

Impact of state of emergency for coronavirus disease 2019 on hospital visits and disease exacerbation: the Japan COVID-19 and Society Internet Survey

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Background: Studies on the impact of coronavirus disease 2019 (COVID-19) on people's routine medical care are limited, and understanding the factors associated with medical care avoidance can inform us about the ongoing pandemic.

Objectives: We aimed to assess the impact of Japan's state of emergency and stay-at-home policy for COVID-19 on hospital visits and disease exacerbation; we also identified related factors.

Methods: This cross-sectional study used data from the Japan COVID-19 and Society Internet Survey (JACSIS), which included randomly sampled research agency panellists in Japan. Among the 28,000 participants, we included 7,747 respondents who reported having any disease. We described baseline characteristics and avoidance-related hospital visit outcomes. We used multivariable logistic regression analyses to assess the association between chronic diseases and outcomes of hospital visit avoidance.

Results: Among 7,747 participants, 17.7% of patients with chronic diseases avoided hospital visits, 2.1% of patients postponed hospitalization or surgery, 4.9% of patients ran out of drug, and 5.3% of patients experienced disease exacerbation during the COVID-19 pandemic in April and May 2020. Exacerbations occurred mostly in participants with mental diseases, chronic pain and headache, and diabetes (OR 3.33 [95% confidence interval (CI): 2.51–4.41], 2.83 [95% CI: 2.19–3.66], and 1.53 [95% CI: 1.10–2.13], respectively). Patients with cardiovascular disease or cancer did not experience exacerbation [OR 0.55 (95% CI: 0.31–0.97), 0.79 (95% CI: 0.43–1.45)].

Conclusions: The rates of hospital visit avoidance and exacerbation varied among patients with different diseases under the COVID-19 stay-at-home policy in April and May 2020, and disease-specific preparedness may be necessary for the pandemic.

Lay summary

There are few studies available on the effect of coronavirus disease 2019 (COVID-19) on people's routine medical care or hospital visits. It is important to understand the factors associated with hospital avoidance in order to be informed about this pandemic. Therefore, we assessed how the declaration of a state of emergency and a stay-at-home order in Japan affected hospital visits and the worsening of diseases; we also identified some risk factors involved. We included 7,747 participants of the Japan COVID-19 and Society Internet Survey, who reported having conditions, such as mental diseases, chronic pain and headache, diabetes, cardiovascular diseases, and cancer. We evaluated the association between chronic diseases and outcomes of hospital visits avoidance, and our findings showed that exacerbations occurred mostly in participants with mental diseases, chronic pain and headache, and diabetes. Though our study only focussed on hospital/clinic visits and did not consider acute health care, including mortality, the rates of hospital visits avoidance and exacerbation varied among patients with different diseases under the COVID-19 stay-at-home policy. It is particularly important to follow up patients with mental diseases during the pandemic, and disease-specific planning is necessary.

Key words: avoiding hospital visits, chronic diseases, COVID-19, JACSIS, Japan, online survey

Introduction

The coronavirus disease 2019 (COVID-19) pandemic was a global public health crisis that commenced in 2020, wherein access to healthcare systems and quality of daily life have been remarkably challenging. A survey of US adults reported that approximately 80% of the respondents felt that COVID-19 affected their daily routine and changed their plans for medical care.¹ Particularly, delay or avoidance of medical care among non-COVID-19 patients of the general population is

also a health issue. A web survey of approximately 5,000 adult participants in the United States showed that 40% of them avoided medical care due to the risk of being infected with COVID-19.² Another study from Italy reported a 67% reduction in emergency department visits and a 31% reduction in urgent hospitalization among children.³

Chudasama et al. reported that patients with diabetes, chronic obstructive pulmonary disease (COPD), and hypertension were the most affected due to a reduction in access

Key messages

- The proportion of those who avoided hospital visits differed by disease reported.
- The proportion of those who experienced disease exacerbation differed by disease.
- Disease-specific preparedness may be necessary for the COVID-19 pandemic.
- Patients with mental health conditions should be followed up during COVID-19.
- Patients with cancer were less likely than others to avoid hospital visits.

to health care systems, and 80% of the healthcare professionals reported that the mental health of their patients worsened during COVID-19.⁴ Regarding dental care, Kranz et al. used the RAND American Life Panel Survey and reported that nearly half of the US adults delayed dental care due to the COVID-19 pandemic during the spring of 2020.⁵ They also reported that nearly three in four adults reported delay in dental check-up, examination, or cleaning for oral care. Delayed or avoided medical care might worsen diseases; therefore, it has become vital to know and describe the current situation of hospital visit avoidance and exacerbation of diseases.

