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Trends in prescription days and intervals between physician visits and their impact on glycemic control before and during the COVID-19 pandemic in Japan

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Abstract: We assessed trends in glycemic control among individuals with diabetes before and during the coronavirus disease 2019 pandemic. We used two databases to investigate changes in prescription days and the interval between physician visits and their impact on glycemic control among individuals with diabetes in Japan between 2017 and 2020. The analysis using the JMDC database indicated that prescription days were extended by approximately 20 days in 2020 compared to other years. The analysis using the Japan diabetes comprehensive database project based on an advanced electronic medical record system database revealed that intervals between physician visits were extended by approximately 7 days in 2020 compared to other years and glycemic control did not materially change in 2020. These results suggest that the prescription days increased with the spread of coronavirus disease 2019 in patients with diabetes, but the impact of the coronavirus disease 2019 pandemic on glycemic control appeared to be small.

***Keywords*:** diabetes, coronavirus, outpatient

Introduction

The spread of coronavirus disease 2019 (COVID-19) had a major impact on the treatment of lifestyle-related diseases. To reduce the risk of infection, efforts were made to discourage medical visits in many countries. In April 2020, the Japanese government declared a state of emergency and urged the public to avoid leaving home and visiting medical institutions unnecessarily. Because diabetes management requires continuous medical care (*1,2*) there have been concerns that extended intervals between physician visits may have negatively impacted glycemic control because individuals with diabetes had fewer opportunities for prescription days and lifestyle guidance.

According to a survey of 155 countries released by the World Health Organization in May 2020, 53% of the countries surveyed reported that some or all services for diabetes and diabetes-related complications were interrupted (*3*). Additionally, a study examining trends in diabetes-related services (HbA1c level, serum creatinine level, and urine protein level evaluations; fundus examinations; diabetic foot care; renal care services) in Japan reported a downward trend in diabetes-related medical care during the COVID-19 pandemic (*4*). Furthermore, changes in lifestyles and their associations with the metabolic and glycemic statuses among patients with diabetes during the first COVID-19-related state of emergency in Japan were reported (*5*). Some studies indicated that glycemic control was improved during the COVID-19 pandemic (*6*), while others showed deterioration (*7,8*) or no change (*9*). However, to the best of our knowledge, no study has examined trends in prescription adjustment and physician visit intervals during COVID-19 in patients with diabetes in relation to glycemic control.

To address this gap, we aimed to determine whether the intervals between physician visits lengthened and whether glycemic control deteriorated among those with diabetes during the COVID-19 pandemic. We first evaluated the prescription days using the JMDC Claims Database — a large-scale claims database in Japan encompassing populations across various regions of Japan, covering about 10 million people, with the

prescription days serving as a surrogate measure of physician visit intervals. We further investigated the interval between physician visits and glycemic control using the J-DREAMS (Japan Diabetes compREhensive database project based on an Advanced electronic Medical record System), a large-scale database directly linked to electronic medical records.

Materials and Methods

We obtained anonymized individual data from the JMDC Claims Database, which is a medical database managed by JMDC Inc. Japan has a universal health insurance system. Citizens are covered by one of several insurance systems, including employee health insurance programs, the national health insurance program, and the elderly health care system. The JMDC database contains the monthly claims reported by multiple employee health insurance programs since January 2005. This research using the JMDC database was approved by the institutional review board of the Yokohama City University (Reference No. B200800024).

We counted the median number of days between diabetes medication adjustments for each month from 2017 to 2020. Diabetes medication prescriptions were defined based on the World Health Organization Anatomical Therapeutic Chemical classification codes. Those with A10 codes (starting with A10X) were excluded. Those prescribed during hospitalization were also excluded. During the subgroup analysis, we categorized hospitals according to the number of beds (0-19, 20-99, 100-199, 200-299, 300-499, more than 500, and unknown).

To further examine the trends in intervals between prescription days and glycemic control for patients with diabetes who visited relatively large hospitals, we calculated the average intervals between physician visits and average HbA1c using the Japan diabetes comprehensive database project based on an advanced electronic medical record system (J-DREAMS) as of November 2021. The J-DREAMS included 65 participating facilities specialized in diabetes care. The research using the the J-DREAMS was reviewed and approved by the institutional review board of the National Center for Global Health and Medicine (approval number: NCGM-G-003329-00). The median intervals between physician visits were calculated for patients whose HbA1c was measured from 2017 to 2020 and for whom visit intervals could be estimated and compared between years. The interval between physician visits was estimated when HbA1c was measured at least once during the relevant year, and at least one HbA1c measurement was confirmed within approximately 180 days.

All statistical analyses were performed using R software (version 4.12 for Windows; R Project for Statistical Computing, Vienna, Austria).

Results

The JMDC database contained an average of 6,155,934, 6,963,009, 7,511,122, and 7,801,111 individuals each month during 2017, 2018, 2019, and 2020, respectively (Figure 1).

