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An epidemiological surveillance system for COVID-19 in a dental teaching center between 2021 and 2023*

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ABSTRACT

Objective: To describe the follow-up of epidemiological surveillance of COVID-19 positive cases in a dental teaching center in Peru between 2021 and 2023. **Materials and methods:** A cross-sectional study was conducted as part of a COVID-19 surveillance plan in a dental teaching center of a Peruvian university. The study was conducted between June 2021 and April 2023, reaching a total of 1,623 records, in which students and faculty members participated. **Results:** A total of 120 COVID-19 positive cases were reported during the surveillance period, with the highest peak observed during the third wave. The results showed that the year with the highest number of cases was 2022, accounting for 92.5% (n = 111), and the most affected group was that of postgraduate students, representing 57.5% (n = 69). **Conclusions:** This study highlights the importance of implementing effective epidemiological surveillance systems in clinical-educational settings, particularly during public health emergencies such as the COVID-19 pandemic. The collected data revealed that most positive cases were concentrated during the third wave, particularly among postgraduate students, highlighting the urgent need to strengthen preventive measures in these high-risk groups. The absence of reported cases in the first four months of 2023 suggests successful containment, mainly attributed to the implementation of strict biosafety protocols and the progress of vaccination. Epidemiological surveillance systems must remain up to date to ensure a safe environment for all those involved.

Keywords: COVID-19; health sciences; epidemiology.

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INTRODUCTION

COVID-19 is a disease caused by a type of coronavirus known as SARS-CoV-2, which the World Health Organization (WHO) first identified in December 2019, after receiving reports of a cluster of viral pneumonia cases in the city of Wuhan, China (1). At the beginning of 2020, it was declared a Public Health Emergency of International Concern (PHEIC) (2), as it was a highly infectious virus that spread rapidly among individuals through coughing, respiratory secretions, and close contact (3).

In response to the rapid global spread of COVID-19, countries implemented a series of measures to slow its transmission. One of the most widespread and effective strategies was epidemiological surveillance, which involves the collection, evaluation, analysis, and periodic communication of relevant information. This system serves as a crucial tool for public health decision-making, considering factors such as transmission rate, disease severity, and overall impact (4). It also plays a fundamental role in defining necessary actions across different areas of intervention, supporting decision-making, implementation, and evaluation of related measures (5).

In this scenario, all professional sectors were affected, particularly dental services, including dental teaching centers, which are designed to provide comprehensive dental care and serve as training settings where students dedicate a significant portion of their practical education (6). Since these centers offer a wide range of general and specialized services and follow an educational approach focused on clinical practice (7), it was necessary to establish an epidemiological surveillance plan aimed at minimizing transmission risks among students, faculty, administrative staff, and patients (8).

Given the importance of this topic, this study aims to describe the results of the epidemiological surveillance system for COVID-19 implemented in a dental teaching center between 2021 and 2023.

MATERIALS AND METHODS

This study was a cross-sectional design involving records of students and faculty members who participated in the COVID-19 monitoring program at the Dental Teaching Center of Universidad Peruana Cayetano Heredia (CDD-UPCH) between June 2021 and May 2023. A total of 1,623 records were analyzed: 755 in 2021, 648 in 2022, and 220 in 2023. The marked difference in sample sizes of each year was due to the reduction in the number of participants in the monitoring program. It is important to mention that this is one of the limitations of the study. The program was coordinated by the Public Health and Dental Management Research Unit of UPCH. A non-probabilistic sampling method was applied, allowing all members of the Dental Teaching Center to take part in the program, while data collection was conducted by researchers from the same unit.

Inclusion criteria comprised complete lists of students and faculty members who participated in the UPCH COVID-19 Surveillance Program during 2021, 2022, and 2023, with complete data on the relevant variables of the study. As exclusion criteria, lists with incomplete information in the variables of interest were not considered. Data were collected using an anonymous Google Forms questionnaire.

Authorization was granted from the Faculty of Stomatology of UPCH to share data from the surveillance program. Records with incomplete information or those not meeting the research requirements were excluded. Subsequently, complete and selected data were analyzed according to the study objectives. Data processing was performed using STATA version 17.0, conducting a descriptive analysis of the variables.

As this study was based on secondary data, it was necessary to request access from the Faculty of Stomatology of UPCH and to obtain approval from the Institutional Ethics Committee of the same university (CIE-UPCH). It is important to mention that the international ethical guidelines for human health of the Council for International Organizations of Medical Sciences (CIOMS) of the WHO, particularly Guideline 12, which addresses the collection, storage, and appropriate use of data. By working with a database, the anonymity of participants was ensured, and identification of participants was avoided.