In Japan, the government declared a state of emergency and imposed a stay-at-home order without lockdown in April and May 2020 because of the rapid surge of COVID-19 cases.⁶ However, studies on the impact of COVID-19 on people's routine medical care or hospital visits are limited, and understanding the factors associated with medical care avoidance during the ongoing pandemic to inform future pandemic management is important. The present study examined the impact of the emergency and stay-at-home policy for COVID-19 on individuals' hospital visits and disease exacerbation; we also determined the related factors.

Methods

Design and settings

This study used online survey data from the Japan COVID-19 and Society Internet Survey (JACSIS), which was designed to investigate patients' social and health status during the COVID-19 pandemic. In 2020, approximately 2.2 million individuals registered with a Japanese Internet Survey Agency (Rakuten Insight, Inc., Tokyo, Japan), of which 224,389 candidates received an e-mail invitation to participate in this study.⁷ In total, 28,000 respondents aged 15–79 years were selected among the 224,389 candidates. We set a target sample size of 28,000 people, based on a statistical presumption (i.e. enough numbers to estimate the proportion of events for each age and sex stratum) and available survey budget. Our questionnaires were distributed from 25 August 2020 to 30 September 2020, when the target number of patients for each sex, age, and prefecture category was achieved. Using a computer algorithm, the random sampling method was used to recruit participants for this study. Therefore, the data represent the official Japanese demographic composition as of 1 October 2019, according to age, sex, and living prefecture.

Ethical approval

All participants provided web-based informed consent before responding to the online self-report questionnaire. The study protocol was reviewed and approved by the Research Ethics Committee of the Osaka International Cancer Institute

(approved on 19 June 2020; approval number 20084) and National Cancer Center (approved on 22 January 2021; Protocol Number 2020-447).

Questionnaire

The JACSIS questionnaire included questions used to examine the impact of COVID-19 on people's hospital visits and disease exacerbation and identify factors related to Japan's COVID-19 stay-at-home policy enforced from April to May 2020. The questionnaire was developed based on the discussions of small groups that compromised mainly epidemiologists of the Osaka International Cancer Institute, National Center of Neurology and Psychiatry, and National Cancer Center in Japan. This study assessed the following variables: demographic and lifestyle characteristics (sex, age, occupation, educational level, spouse, alcohol intake, and smoking), presence of diseases (Q75), and hospital visits in April and May 2020 (Q19). Regarding diseases (Q75), respondents were asked, 'Do you have any of the following diseases? (more than 10 items listed below)': hypertension, diabetes, asthma, bronchitis and pneumonia, atopic dermatitis, periodontal disease, caries (tooth decay), otitis media, angina pectoris, myocardial infarction, stroke (cerebral infarction or cerebral haemorrhage), COPD, cancer and malignancies, chronic pain, such as back pain and headaches persisting for longer than 3 months, depression, and psychiatric disorders other than depression. We combined some diseases into the following categories: 'respiratory diseases' included asthma, bronchitis and pneumonia, and COPD; 'dental diseases' included periodontal disease and caries (tooth decay); and 'cardiovascular diseases' included angina pectoris, myocardial infarction, and stroke (cerebral infarction or cerebral haemorrhage). Furthermore, we considered the regional epidemic of COVID-19 by classifying the total number of patients in each prefecture from January to April in Japan into quartiles. We excluded otitis media from the final analyses because of the small number of cases.