Results of all medical facilities showed that the median number of days between prescription days increased in February, March, April, and May of 2020 compared to those during other years (Figure 2). The analysis stratified by the number of beds showed no change in the median number of days between prescription days for medical institutions with 19 beds or less, but an increase for those with 20 or more beds, especially during April and May (Supplemental Figure S1, *https://www.ghmopen.com/site/supplementaldata.html?ID=80*).

The analysis involving the J-DREAMS included 7030 patients observed from 2017 to 2020. The mean intervals between physician visits were 53.8 days in

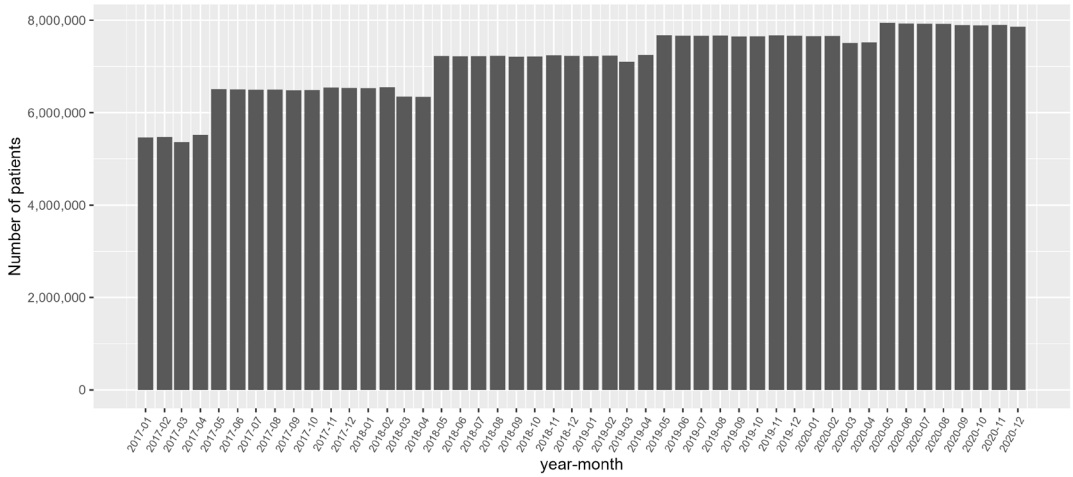

Figure 1. Number of patients during each month.

2017, 55.0 days in 2018, 55.7 days in 2019, and 62.1 days in 2020; however, the mean HbA1c values were 7.37 in 2017, 7.35 in 2018, 7.26 in 2019, and 7.30 in 2020 (Figures 3 and 4).

Discussion

During the JMDC database analysis, we investigated trends in prescription days among patients with diabetes in Japan. We found that these intervals were extended among patients who visited medical institutions with more than 20 beds during the COVID-19 pandemic. Another analysis involving the J-DREAMS database showed that although the intervals between physician visits were extended, the change in glycemic control was minimal before and during the COVID-19 pandemic.

These results suggest that the prescription days increased with the spread of COVID-19 among patients with diabetes, but that the impact on glycemic control was small among patients attending specialized diabetes care facilities. According to the analysis using the JMDC database, the prescription days for patients who visited large hospitals increased, suggesting that the role of medical resources may have been appropriately adjusted. Previous studies have shown that the number of physician visits decreased during the expansion of the COVID-19 pandemic among patients with diabetes (*10,11*). These results suggest that appropriate treatment continuation might have been achieved by reducing the number of visits and increasing the prescription days.

According to the results of the J-DREAMS study of patients who visited physicians at relatively large medical institutions, the interval between physician visits was extended an average of approximately 7 days, but the mean HbA1c levels remained unchanged. Therefore, the extension of approximately 7 days might have had little effect on glycemic control. Although previous studies have shown that the interval between physician visits during the COVID-19 pandemic was significantly

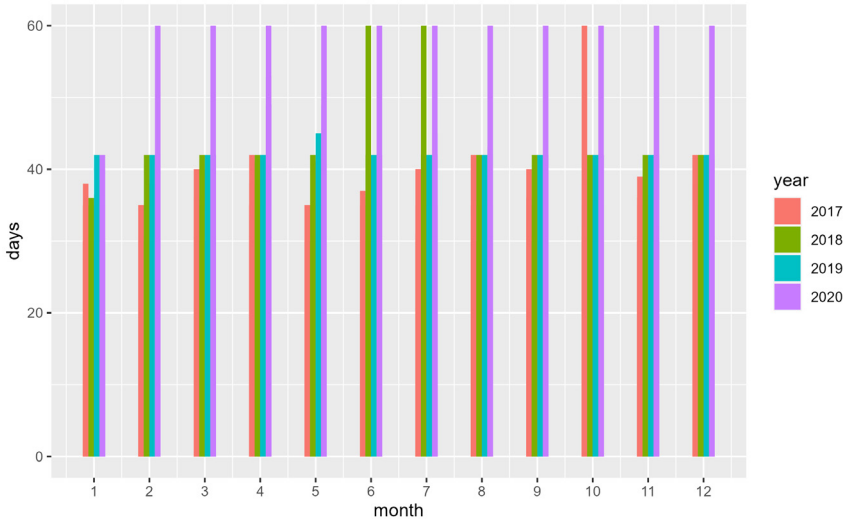

Figure 2. Changes in the median prescription days prescribed (in days) from 2017 to 2020 (stratified by the number of hospital beds).

