

Article

Changes in the Frequency of Dental Clinic Visits, Expenses, and Treatment Type during the COVID-19 Pandemic in Japan

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Abstract: Few studies have reported nationwide changes in dental visit patterns during the COVID-19 pandemic. This study aimed to clarify the impact of the COVID-19 pandemic on the type of dental treatment in Japan based on trends in the frequency of dental clinic visits per month and dental expenses per month or day. An interrupted time-series analysis was performed to examine changes in data from the national database before and after the first declaration of a state of emergency. Between March and April 2020, the monthly dental expenses per patient (MDEPP) increased by approximately JPY 950 (JPY) ($p < 0.001$) in patients aged ≤ 64 years and ≥ 65 years. Dental expenses per treatment (DEPT) increased by approximately JPY 300–400 ($p < 0.001$) in both age groups. After April 2020, the slope of the regression line for DEPT significantly increased in those aged ≤ 64 years ($p < 0.001$) and in those ≥ 65 years ($p = 0.024$). The number of treatments per month (NTPM) increased after the declaration of a state of emergency. However, the decreasing trend in the regression line for NTPM was stronger in those aged ≤ 64 years ($p < 0.001$). The MDEPP, DEPT, and NTPM showed an increasing trend during the first state of emergency compared to those observed in the previous year. The proportion of patients with relatively severe disease may have increased because patients with mild disease refrained from undergoing dental examinations. These results suggest changes in the type of dental treatment during the COVID-19 pandemic.

Keywords: universal health insurance; dental expenses; medical examination behavior; stay at home; interrupted time-series analysis



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1. Introduction

The government declared a nationwide state of emergency in Japan in May 2020, resulting in a decrease in the number of patients seeking dental treatment [1]. Although this restricted citizens' movements and was not included in non-essential outings at medical institutions, including dental clinics [2], people refrained from dental consultations. The state of emergency was lifted on 25 May 2020, and all individuals who received dental care at least once a month showed signs of recovery. However, the overall patient population at dental clinics is still lower than in the pre-emergency state, even two years after the declaration of the state of emergency was lifted [1].

A previous study [1] reported nationwide changes in dental visit behavior among Japanese people. Moreover, since the COVID-19 pandemic, the reasons for dental consultation among Japanese patients and treatment types have changed [2,3]. Furthermore, similar changes in the type of dental treatment have been reported in various countries and regions owing to the COVID-19 epidemic [4–10]. However, there are few reports on nationwide changes in dental visit patterns among dental patients during the COVID-19 pandemic. The epidemic of infectious diseases may affect the type of dental treatment, which is a common problem in dental practice.

An increase in the discontinuation of regular dental visits is associated with the prevalence of periodontal disease [3], and changes in the type of dental treatment may

lead to oral health problems. Therefore, clarifying the impact of the pandemic on dental practice will contribute to future dental care policies. This study aims to clarify the impact of the COVID-19 pandemic in Japan in terms of the change in trends for the frequency of dental visits per month and dental expenses per month or day, and to infer changes in the composition of dental treatment from national data.

2. Materials and Methods

2.1. Data Collection

Data from the medical insurance medical expense database provided by the Ministry of Health, Labor, and Welfare were used for the analysis [11]. This database is part of a nationwide survey on the trend in medical care expenditures from April 1984 to July 2023 (as of December 2023). The health insurance medical expense database collects information on the number of medical and dental visits, number of treatment days, and medical and dental expenses based on the medical and dental care provided through the universal health insurance system (98.9% population coverage). The number of patients visiting a dental clinic (NPVDC) is the total number of individuals who received dental care in a clinic at least once per month. The number of dental treatment days (NDTD) is defined as the total number of days a patient receives dental care in a month. Dental expenses (DE) denote the cost incurred in yen (JPY) towards dental care per month.

Based on these data, the following three variables were calculated: monthly dental expenses per patient (MDEPP), dental expenses per treatment (DEPT), and number of treatments per month (NTPM), which were used to infer changes in the composition of dental treatment. These variables were calculated as follows: $MDEPP = DE/NPVDC$, $DEPT = DE/NDTD$, and $NTPM = NDTD/NPVDC$.

