The Ecology of Medical Care During the COVID-19 Pandemic in Japan: A Nationwide Study

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Research Article

Abstract

Background.

The coronavirus disease 2019 (COVID-19) pandemic has had a profound impact on health care utilization. However, the overall picture of shifts in health-seeking behaviors remains unclear.

Objective.

We assessed the ecology of medical care during the COVID-19 pandemic in Japan and compared it with the results pre-pandemic. We also investigated the associations of sociodemographic and clinical factors with health-seeking behaviors during the COVID-19 pandemic.

Design and Methods.

We conducted a nationwide cross-sectional survey of a representative sample of the general Japanese adult population in May 2021. The main outcomes were health care use for symptoms or health-related events in the last month. We assessed sociodemographic and clinical factors, including age, sex, years of education, annual household income, social isolation, and the number of chronic conditions.

Key Results.

Data were analyzed from 1,747 respondents. Over-the-counter drug use, physician's office visits, and hospital outpatient clinic visits decreased drastically during the COVID-19 pandemic compared with pre-pandemic levels. The decrease in the use of medical facilities was especially pronounced among the elderly. Sociodemographic and clinical factors were differently associated with health care utilization during the COVID-19 pandemic. Social isolation and years of education were positively associated with over-the-counter drug use, while female sex was associated with increased over-the-counter drug use and physician's office visits. In addition, the number of chronic conditions was associated with increased hospital visits.

Conclusions.

During the COVID-19 pandemic, the use of medical facilities for health-related events decreased drastically, especially among the elderly. A pharmacy is an important source of health care in a population with social isolation. These findings may be useful to researchers and policymakers in rethinking health care systems during and after the pandemic.

Introduction

The coronavirus disease 2019 (COVID-19) pandemic is considered to have had a profound impact on health care utilization worldwide. Studies conducted early during the pandemic in the US and Japan have reported that the number of physician's office visits decreased.[1-3] Another study showed reductions in emergency department and inpatient utilization, as well as outpatient utilization during the early stages of the pandemic.[4] These changes may

be due to governments' implementation of various strategies such as large-scale physical distancing measures and movement restrictions.[5] In Japan, the government has repeatedly declared a state of emergency, urging citizens to refrain from going out unnecessarily.[6] In addition to policy factors, individuals' health-seeking behaviors may have changed during the pandemic. However, the overall picture of shifts in health-seeking behaviors due to the pandemic remains unclear.

It is useful to describe "the ecology of medical care" as a way to grasp the whole picture of health-seeking behavior. The theory of "the ecology of medical care" was first proposed by White in 1961,[7] providing a framework for understanding patterns of an individual's choices in seeking medical care for health-related events in specific populations of interest in which the number of people among the total population who had utilized medical services in a given period of time is calculated.[8] This framework was replicated in different countries worldwide and offered a useful tool to researchers and health care policymakers.[9–12] With a universal health coverage in Japan, the ecology of medical care has been investigated in 2003 and 2013.[13,14] Compared with the 2003 study, the participants in the 2013 study were reported to have fewer physician and emergency room visits and less over-the-counter (OTC) drug use, but reported higher frequency of complementary or alternative medicine (CAM) use.[14] Thus, health-seeking behavior is changing under the influence of the social background of each era. For example, it can be inferred that social isolation, which is a state of having few social relationships or infrequent social contact with others, has had an impact on health care utilization during the pandemic.

Regarding the change in health care use due to the COVID-19 pandemic, reevaluating the ecology of medical care may be useful to researchers and policymakers in rethinking health care systems during and after the pandemic. Therefore, this study aimed to assess health-seeking behaviors for health-related events in a representative sample of the Japanese general population during the COVID-19 pandemic and to compare it with the results before the pandemic in Japan. In addition, we investigated the associations of sociodemographic and clinical factors with health-seeking behaviors during the pandemic. In particular, the interest was in the factor of social isolation, which is a major health problem and has increased globally due to the pandemic.[15]

Methods

Design, setting, and participants

We used the data collected from the National Usual Source of Care Survey (NUCS) conducted in May 2021. The NUCS was a nationwide mail survey that aimed to collect data on the usual source of primary care, health care use, health conditions, health-related quality of life, and sociodemographic characteristics in a representative sample of the Japanese adult population. In the NUCS, a national representative panel in Japan administered by the Nippon Research Center was used to select possible participants. This panel is composed of approximately 70,000 residents who were selected from the Japanese general population using a multistage sampling method and who participated in a previous survey from the Nippon Research Center.[16] From the panel, 2,000 possible participants aged 20–75 years were selected through stratified sampling by age, sex, and residential area. The survey participants received 500 JPY gift certificates. Among residents responding to the NUCS, eligible participants in this study were individuals who responded to the survey item regarding health care use. The institutional review board of the Jikei University School of Medicine approved this study [approval no. 32-416(10505)].