Management of data quality

To validate data quality, we excluded respondents with discrepancies and/or artificial/unnatural responses. Three question items, namely, 'Please choose the second from the bottom,' 'choosing positive in all the questions regarding drug use,' and 'choosing positive in all the questions regarding the presence of chronic diseases,' were used to detect such discrepancies. In the questionnaire, we asked 'Do you have diseases?' and subjects answered 'never' 'past' 'current (under treatment),' and 'current (not under treatment)' and limited 'current (under treatment)' subjects for analysis. Finally, among the remaining 25,482 participants, we included 7,747 patients who had any diseases in our analysis.

Outcomes

The primary outcomes included the avoidance of hospital visits (avoidance of scheduled hospital/clinic visits, postponing hospitalization and surgery, and running out of drugs) and disease exacerbation in April and May 2020.

Statistical analyses

The baseline characteristics, including information on diseases, demographic variables, hospital visits avoidance, and disease exacerbation were summarized for all people included in the study. Multivariable logistic regression analyses were used to estimate the association of chronic diseases (hypertension, diabetes, respiratory diseases, atopy, dental diseases, cardiovascular diseases, cancer, chronic pain and headaches, and mental diseases) with avoidance of hospital visits, postponing hospitalization, and running out of medications, with adjustment for the following lifestyle characteristics: sex, age (<40, 40–59, ≥60 years), occupation classification (self-employed, employed full time, employed part time, student/housewife/others), educational level (high school, college, university, others), spouse (no/yes), alcohol intake (no/yes), smoking (no/yes), and regional number of COVID-19 patients. The odds ratios (OR) were assessed for each disease and those who did not report having that disease were the reference group. We also performed multivariable logistic regression analyses to assess the association of disease exacerbation with avoidance of hospital visits and chronic diseases. Furthermore, as supplemental analyses, we conducted additional logistic regression analyses to assess the association between avoiding scheduled hospital visits and disease exacerbation for those who had one disease, by separate analyses for each disease, i.e. restricting the participants to those who reported each one of the listed diseases. The level of significance was set at 5% ($P < 0.05$). All statistical analyses were performed using Stata software (version 13.0; StataCorp LLC).

Results

Among 28,000 participants, 7,747 people who indicated having any disease (under current medical treatment) on the JACSIS questionnaire were included in the final analysis. Among them, 4,289 were men (55.4%) and the mean age was 56.7 years (standard deviation: 15.9). **Table 1** shows the baseline characteristics of study participants who had chronic diseases. Among them, 47.7% had hypertension, 38.5% had any dental diseases, 20.7% had chronic pain and headache, 17.9% had diabetes, 15.0% had any mental diseases, 5.4% had cancer diseases, and 7.5% of patients had cardiovascular diseases. Regarding hospital visits and exacerbation of diseases, 17.7% of patients with any chronic diseases avoided hospital visits, 4.9% of patients ran out of a drug, 5.3% of patients experienced disease exacerbation, and 2.1% of patients postponed hospitalization or surgery around April and May 2020 due to Japan's state of emergency for COVID-19. Participants were classified as self-employed, employed full time, employed part time, and student/housewife/others (7.5%, 30.0%, 16.1%, and 46.4%, respectively). Regarding educational level, they were classified as having high school, college, university, and others (33.9%, 20.5%, 45.4%, and 0.18%, respectively). Furthermore, 64.6% had a spouse, 52.0% consumed alcohol, and 20.5% smoked.

Table 1. Baseline characteristics of study respondents those who had chronic diseases ($N = 7,747$).