This study was a secondary analysis of the data and was approved by the Ethics Committee of the Japanese Red Cross Toyota College of Nursing (Project No. 2211).

2.2. Statistical Methods

An interrupted time-series analysis [12] was performed to examine changes in the MDEPP, DEPT, and NTPM before and after the first declaration of a state of emergency. Based on the cut-off age of 65 years, the patients were divided into two groups as follows: ≤ 64 years and ≥ 65 years. The available data between April 2015 and July 2023 were analyzed.

Furthermore, the changes in the MDEPP, DEPT, and NTPM in April 2020, immediately after the declaration of the state of emergency, were calculated. Changes in MDEPP, DEPT, and NTPM were calculated as the change in the values for April 2020 obtained using the regression equation from April 2020 to July 2023 and estimated as the value for April 2020 obtained using the regression equation from April 2015 to March 2020.

All statistical analyses were performed using the SPSS 29.0 software package (IBM Corp., Armonk, New York, NY, USA).

3. Results

3.1. Overview of Changes in MDEPP, DEPT and NTPM after the First Declaration of a State of Emergency

The government declared the first state of emergency between April and May 2020, and the MDEPP, DEPT, and NTPM increased from their corresponding values in the previous month (Figure 1). After the state of emergency was declared, the increased MDEPP returned slightly to the value of the regression equation before the declaration over a period of approximately 3 years; however, there was still a large difference. The difference between the predicted value of DEPT obtained from the regression equation before the declaration of the state of emergency and its actual value tended to increase 3 years after the declaration than that observed immediately after the declaration. The increase after the declaration of the state of emergency at the NTPM in the ≤ 64 years group had eliminated

in approximately 3 years. However, the NTPM in the ≥ 65 years group showed a slight increase even after 3 years.

