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Perspective article

The implementation of strengthening infection control in dental institutions in Taiwan

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According to statistics from the World Health Organization (WHO), from November 2002 to July 2003, the outbreak of the severe acute respiratory syndrome (SARS) affected a total of 8,096 possible SARS cases worldwide and caused 774 deaths. Among them, the main affected countries include China (5,327 cases), Hong Kong (1,755 cases), Taiwan (346 cases), Canada (251 cases), and Singapore (238

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cases). This wave of the epidemic has caused a total of 73 deaths in Taiwan, including 7 medical staff from the Taipei City Heping Hospital.¹

The SARS is transmitted mainly from one person to another through close contact. The infection is possible only through contact with the patient's respiratory secretions, body fluids and excreta, while the infection routes include: (1) infection caused by direct inhalation or mucous membrane contact with patient's droplets or body fluids; (2) indirect contact with secretions or body fluids of infected persons.² In addition, Taiwan's experience with the SARS epidemic has proven that the SARS virus can survive on the object surfaces, such as the hospital beds and drinking fountain buttons, and indirectly explains the possible infection process of some medical colleagues who cannot trace their infection history.³ Therefore, the National Health Insurance Administration (NHIA) of Taiwan began to plan the dental infection control measures in 2004 in order to respond to the increasingly changing sources of highly infectious diseases in the future, and to ensure the safety of people seeking for medical treatments. Under the National Health Insurance (NHI) system, dental institutions conduct self-inspections to confirm that the infection control hardware and software (equipment and operating procedures) meet the standards. Through voluntary declaration by dental institutions, the NHI gives them 30 NHI points per patient's dental visit to cover the dental infection control cost. This measure was first implemented on a trial basis in July 2004. Then, the Taiwan NHI has begun to officially launch the "Implementation Plan for Strengthening Infection Control in Dental Outpatient Clinics" in 2005. It has been nearly 20 years till now. In this article, we used secondary data analysis to understand the status of dental infection control measures in Taiwan.

On February 11, 2004, the Taiwan Dental Association (TWDA) formulated the "Standard Operating Procedures (SOP) for Infection Control in Dental Institutions" as a reference for dentists and dental clinic operators to implement dental infection control. The content includes the SOP for infection control before the start of the daily clinic, before the start of the dental treatment, during the dental treatment, after the patient leaves, and after the daily clinic, as well as the sharp object injury treatment process, medical waste disposal, dental instrument disinfection and sterilization, and education and promotion for the infection control. If the dental institutions determine that their infection control measures meet the standards, they can proactively declare dental outpatient consultation fees for the infection control. Every year, the NHIA will conduct random inspections of all dental institutions (including those who have not declared) to check whether their implementation of the infection control meets the standards.

In this article, we used information from the websites of the Ministry of Health and Welfare and the NHIA and searched for publicly available information released by the TWDA to explore the changes in the dental outpatient consultation fees for the infection control, the participation in the "Implementation Plan for Strengthening Infection Control in Dental Outpatient Clinics" among dental institutions, and the numbers of dental patients and dental

outpatient visits under Taiwan NHI from 2003 to 2023. The results are shown in [Table 1](#).

For dental institutions, there are two types of consultation fees including general dental outpatient consultation fee and dental outpatient consultation fee for the infection control, and the difference between the two is dental infection control cost. From 2003 to 2023, the general dental outpatient consultation fee remained at 230 NHI points, while dental outpatient consultation fee for the infection control increased from 260 NHI points in 2003 to 362 NHI points in 2023. This was equivalent to the dental infection control cost increasing from 30 NHI points to 132 NHI points from 2003 to 2023. During this period, there were a total of 6 times for increasing the dental infection control cost per patient's dental visit, while the increase rate was as high as 317 %. For both the dental departments in hospitals and the dental clinics, the number of dental institutions increased from 6119 in 2003–7184 in 2022 with a total increase of 1065 and a total increase rate of 17.4 %. In addition, the number of dental institutions participating this infection control plan increased from 3863 in 2008–7070 in 2021 with a total increase of 3207 and a total increase rate of 83.0 %. Therefore, the participation rate increased from 60.4 % in 2008 to 99.1 % in 2021 with a total increase of 38.7 % and a total increase rate of 64.1 %. In the past, the ratio of random inspections for the infection control by the NHIA was usually not less than 4 %. Among the inspected dental institutions, the check pass rate was between 92.6 % and 100 % from 2008 to 2021. The mean pass rate was 96.30 %. Additional management measures would be imposed on those who failed the random inspections, and re-inspections would continue until they passed the check.