Variables	Having any chronic diseases (under medical treatment)
Sex, male, n (%)	4,289 (55.4)
Age, mean (SD)	56.7 (15.9)
<40 years of age	1,225 (15.8)
40–59 years of age	2,568 (33.2)
≥60 years of age	3,954 (51.0)
Diseases, n (%)	
Hypertension	3,692 (47.7)
Diabetes	1,386 (17.9)
Respiratory diseases	800 (10.3)
Atopy	752 (9.7)
Dental diseases	2,979 (38.5)
Cardiovascular diseases	579 (7.5)
Cancer	415 (5.4)
Chronic pain and headache	1,606 (20.7)
Mental diseases	1,162 (15.0)
Occupation classification, n (%)	
Self-employed	584 (7.5)
Employed (full time)	2,325 (30.0)
Employed (part time)	1,247 (16.1)
Student, housewife, others	3,591 (46.4)
Educational level	
High school	2,629 (33.9)
College	1,590 (20.5)
University	3,514 (45.4)
Others	14 (0.18)
Spouse, n (%) ^a	5,005 (64.6)
Alcohol intake, current, n (%)	4,025 (52.0)
Smoking, current, n (%)	1,587 (20.5)
Regional patients of COVID-19, quartiles ^b	
Lowest quartile	1,872 (24.2)
Second quartile	1,720 (22.2)
Third quartile	2,351 (30.4)
Highest quartile	1,804 (23.3)
During April and May in 2020	
Avoiding scheduled hospital visits	1,367 (17.7)
Postponing hospitalization or surgery	161 (2.1)
Running out of drug	379 (4.9)
Exacerbation of diseases	414 (5.3)

Participants who answered yes for nonessential and non-urgent outings under COVID-19.

^a1,407 (18.2%) responses were missing.

^bThe quartiles were calculated based on the total number of patients of COVID-19 in each prefecture from January to April in Japan.

Table 2 shows the results of logistic regression analyses assessing the association between the participants' characteristics and avoidance of medical treatments. Compared with men, women were more likely to avoid scheduled hospital visits (OR 1.74, 95% CI: 1.49–2.04). Among disease characteristics, patients with chronic pain and headache, respiratory disease, or atopy were more likely to avoid scheduled

Table 2. Association between respondent characteristics and avoiding medical treatments (*N* = 7,747).