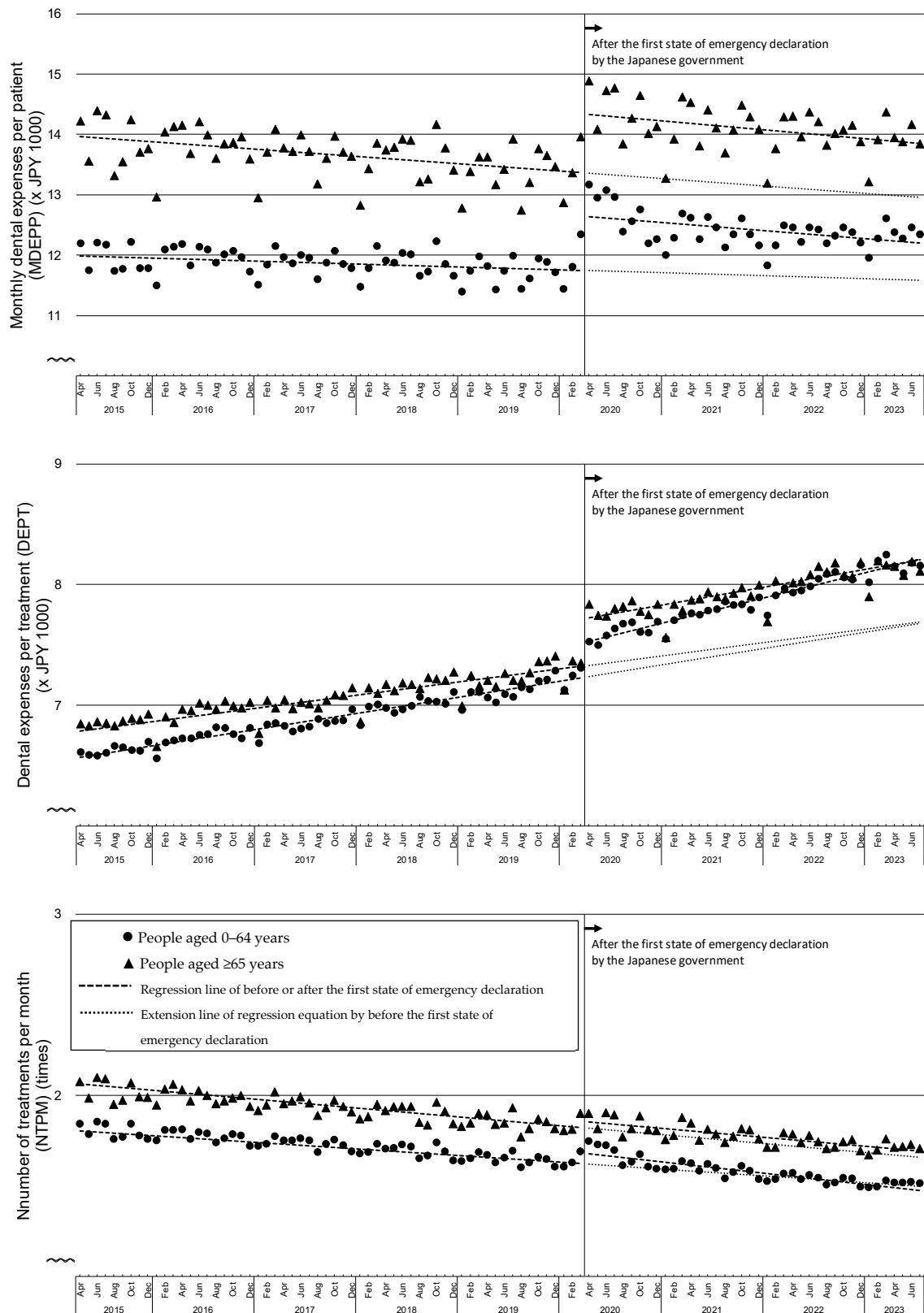


Figure 1. Trend changes in the monthly dental expenses per patient, dental expenses per treatment, and number of treatments per month before and after the first state of emergency declaration.

3.2. Changes in the MDEPP during the COVID-19 Pandemic

The MDEPP, monthly dental expenses per patient visiting a dental clinic, showed a decreasing trend in both groups ($p = 0.022, p < 0.001$) until March 2020, before the state of emergency was declared (Table 1). Between March and April 2020, significant differences were observed in the ≤ 64 years group and ≥ 65 years group (both $p < 0.001$). The April 2020 estimate based on regression equations before and after the declaration of a state of emergency showed an MDEPP increase of JPY 894 and JPY 968 for those aged ≤ 64 years and ≥ 65 years, respectively (Table 2). Between March and April 2020, the decreasing trend of the regression line changed slightly in those aged ≤ 64 years ($p = 0.051$) and ≥ 65 years ($p = 0.670$).

Table 1. Parameter estimates, 95% confidence intervals, and p -values from segmented regression model describing the trends of the monthly dental expenses per patient, dental expenses per treatment, and number of treatments per month.

		95% Confidence Interval			
		Coefficient	Lower Limit	Upper Limit	p -Value ¹
People aged 0–64 years					
Monthly dental expenses per patient (MDEPP; unit: JPY 1000)	Intercept	11.749	11.626	11.871	<0.001
	Baseline trend	−0.004	−0.008	−0.001	0.022
	Level change	0.894	0.703	1.084	<0.001
	Slope change	−0.007	−0.015	0.00003	0.051
Dental expenses per treatment (DEPT; unit: JPY 1000)	Intercept	7.228	7.201	7.256	<0.001
	Baseline trend	0.011	0.010	0.012	<0.001
	Level change	0.303	0.261	0.346	<0.001
	Slope change	0.006	0.005	0.008	<0.001
Number of treatments per month (NTPM; unit: times)	Intercept	1.622	1.606	1.638	<0.001
	Baseline trend	−0.003	−0.004	−0.003	<0.001
	Level change	0.054	0.030	0.079	<0.001
	Slope change	−0.002	−0.003	−0.001	<0.001
People aged ≥ 65 years					
Monthly dental expenses per patient (MDEPP; unit: JPY 1000)	Intercept	13.365	13.176	13.555	<0.001
	Baseline trend	−0.010	−0.015	−0.004	<0.001
	Level change	0.968	0.674	1.262	<0.001
	Slope change	−0.002	−0.014	0.009	0.670
Dental expenses per treatment (DEPT; unit: JPY 1000)	Intercept	7.324	7.282	7.367	<0.001
	Baseline trend	0.009	0.007	0.010	<0.001
	Level change	0.402	0.337	0.468	<0.001
	Slope change	0.003	0.0004	0.005	0.024
Number of treatments per month (NTPM; unit: times)	Intercept	1.822	1.801	1.843	<0.001
	Baseline trend	−0.004	−0.004	−0.003	<0.001
	Level change	0.031	−0.001	0.064	0.056
	Slope change	−0.0004	−0.002	0.001	0.545

The model describes the trends and changes in the before and after the first state of emergency declaration. ¹ Calculated using Student’s t -test. Baseline trend: Trend from April 2015 to March 2020. Level change: Level change from March 2020 to April 2020. Slope change: Slope change from before March 2020 to after April 2020.