RESULTS

Figure 1 illustrates the peaks of COVID-19 waves throughout the pandemic period according to the type of personnel evaluated: undergraduate students, postgraduate students, and faculty members. Figure 2 presents the epidemiological monitoring surveillance of confirmed COVID-19 cases in the dental teaching center under study.

An analysis of the data from the onset of the pandemic revealed that 76.67% (n = 92) of all recorded cases occurred during the third wave, marking a significant peak in disease prevalence. Among these, postgraduate students were the group most affected, accounting for 75.0% (n = 52) of all positive cases in this group. Finally, 15.83% (n = 19) of the total cases were reported during the fourth wave, reaching the maximum cumulative number of cases (n = 120), with no new cases reported during the fifth wave. These concentration and accumulation patterns can be clearly observed in Figure 2, which illustrates both the temporal evolution of cases and the cumulative trend.

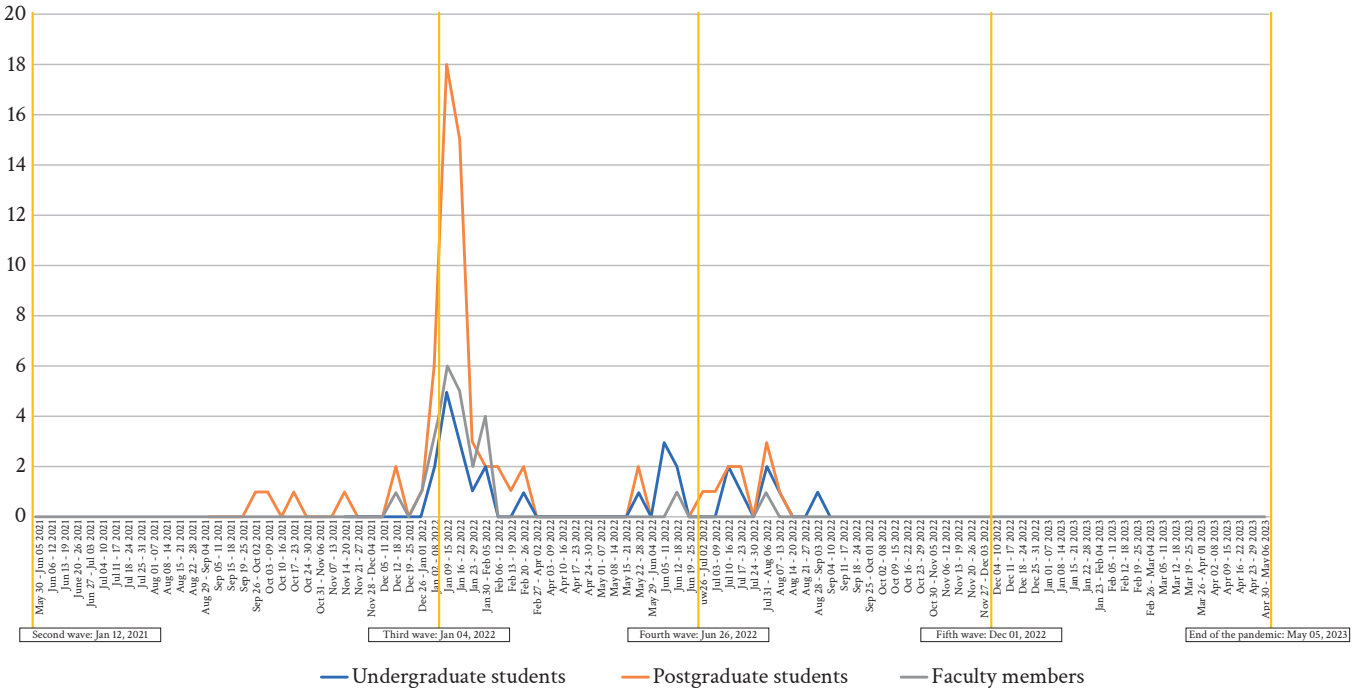

Figure 1. Epidemiological surveillance monitoring of confirmed COVID-19 cases among students and faculty members in a dental teaching center, Peru, 2021-2023.