Variables	Avoiding scheduled hospital visits <i>N</i> = 1,367				Postponing hospitalization or surgery <i>N</i> = 161				Run out of drug <i>N</i> = 379			
	%	Adjusted odds ratios	(95% CI)	<i>P</i> value	%	Adjusted odds ratios	(95% CI)	<i>P</i> value	%	Adjusted odds ratios	(95% CI)	<i>P</i> value
Diseases ^a												
Hypertension	41.9	0.95	(0.82–1.11)	0.521	39.1	0.89	(0.59–1.34)	0.565	30.3	0.91	(0.68–1.22)	0.519
Diabetes	17.1	1.11	(0.93–1.33)	0.249	30.4	1.55	(0.99–2.41)	0.054	16.1	1.07	(0.76–1.53)	0.686
Respiratory diseases	14.6	1.43	(1.17–1.76)	0.001	36.0	2.13	(1.32–3.42)	0.002	25.9	2.31	(1.70–3.15)	<0.001
Atopy	12.4	1.29	(1.03–1.60)	0.024	29.8	2.07	(1.29–3.29)	0.002	26.7	2.23	(1.65–3.02)	<0.001
Dental diseases	38.4	1.02	(0.88–1.17)	0.829	49.7	1.24	(0.85–1.81)	0.274	38.5	1.07	(0.83–1.38)	0.586
Cardiovascular diseases	8.3	1.07	(0.82–1.41)	0.610	26.7	1.72	(0.95–3.13)	0.076	10.6	0.95	(0.57–1.58)	0.840
Cancer	4.6	0.68	(0.49–0.94)	0.019	18.6	1.70	(0.91–3.17)	0.098	5.0	0.38	(0.19–0.77)	0.007
Chronic pain and headache	29.7	1.83	(1.58–2.13)	<0.001	37.3	1.40	(0.92–2.12)	0.118	30.1	1.70	(1.30–2.22)	<0.001
Mental diseases	18.4	1.16	(0.95–1.41)	0.139	37.9	2.38	(1.53–3.71)	<0.001	30.1	1.60	(1.19–2.15)	0.002
Female sex, reference: male	53.9	1.74	(1.49–2.04)	<0.001	36.0	1.05	(0.67–1.63)	0.840	46.4	1.11	(0.84–1.47)	0.450
Age												
<40 years of age (reference)	17.9	1.00	–	–	35.4	1.00	–	–	38.8	1.00	–	–
40–59 years of age	37.1	1.11	(0.90–1.37)	0.330	37.3	0.67	(0.41–1.08)	0.100	39.3	0.59	(0.43–0.80)	0.001
≥60 years of age	45.0	0.94	(0.74–1.19)	0.601	27.3	0.52	(0.28–0.96)	0.036	21.9	0.29	(0.19–0.44)	<0.001
Occupation classification												
Self-employed (reference)	7.4	1.00	–	–	8.7	1.00	–	–	6.6	1.00	–	–
Employed (full time)	29.9	0.95	(0.72–1.25)	0.702	47.2	1.08	(0.53–2.20)	0.831	40.1	0.97	(0.59–1.59)	0.897
Employed (part time)	16.6	0.91	(0.68–1.23)	0.551	15.5	0.79	(0.35–1.77)	0.565	17.9	1.05	(0.61–1.80)	0.864
Student, housewife, others	46.1	1.06	(0.81–1.38)	0.688	28.6	0.63	(0.30–1.33)	0.228	35.4	0.99	(0.59–1.64)	0.960
Educational level												
High school (reference)	29.5	1.00	–	–	26.7	1.00	–	–	28.0	1.00	–	–
College	22.6	1.16	(0.97–1.40)	0.113	19.9	1.24	(0.72–2.15)	0.441	22.2	1.08	(0.77–1.51)	0.657
University	47.8	1.38	(1.17–1.62)	<0.001	52.8	1.34	(0.85–2.13)	0.213	49.3	1.07	(0.80–1.44)	0.635
Others	0.1	0.56	(0.07–4.51)	0.584	0.6	5.47	(0.62–48.04)	0.125	0.5	3.71	(0.72–19.02)	0.116
Spouse, reference: no	63.9	0.94	(0.80–1.12)	0.493	65.2	2.05	(1.25–3.35)	0.004	52.2	0.87	(0.66–1.15)	0.332
Alcohol intake, reference: no	52.5	1.20	(1.05–1.38)	0.009	37.9	0.79	(0.53–1.17)	0.241	46.4	1.06	(0.82–1.36)	0.665
Smoking, reference: no	22.3	1.23	(1.04–1.46)	0.016	36.0	1.71	(1.14–2.55)	0.009	28.5	1.38	(1.04–1.84)	0.025
Number of patients of COVID-19, quartiles ^b												
Lowest quartile (reference)	18.5	1.00	–	–	18.6	1.00	–	–	17.4	1.00	–	–
Second quartile	20.1	1.21	(0.99–1.49)	0.065	23.0	1.25	(0.71–2.19)	0.441	21.9	1.35	(0.93–1.97)	0.112
Third quartile	31.9	1.45	(1.20–1.75)	<0.001	29.2	1.21	(0.71–2.05)	0.484	31.4	1.32	(0.93–1.88)	0.125
Highest quartile	29.5	1.96	(1.62–2.39)	<0.001	29.2	1.26	(0.73–2.17)	0.411	29.3	1.65	(1.15–2.37)	0.006

Abbreviations: OR, odds ratio; CI, confidence interval.

^aOR and 95% CI were assessed for each disease and references were those who did not report having that disease. Adjusted for sex, age, occupation classification, educational level, spouse, alcohol intake, smoking, and regional patients.^bThe quartiles were calculated based on the total number of patients of COVID-19 in each prefecture from January to April in Japan.

hospital visits (OR 1.83, 95% CI: 1.58–2.13, OR 1.43, 95% CI: 1.17–1.76, OR 1.29, 95% CI: 1.03–1.60, respectively). These trends were in accordance with those regarding postponing hospitalization or surgery, although OR were higher for respiratory disease and atopy patients. Additionally, compared to people living in regions with the lowest number of COVID-19 patients (lowest quartile), those who lived in regions with higher numbers of COVID-19 patients were more likely to avoid scheduled hospital visits (Third quartile area: OR 1.45, 95% CI: 1.20–1.75, Highest quartile area: OR 1.96 95% CI: 1.62–2.39). On the other hand, people aged 40–59 years and ≥60 years were less likely to run out of drugs, compared to people aged <40 years (OR 0.59, 95% CI: 0.43–0.80 and OR 0.29, 95% CI: 0.19–0.44, respectively).