3.3. Changes in the DEPT during the COVID-19 Pandemic

The DEPT, dental expenses per treatment for patients visiting a dental clinic, showed an increasing trend in both age groups ($p < 0.001$) until March 2020, before the state of emergency was declared. Between March and April 2020, significant differences were observed in the ≤ 64 years group and ≥ 65 years group (both $p < 0.001$). The April 2020 estimate based on regression equations before and after the declaration of the state of emergency showed a DEPT increase of JPY 303 and JPY 402 in those aged ≤ 64 years and ≥ 65 years, respectively. Between March and April 2020, the slope of the regression line increased significantly in those aged ≤ 64 years ($p < 0.001$) and ≥ 65 years ($p = 0.024$).

Table 2. Changes in the MDEPP, DEPT, and NTPM of the value for April 2020 obtained using the regression equation from before and after the first declaration of a state of emergency.

	Individuals Aged 0–64 Years			Individuals Aged ≥65 Years		
	From Regression Equation before Declaration ¹	From Regression Equation after Declaration ²	Change ³	From Regression Equation before Declaration ¹	From Regression Equation after Declaration ²	Change ³
MDEPP	11,749	12,643	894	13,365	14,333	968
DEPT	7228	7531	303	7324	7726	402
NTPM	1.62	1.69	0.06	1.82	1.86	0.04

MDEPP: monthly dental expenses per patient (JPY); DEPT: dental expenses per treatment (JPY); NTPM: number of treatments per month (times). ¹ From April 2015 to March 2020; ² from April 2020 to July 2023; ³ change = (from regression equation after declaration – from regression equation before declaration).

3.4. Changes in the NTPM during the COVID-19 Pandemic

NTPM showed a decreasing trend in both age groups ($p < 0.001$) until March 2020, before the state of emergency was declared. Between March and April 2020, significant differences were observed in the ≤64 years group ($p < 0.001$). The April 2020 estimate based on regression equations before and after the declaration of the state of emergency showed a 0.054-fold increase in NTPM in the ≤64 years group ($p < 0.001$). Patients in the ≥65 years group showed a 0.031-fold increase in NTPM ($p = 0.056$). Between March and April 2020, the decreasing trend in the regression line was significantly stronger in those aged ≤64 years ($p < 0.001$); however, no significant change was observed in those aged ≥65 years ($p = 0.545$).

4. Discussion

Macro-perspective changes in people’s dental clinic visit behavior during the COVID-19 pandemic in Japan have been previously reported [1]. The state of emergency declaration and the COVID-19 pandemic have resulted in a nationwide reduction in the total number of patients visiting dental clinics and the number of dental treatments. This report attempts to clarify changes in the treatment approaches adopted in dental clinics, such as dental expenses per treatment.

Consequent to the state of emergency declaration and the COVID-19 pandemic, dental expenses per month and per treatment increased. The increase in monthly dental expenses indicates that patients may have refrained from undergoing routine checkups or regular visits for mild dental caries and periodontal diseases. The number of people receiving regular dental checkups has decreased by 29% following the COVID-19 pandemic in Japan [2]. In Japan, treatment for mild dental caries and periodontal tissue maintenance therapy are relatively inexpensive, whereas treatment for severe dental caries, missing teeth, and prosthetics are expensive. At the beginning of the COVID-19 outbreak in Japan, most individuals refrained visiting dental clinics for non-urgent treatments, which may have resulted in a relative increase in the proportion of people with severe illness visiting dental clinics.