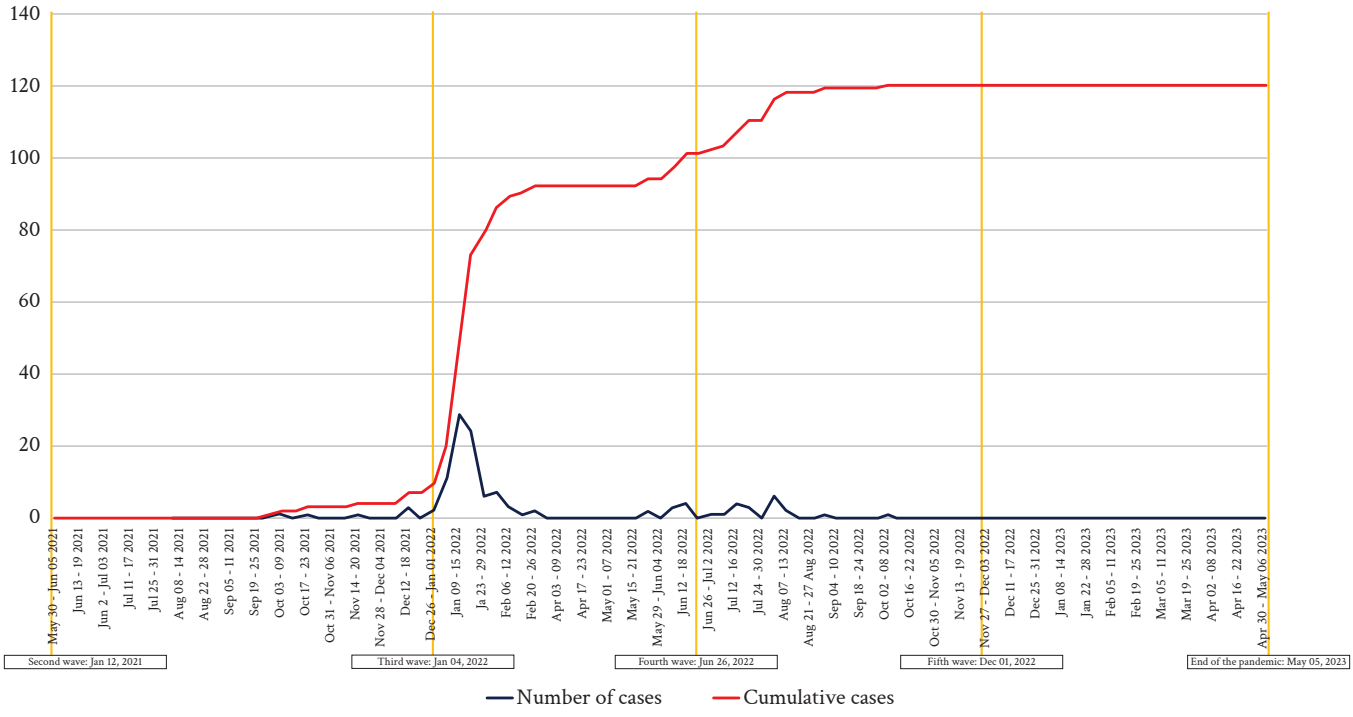

Figure 2. Epidemiological surveillance monitoring of confirmed COVID-19 cases in a dental teaching center, Peru, 2021-2023.

Between June 2021 and December 2022, a total of 120 confirmed cases of COVID-19 were recorded among the study population. Of these, 7.5% (n = 9) occurred in the second half of 2021, while the remaining 92.5% (n = 111) were reported in 2022. In 2023, no cases were reported. When analyzing the distribution by population group, postgraduate students accounted for the majority of cases (57.5%, n = 69), followed by undergraduate students (22.5%, n = 27) and faculty members (20.0%, n = 20). Percentages were calculated based on the total number of confirmed positive cases (Table 1).

Table 1. Epidemiological surveillance of confirmed COVID-19 cases by year and month in a dental teaching center in Peru, 2021-2023.

Period	Students				Faculty members		Total		Cumulative total	
	Undergraduate		Postgraduate							
	n	%	n	%	n	%	n	%	n	%
2021										
June	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
July	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
August	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
September	0	0.00	1	0.33	0	0.00	1	0.21	1	0.21
October	0	0.00	2	0.66	0	0.00	2	0.41	3	0.62
November	0	0.00	1	0.33	0	0.00	1	0.21	4	0.82
December	0	0.00	3	0.99	2	1.69	5	1.03	9	1.85
Total	0	0.00	7	2.30	2	1.69	9	1.85		
N	64		304		118		486			
2022										
January	11	5.14	42	12.69	16	12.90	69	10.31	69	10.31
February	3	1.40	7	2.11	4	3.23	14	2.09	83	12.41
March	0	0.00	0	0.00	0	0.00	0	0.00	83	12.41
April	0	0.00	0	0.00	0	0.00	0	0.00	83	12.41
May	1	0.47	2	0.60	0	0.00	3	0.45	86	12.86
June	5	2.34	1	0.30	1	0.81	7	1.05	93	13.90
July	3	1.40	6	1.81	0	0.00	9	1.35	102	15.25
August	3	1.40	4	1.21	1	0.81	8	1.20	110	16.44
September	1	0.47	0	0.00	0	0.00	1	0.15	111	16.59
October	0	0.00	0	0.00	0	0.00	0	0.00	111	16.59
November	0	0.00	0	0.00	0	0.00	0	0.00	111	16.59
December	0	0.00	0	0.00	0	0.00	0	0.00	111	16.59
Total	27	12.62	62	18.73	22	17.74	111	16.59		
N	214		331		124		669			
2023										
January	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
February	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
March	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
April	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Total	0	0.00	0	0.00	0	0.00	0	0.00		
N	215		327		124		666			
Total	27	5.48	69	7.17	24	6.56	120	6.59		
N	493		962		366		1821			