Table 3 shows the results of the association between diseases, hospital visits, and disease exacerbation. Model 1, which adjusted for demographic variables, revealed that patients with mental disease and chronic pain/headache were more likely to have exacerbated conditions during a state of emergency for COVID-19, compared to patients with other

diseases (OR 3.59, 95% CI: 2.75–4.68 and OR 3.25, 95% CI: 2.54–4.15, respectively), followed by those with respiratory diseases, atopy, and diabetes (OR 1.74, 95% CI: 1.25–2.42, OR 1.72, 95% CI: 1.24–2.40, and OR 1.60, 95% CI: 1.17–2.20, respectively). Whereas patients with cardiovascular diseases and cancer were less likely to experience exacerbations (OR 0.57, 95% CI: 0.33–0.98 and OR 0.70, 95% CI: 0.39–1.26, respectively), compared to patients with other diseases. After adjusting for demographic variables as well as variables, such as hospital visits and ‘running out of drugs,’ model 2 showed that mental diseases, chronic pain and headache, and diabetes were associated with disease exacerbation (OR 3.33, 95% CI: 2.51–4.41, OR 2.83, 95% CI: 2.19–3.66, and OR 1.53, 95% CI: 1.10–2.13, respectively). On the other hand, cardiovascular disease and cancer were not associated with disease exacerbation (OR 0.55, 95% CI: 0.31–0.97 and OR 0.79, 95% CI: 0.43–1.45, respectively). Furthermore, in model 2, in which the OR were 2–3 times higher than that for patients who avoided hospital visits, postponed hospitalization or surgery, and ran out of drug (OR 2.65, 95% CI:

Table 3. Association between disease exacerbation and respondent characteristics (N = 7,747).

Variables	Exacerbation of diseases N = 414						
	Model 1				Model 2		
	%	Adjusted odds ratios	(95% CI)	P vale	Adjusted odds ratios	(95% CI)	P vale
Avoiding scheduled hospital visits	46.1	–	–	–	2.65	(2.03–3.46)	<0.001
Postponing hospitalization or surgery	11.6	–	–	–	3.32	(2.02–5.45)	<0.001
Run out of drug	24.6	–	–	–	3.04	(2.15–4.29)	<0.001
Diseases ^a							
Hypertension	29.7	0.77	(0.58–1.03)	0.076	0.75	(0.56–1.01)	0.059
Diabetes	19.8	1.60	(1.17–2.20)	0.004	1.53	(1.10–2.13)	0.012
Respiratory diseases	21.7	1.74	(1.25–2.42)	0.001	1.38	(0.97–1.96)	0.075
Atopy	18.1	1.72	(1.24–2.40)	0.001	1.42	(0.99–2.02)	0.054
Dental diseases	37.9	1.01	(0.79–1.29)	0.929	0.96	(0.74–1.24)	0.745
Cardiovascular diseases	10.1	0.57	(0.33–0.98)	0.043	0.55	(0.31–0.97)	0.040
Cancer	6.8	0.70	(0.39–1.26)	0.235	0.79	(0.43–1.45)	0.452
Chronic pain and headache	42.3	3.25	(2.54–4.15)	<0.001	2.83	(2.19–3.66)	<0.001
Mental diseases	46.1	3.59	(2.75–4.68)	<0.001	3.33	(2.51–4.41)	<0.001
Sex, reference: male	50.0	1.05	(0.8–1.39)	0.706	0.94	(0.71–1.26)	0.691
Age							
<40 years of age (reference)	30.2	1.00	–	–	1.00	–	–
40–59 years of age	45.2	0.97	(0.71–1.32)	0.838	1.06	(0.77–1.47)	0.719
≥60 years of age	24.6	0.41	(0.27–0.62)	<0.001	0.50	(0.32–0.76)	0.001
Occupation classification							
Self-employed (reference)	8.0	1.00	–	–	1.00	–	–
Employed (full time)	31.4	0.73	(0.46–1.18)	0.198	0.73	(0.44–1.20)	0.218
Employed (part time)	20.3	0.97	(0.59–1.60)	0.901	1.03	(0.60–1.74)	0.924
Student, housewife, others	40.3	1.09	(0.68–1.74)	0.725	1.17	(0.72–1.91)	0.532
Educational level							
High school (reference)	28.0	1.00	–	–	1.00	–	–
College	25.1	1.43	(1.03–1.97)	0.031	1.37	(0.97–0.91)	0.07
University	46.8	1.41	(1.05–1.89)	0.023	1.30	(0.96–1.77)	0.091
Others	0.0	NA	–	–	NA	–	–

Abbreviations: OR, odds ratio; CI, confidence interval; NA, not applicable.