Furthermore, the numbers of dental patients and dental outpatient visits increased from 8,132,046 to 25,778,173 in 2003 to 10,656,945 and 39,130,889 in 2021, respectively. Therefore, the annual increase and increase rate of dental patients were 140,272 and 1.7 %, while their total increase and increase rate were 2,524,899 and 31.0 %. Besides, the annual increase and increase rate of dental outpatient visits were 741,818 and 2.9 %, while their total increase and increase rate were 13,352,716 and 51.8 %. Since the implementation of strengthening infection control measures, the numbers of dental patients and dental outpatient visits under the NHI system continued to increase steadily. They only experienced a slight decline from 2020 to 2021 during the COVID-19 pandemic.

Under the NHI system, general dental outpatient consultation fees have not been increased, while dental outpatient consultation fees for the infection control have continued to increase, indicating the government hopes that the increase in consultation fees will be reflected in the improvement of dental infection control measures. Since the SARS epidemic in 2003, the Taiwan's dental community has implemented the infection control measures for many years. After accumulating the infection control experiences of more than ten years, when facing the outbreak of the COVID-19, we have achieved the results of uninterrupted dental services during the COVID-19 pandemic. Although some dental clinics had to

Table 1 The changes in the dental outpatient consultation fees for the infection control, the participation in the “Implementation Plan for Strengthening Infection Control in Dental Outpatient Clinics” among dental institutions, and the numbers of dental patients and dental outpatient visits under Taiwan National Health Insurance (NHI) system from 2003 to 2023.

	Dental outpatient consultation fee ^a			Number ^b		Participation rate	Check pass rate	Number#	
	A	B	C	Institutions	Participants			Patients	Outpatient visits
2003	230	260	30	6119	—	—	—	8,132,046	25,778,173
2004	230	260	30	6213	—	—	—	8,694,196	28,131,080
2005	230	260	30	6259	—	—	—	8,776,632	28,105,499
2006	230	260	30	6290	—	—	—	8,873,570	28,362,668
2007	230	260	30	6326	—	—	—	9,103,658	29,704,470
2008	230	260	30	6396	3863	60.4 %	96.1 %	9,305,742	30,786,631
2009	230	260	30	6442	4187	65.0 %	92.6 %	9,598,736	31,824,021
2010	230	260	30	6519	4452	68.3 %	95.8 %	9,757,985	32,077,750
2011	230	260	30	6617	4705	71.1 %	97.6 %	9,819,952	32,231,945
2012	230	260	30	6692	4845	72.4 %	94.9 %	10,109,014	33,456,895
2013	230	270	40	6780	4977	73.4 %	96.2 %	10,427,134	34,634,279
2014	230	270	40	6843	5201	76.0 %	96.1 %	10,605,462	35,387,009
2015	230	285	55	6871	5937	86.4 %	94.1 %	10,753,098	35,731,714
2016	230	313	83	6936	6270	90.4 %	93.4 %	10,770,247	38,484,904
2017	230	313	83	6997	6402	91.5 %	95.7 %	11,082,403	40,239,884
2018	230	320	90	7039	6476	92.0 %	96.1 %	11,221,837	41,196,537
2019	230	320	90	7077	6766	95.6 %	99.6 %	11,399,403	42,271,014
2020	230	355	125	7098	6963	98.1 %	100 %	11,079,061	41,516,897
2021	230	355	125	7134	7070	99.1 %	100 %	10,656,945	39,130,889
2022	230	355	125	7184	—	—	—	—	—
2023	230	362	132	—	—	—	—	—	—

A: General dental outpatient consultation fee.

B: Dental outpatient consultation fee for the infection control.

C: Dental infection control cost.

The data in the table are the numbers of medical, dental, and traditional Chinese medicine patients and outpatient visits diagnosed as having diseases of teeth and supporting structures. From 2003 to 2015, the statistics include the emergency visits. However, from 2016 to 2021, the statistics do not include the emergency visits.

^a The unit of fee is NHI point, while the value of one NHI point is settled quarterly, and one NHI point fluctuates around NT\$ 0.8–1.2.

^b The dental institutions include the dental departments in hospitals and the dental clinics.

temporarily close their clinics due to the visits by confirmed patients, at the peak of the COVID-19 pandemic in 2021, more than 10 million people received dental services with nearly 40 million visits, and no one contracted the disease through the dental procedures.

The research on coronavirus family genes speculates that coronaviruses have a long history of repeated infection and adaptation across species. The first coronavirus to infect humans may have evolved from a bat coronavirus family two hundred years ago. The researchers even re-examined the preserved blood and discovered that the SARS had infected Hong Kong people in 2001.⁴ In the past centuries, coronaviruses have continued to be transmitted across species between humans and animals. From another perspective, humans have been allowing coronaviruses the opportunity to enter human society from wild animals, constantly producing new types of zoonotic diseases. This was true for the SARS in 2002 and the COVID-19 in 2019.⁵ It is still possible that new virus variants will become rampant. When facing the threat of new and changing types of highly infectious pathogens in the

future, it is useful and necessary for the public, the medical staff, and the dental staff to integrate the infection control awareness into their daily life and their daily practice.

Declaration of competing interest

The authors have no conflicts of interest relevant to this article.

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