DISCUSSION

The implementation of public health measures has been fundamental in mitigating the impact of COVID-19, highlighting the importance of epidemiological surveillance and a rapid response to outbreaks (9). In the Peruvian context, the strict restrictions applied at the onset of the emergency aimed to contain the spread of the virus; however, their impact was limited by the structural fragility of the healthcare system and the insufficient preparedness to face large-scale health crises (10).

Similar experiences have been reported in other countries of the region. In Brazil, Martins et al. (11) reported that more than 360,000 healthcare workers had been infected by October 2020, with 384 deaths, including 16 dentists. Among 423 dentists surveyed, more than half limited their practice to emergencies, mainly in the private sector. The most frequent preventive measures included reinforced handwashing, physical distancing, use of rubber dams, face shields, and disposable gowns, while natural ventilation and preoperative mouth rinses were implemented less frequently. Nonetheless, most participants intended to maintain these precautions beyond the pandemic.

In this study, it was observed that most infections occurred during the third wave, between January and June 2022, coinciding with the Omicron variant. This variant exhibited a lower fatality rate but significantly higher transmissibility, leading to global peaks of more than 3.8 million daily cases. In Peru, the decrease in ICU admissions during this wave coincided with coverage of at least three vaccine doses (10). Consistently, Ren et al. (12) documented that this variant was circulating earlier than officially reported and that it increased the risk of reinfection, especially in young and middle-aged adults. Similarly, Smallwood et al. (13) found that protection against transmission declined three months after the last vaccine dose, limiting the clinical effectiveness of vaccines against emerging variants.

Subsequently, infections reached their cumulative peak in October 2022 and then declined until reaching zero during the fifth wave, which began in December of the same year. This trend persisted until the official declaration of the end of the pandemic in Peru on May 5, 2023. According to Koelle et al. (14), these variations respond to multiple factors, including changes in non-pharmacological measures, shifts in social behavior, seasonal variations, and immunity acquired through natural infection, which decreases over time.

A key aspect of this study was the difference in impact depending on roles. Postgraduate students were the most affected, followed by undergraduate students and faculty members. This distribution aligns with findings by Mathew et al. (15) in India, where occupational exposure was associated with a higher risk of infection and reinfection among physicians, nurses, and interns, with a mean age of 34 years. In our analysis, the increase in cases among postgraduate students and interns was mainly concentrated during the third wave, reflecting their greater clinical exposure and, therefore, greater vulnerability.

Finally, this study reaffirms the value of epidemiological surveillance as a tool for disease prevention and control, emphasizing the need to sustain it in educational and dental settings characterized by high population density. However, this study had some limitations, such as the lack of data from the early phase of the pandemic, the absence of additional variables, and the lack of differentiation by academic year or specialty. Nonetheless, the results provide useful evidence to inform and strengthen preventive strategies in academic and clinical environments.

CONCLUSIONS

This study highlights the importance of implementing effective epidemiological surveillance systems in clinical-educational settings, especially during public health emergencies such as the COVID-19 pandemic. Data from the academic dental center revealed that most positive cases were concentrated during the third wave, particularly among postgraduate students, highlighting the urgent need to strengthen preventive measures within this high-risk group. The absence of reported cases in 2023 suggests successful containment, primarily attributed to the implementation of strict biosafety protocols and the progress of vaccination. Finally, it is crucial that epidemiological surveillance systems remain up to date to ensure a safe environment for all those involved.

Conflict of interest:
The authors declare no conflict of interest.

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Ethics approval:
Authors are responsible for all aspects of the work, ensuring that any questions related to the accuracy or integrity of any part of the study are appropriately investigated and addressed. The study was conducted in accordance with the Declaration of Helsinki (revised in 2013), approved by the Ethics Committee of Universidad Peruana Cayetano Heredia (protocol code: 212253), and informed consent was obtained from all individual participants.

Authorship contribution:
MRR: conceptualization, methodology, research, writing of original draft.
DKPA: conceptualization, research, methodology, project administration, supervision, software, visualization, writing of original draft, writing – review & editing.
NQS, CSOC: conceptualization, writing of original draft, writing – review & editing.
RLM: conceptualization, data curation, methodology, software, supervision, validation, visualization, writing – review & editing.

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