^aOR and 95% CI were assessed for each disease and references were those who did not report having that disease. Adjusted for sex, age, occupation classification, educational level, spouse, alcohol intake, smoking, and regional patients.

2.03–3.46, OR 3.32, 95% CI: 2.02–5.45, OR 3.04, 95% CI: 2.15–4.29).

Supplementary Table 1 shows the results of the regression model assessing the association between avoidance of scheduled hospital visits and disease exacerbation among those with one disease (separate analyses for each disease; i.e. restricting the participants to those who reported each one of the listed diseases). Many patients tend to have a comorbidity; therefore, the number of patients who had one disease was limited, with some diseases, such as cancer and cardiovascular omitted. However, the results of logistic regression showed the same direction as those of the main analyses (Table 3). Atopy, chronic pain/headache, and mental disease were all significantly associated with disease exacerbation under the state of emergency and stay-at-home policy for COVID-19.

Discussion

This study examined the impact of Japan's state of emergency and stay-at-home policy for COVID-19 on individual's hospital visits and disease exacerbation and examined the factors related to them. Overall, patients with mental diseases, chronic pain and headache, respiratory diseases, or atopy were more likely to avoid hospital visits or postpone hospitalization, and this finding correlated with the results of models that included disease exacerbation as the outcome. However, patients with cardiovascular disease or cancer were less likely to avoid hospital visits or experience disease exacerbation during a state of emergency for COVID-19 in Japan.

Some studies reported changes in patient behaviour before and after the COVID-19 pandemic, and that the rate of outpatient clinic visits and non-COVID-19 hospital visits were decreasing.^{8–11} Czeisler et al. conducted a web-based survey in June 2020 with a nationwide representative sample of US adults aged ≥ 18 years.² They found that an estimated 40.9% of US adults avoided medical care during the pandemic because of concerns about the risk of being infected with COVID-19, including 12.0% who avoided urgent or emergency care and 31.5% who avoided routine care. A survey conducted among 5,302 patients with cancer in The Netherlands reported that 30% of patients experienced consequences regarding their oncological treatment, and the most frequently adjusted schedules for therapies were those for chemotherapy and immunotherapy.¹² In our study, 20% of the patients avoided scheduled hospital visits or hospitalization, and this percentage may be lower than those in other countries. This may be affected by governmental policy for COVID-19, which was a mild stay-at-home order without lockdown in Japan compared with other countries. On the other hand, our study showed that the proportion of people who avoided hospital visits and experienced disease exacerbation differed according to disease reported. For instance, patients with atopy as well as mental diseases were more likely to avoid hospital visits and have exacerbated conditions. However, the extent of disease exacerbation in cancer patients was moderate compared with that in patients with other diseases among our participants. Although we were unable to determine why the cancer patients in our study were more likely to continue hospital visits compared to patients with other diseases, compulsory treatments that must not

be missed, or the fact that most cancers are terminal; hence, these patients cannot afford to avoid hospital visits, regardless of the COVID-19 pandemic.

Our previous study showed that the prevalence of severe psychological distress among Japanese people increased from 6.7% in 2016 to 9.2% during COVID-19.^{13,14} In our study, the proportion of people who experienced disease exacerbation was about 46% in patients with mental diseases, which is relatively higher than that in patients with other diseases. Ueda et al. reported that the mental health condition of people in an economically vulnerable situation may be particularly affected during the COVID-19 crisis commenced in 2020.¹⁵ Furthermore, another study with a sample of the Japanese general population indicated that people with mental health problems may be at increased risk of COVID-19 infection given their lower engagement in many preventive behaviours, especially those with depressive symptoms.¹⁶ These findings indicate that follow-up may be necessary for patients with mental health conditions, especially during this pandemic.