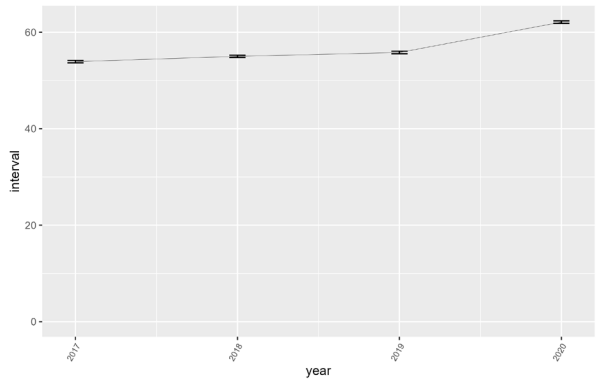

Figure 3. Mean interval between physician visits during each year (7,030 patients had data for all years).

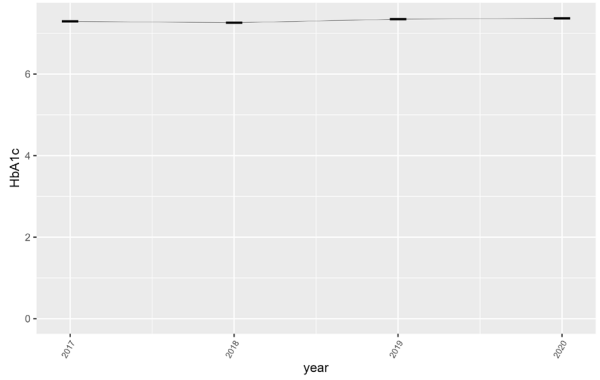

Figure 4. Mean HbA1c values (7,030 patients had data for all years).

associated with HbA1c control, worsening of HbA1c was not observed during the analysis involving the J-DREAMS (*12*). This may be because the association reported in the previous literature was observed for HbA1c < 7%, and the effect on HbA1c was minor during a short period of 7 days.

The J-DREAMS includes relatively large hospitals; however, the characteristics of large hospitals are similar to those of hospitals not included in the J-DREAMS. Therefore, by combining the results of the analysis using the J-DREAMS and those of the analysis using the JMDC database, it was observed that little effect on glycemic control occurred despite the increased prescription days and reduced number of physician visits.

This study had several limitations. First, because the JMDC database includes those enrolled in employment insurance, the survey was limited to individuals of working age and their dependents; it did not include populations not covered by corporate health insurance. Second, caution should be exercised when interpreting the data. Additionally, all medical institutions participating in the J-DREAMS are educational facilities designated by the Japan Diabetes Society, and the data included in this study are only those of patients who attended relatively large medical institutions. Therefore, we conducted an analysis using data from before 2020 to examine prescription durations and appointment intervals at that time. However, on May 8, 2023, COVID-19 has been downgraded to a Class V Infectious Disease under the Infectious Disease Act, resulting in the ability of a wide range of medical institutions to provide treatment for the infection (*13*). This change has brought about various transformations, including the normalization of routine medical responses. This shift is believed to have influenced public awareness of COVID-19. Further investigation is necessary to understand the implications of this reclassification on prescription durations and blood glucose control.

In conclusion, our results indicate that the interval between physician visits among patients with diabetes in Japan was extended during the COVID-19 pandemic, but the effect on HbA1c was small. Additionally, prescription days were extended for patients who visited medical facilities with fewer than 20 beds, suggesting that medical resources may have been appropriately distributed during the pandemic. These results have certain implications regarding diabetes management. If the patient's glycemic control status is stable, extending the prescription period as part of the treatment plan during the pandemic may be acceptable. Additionally, given the possibility of future pandemics, it may be worth exploring a system that allows for ongoing access to essential medications while minimizing the need for frequent visits to healthcare facilities. Such a system would help to reduce exposure risks while ensuring that those with chronic conditions can continue to receive necessary treatments.

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Conflict of Interest: SY is employed by Integrity Healthcare Co., Ltd., a company that provides online medical systems, in Japan. However, this study was not related to the company. Other autors declare they have no conflicts of interest concerning this manuscript.

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