Furthermore, dental diagnostic and preventive care visits for children declined in the United States in the same time period [13]. Conversely, the increase in the dental expenses per treatment may imply that the proportion of patients seeking treatment for reasons such as pulpitis and tooth loss has increased. A study conducted in Buenos Aires reported that radiographic examinations and tooth extractions were more common during the pandemic period [9]. In Italy, emergency treatments for conditions such as pulpitis, prosthesis decementation, and abscesses were the most common procedures provided during the COVID-19 pandemic [4]. The COVID-19 outbreak may have caused similar changes in dental visit behavior in Japan.

In April 2020, immediately after the first state of emergency was declared, the Japan Dental Association issued a message urging people to postpone their dental visits. However,

in May, the Japan Dental Association encouraged individuals to consider the risks and benefits of dental visits while making decisions. To reduce and prevent infections caused by dental treatment, the Japan Dental Association has published countermeasure guidelines for dental clinics. The number of dental visits improved in June, following the guidelines for dental visits and infection control by the Japan Dental Association. Nevertheless, our study results indicate that patients may continue to refrain from non-urgent dental visits. Cancer screening rates decreased significantly in the United States and other developed nations during the surge of the COVID-19 pandemic and in lockdowns [14,15]. Furthermore, our study results suggest that there may have been a change in the composition of treatment content after the first declaration of the state of emergency. Moreover, the composition of treatment types has not returned to the pre-epidemic state even after 3 years since the declaration of the first state of emergency. Robust evidence demonstrating the changes in dental visit behavior due to the COVID-19 pandemic and its impact on the prevalence of caries and periodontal disease is lacking [16]. Similarly, the COVID-19 pandemic-related suspension of cancer screening has led to delays in cancer detection [17,18]. Refraining from non-urgent dental visits may lead to the spread of periodontal disease, and an increase in the incidence of advanced dental caries is of potential concern.

The increase in expenses per treatment could be attributed to consensus between dentists and patients, as the discrepancy continued to widen after 3 years compared to the estimated value before the COVID-19 pandemic. Dentists may have preferred to change their treatment approach from examining many patients in a short period of time to increasing the treatment time and treatment content per patient because of the cost of infection control per treatment [19]. In addition, patients may have preferred to limit the frequency of dental visits, considering the increased risk of COVID-19 infection at dental clinics. In Japan, the quasi-state of emergency was lifted on 21 March 2022, and the implementation of infection control measures and business-hour restrictions for restaurants ended, thereby limiting social life restrictions. However, no change in the type of dental treatment was observed after the quasi-state of emergency was lifted, as indicated by our findings. Dental treatment may have continued in a certain direction after the first state of emergency was declared until July 2023.

The number of treatments per month (NTPM) in the ≤ 64 years group returned to an extension of the regression line before the first state of emergency was declared in the second half of 2022, with a slight increase in the ≥ 65 years group. This variable indicates the number of times a patient visits the dental clinic in one month, that is, the number of days in the same month. If the number of hours a dentist spends on treatment per month remains the same, the NTPM decreases as the time spent on each treatment increases. However, if the number of patients visiting the clinic decreases, the NTPM will increase because they will be able to schedule their next treatment for a closer date. The number of patients visiting dental clinics is decreasing [1], and the NTPM should increase. Therefore, the increase in the NTPM may be nullified by enriching the content and requiring more time for each treatment. Moreover, the possibility of changes that enrich the content of each treatment was supported by the increase in the DEPT.

A potential limitation of this study is that it was not possible to directly show specific changes in the type of dental treatment. Information and analysis of the treatment content are necessary to examine changes in the treatment type in further research.

5. Conclusions

After the first state of emergency was declared in Japan, the MDEPP and DEPT increased by approximately JPY 950 and JPY 300–400, respectively. Moreover, the DEPT has subsequently demonstrated an increasing trend, elucidating the changes in the type of dental treatment during the COVID-19 pandemic.

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Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study are available in a database from the Japanese government of the Ministry of Health, Labor, and Welfare at <https://www.mhlw.go.jp/bunya/iryohoken/iryohoken14/> (accessed on 24 July 2024), reference number 4. These data were derived from the following resources available in the public domain: <https://www.mhlw.go.jp/bunya/iryohoken/iryohoken14/> (accessed on 24 July 2024).

Conflicts of Interest: The authors declare no conflicts of interest.

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