Our study also showed that men were less likely to avoid scheduled hospital visits and younger people were less likely to run out of drugs during a state of emergency for COVID-19, compared to women and older people, respectively. Although there were limited reports regarding the avoidance of hospital visits during COVID-19, a survey examining the perception and behaviour of a UK adult population had similar findings with those of our study in that women were more likely to socially distance or have self-isolated behaviour compared to men.¹⁷ This study also showed that, compared with younger people, older people were more likely to socially distance, which was in contrast with our study's results regarding avoiding hospital visits. A plausible reason for this may be that elderly people were more serious about their health and, therefore, less likely to avoid hospital visits, compared to younger people. Another study conducted among US adults reported that not only sex and age, but also race/ethnicity and income were related to people's COVID-19-related knowledge and behaviour.^{18,19} Regardless, as our study showed, avoiding hospital visits can naturally lead to exacerbation of diseases; therefore, necessary hospital visits should not be avoided. Overall, any special caution for risk-avoiding people may be necessary in addition to disease-specific caution.

As for policy implications, our study suggested that avoiding hospital visits varied according to disease; therefore, disease-specific preparedness may be necessary for this pandemic. Furthermore, our findings suggest that follow-up may be necessary for patients with mental health conditions, especially during this pandemic. Effective modes of health care delivery, telemedicine, or online prescription could be useful for patients to manage their conditions, such as respiratory diseases.^{20–22} In fact, the Japanese government has promoted telemedicine by removing regulatory obstacles during the COVID-19 pandemic; however, many factors that inhibit the dissemination of telemedicine, such as cost and security, were indicated in Japan.²³ Some of these problems may be common in other foreign countries,^{24–26} and it is necessary to overcome technical and political frameworks. Our study only focussed on a measure of morbidity and not on orality which can permit individual health status or thinking. During the COVID-19 pandemic, many problems, not limited to healthcare, became apparent. Though our study may be of

significance for public health during COVID-19 as a quantitative measure of health problems, further studies are needed for a greater understanding of health problems, which include studies on an individual level and to rethink strategies for future pandemics.

Limitations

There are several limitations to our study. First, our study was an online survey conducted using a questionnaire, and there could be sampling bias of representativeness and response bias for the questionnaire, compared with paper-based surveys. Therefore, we sampled participants who would represent the Japanese population with respect to sex, age, and residential area, at least, among the panel members. Second, although our targets were people with diseases and those who avoided hospital visits, the main outcomes (such as exacerbation of diseases) could not be caused by target diseases. This means that the chronic diseases selected by respondents were different from the diseases related to the outcomes and we did not consider comorbidities. Moreover, our study only focussed on hospital/clinic visits and did not consider acute health care, including mortality and could not know the details of exacerbation and severity of exacerbation. Third, the questionnaire was developed by some specialists in epidemiology, but the validation of the questionnaire may be not enough. Moreover, our study design was cross-sectional, and the causal association of our results could not be confirmed. Therefore, further research that could examine causality may be required.

Conclusions

We showed that patients with respiratory diseases, atopy, chronic pain and headache, or mental diseases were more likely to avoid hospital visits under COVID-19 restrictions, compared with those with other diseases. These findings were in accordance with those regarding 'drugs running out' and disease exacerbation. However, patients with cardiovascular disease and cancer were less likely to avoid hospital visits and experience exacerbations than those with other diseases, during a state of emergency for COVID-19 in Japan. These results suggest that disease-specific treatment and preparedness may be necessary for this pandemic.

Supplementary material

Supplementary material is available at *Family Practice* online.

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Conflict of interest

Katanoda received a JMWH Bayer Grant (1 million JPY) from Sep. 1, 2017 to Aug. 31, 2019 via the Japan Society for Menopause and Women's Health.

Data availability

The data underlying this article cannot be shared publicly due to limitations given by the ethical approval of the Research Ethics Committee of the Osaka International Cancer Institute and National Cancer Center in Japan.

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