 2019;36(4):281–286. doi:10.1922/CDH_4597Carbajal-Rodriguez06
26. Lang IA, Gibbs SJ, Steel N, Melzer D. Neighbourhood deprivation and dental service use: A cross-sectional analysis of older people in England. *J Public Health (Oxf)*. 2008;30(4):472–478. doi:10.1093/pubmed/fdn047
27. Farquharson WH, Thornton CJ. Debate: Exposing the most serious infirmity – racism's impact on health in the era of COVID-19. *Child Adolesc Ment Health*. 2020;25(3):182–183. doi:10.1111/camh.12407
28. Roy CM, Bollman EB, Carson LM, Northrop AJ, Jackson EF, Moresky RT. Assessing the indirect effects of COVID-19 on healthcare delivery, utilization and health outcomes: A scoping review. *Eur J Public Health*. 2021;31(3):634–640. doi:10.1093/eurpub/ckab047
29. Azañedo D, Hernández-Vásquez A, Casas-Bendezú M, Gutiérrez C, Agudelo-Suárez AA, Cortés S. Factors determining access to oral health services among children aged less than 12 years in Peru. *F1000Res*. 2017;6:1680. doi:10.12688/f1000research.12474.1
30. Brian Z, Weintraub JA. Oral health and COVID-19: Increasing the need for prevention and access. *Prev Chronic Dis*. 2020;17:E82. doi:10.5888/pcd17.200266
31. Kranz AM, Gahlon G, Dick AW, Stein BD. Characteristics of US adults delaying dental care due to the COVID-19 pandemic. *JDR Clin Trans Res*. 2021;6(1):8–14. doi:10.1177/2380084420962778