Measures

Health-seeking behaviors

We collected data on participants' health-seeking behaviors using a structured questionnaire. Participants were asked to answer the following questions about health care use for symptoms or health-related events in the last month: OTC drug use, physician's office visit, hospital outpatient clinic visit, university medical center visit, emergency room visit, home health care use, CAM use, and hospitalization. We excluded telemedicine visits because telemedicine for new symptoms or health-related events was not widespread in Japan as of May 2021.[17]

Sociodemographic and clinical factors

We collected data on the sociodemographic and clinical factors of the participants. The questionnaire measured the age, sex, years of education, annual household income, social isolation, and the number of chronic conditions.

We used the Japanese version of the abbreviated Lubben Social Network Scale (LSNS-6)[18] to assess social isolation. The LSNS-6 score is an equally weighted sum of six items, and the scores range from 0 to 30 points, with higher scores indicating a better quality of the social network. The reliability and validity of the Japanese version of LSNS-6 have been assessed in a previous study in Japan.[18] As suggested in the previous study, we classified patients with a score of <12 points as being socially isolated.[19]

We used a validated list of 20 chronic conditions that were created based on previous multimorbidity literature and relevance to the primary care population[20]: hypertension, depression/anxiety, chronic musculoskeletal conditions that cause pain or limitation, arthritis/rheumatoid arthritis, osteoporosis, chronic respiratory disease (asthma, chronic obstructive pulmonary disease, or chronic bronchitis), cardiovascular disease, heart failure, stroke/transient ischemic attack, stomach problems, colon problems, chronic hepatitis, diabetes, thyroid disorder, any cancer in the past 5 years, kidney disease/failure, chronic urinary problem, dementia/Alzheimer's disease, hyperlipidemia, and obesity.

Statistical analysis

Descriptive analyses were performed using the ecology of medical care model.[7] We estimated the number of persons per 1,000 residents who had experienced different health care use during a one-month period and calculated 95% confidence intervals (CI) for event rates.

Subgroup analyses for variables of interest in health care use were conducted by age, sex, years of education, annual household income, social isolation, and the number of chronic conditions. In addition, to investigate the associations of sociodemographic and clinical factors with each health care use, we performed multivariable logistic regression analyses. In the multivariable analyses, we defined a hospital visit as a composite outcome that included hospital outpatient clinic visits, university medical center visits, and emergency room visits.

For each analysis, we used a two-sided significance level of $P = 0.05$. For missing independent variables in the regression model, we performed a complete case analysis. Statistical analyses were performed using R version 4.1.0 (R Foundation for Statistical Computing, Vienna, Austria; www.R-project.org).

Results

Participants' characteristics

Of the 2,000 adult residents, 1,757 responded to the NUCS (response rate: 87.9%). Among them, we excluded 10 participants who did not respond to the survey item regarding health care use. Then, we analyzed the remaining 1,747 eligible participants. Table 1 presents the characteristics of the study population. Of the eligible participants, 22.5% were elderly (≥ 65 years old), while 30.3% were considered socially isolated. Approximately half of the participants had one or more chronic conditions.

Table 1
Participants' Characteristics (N = 1,747)

Characteristic	n (%)
Age, y	
20 – 64	1,354 (77.5)
≧ 65	393 (22.5)
Gender	
Male	857 (49.1)
Female	890 (50.9)
Education	
Less than or equal to high school	637 (36.5)
More than high school	1,069 (61.2)
Data missing	41 (2.3)
Annual household income, million JPY	
< 3.00 (≒27,000 US dollar)	285 (16.3)
3.00−4.99	526 (30.1)
≧ 5.00	916 (52.4)
Data missing	20 (1.1)
Social isolation	
Absent	1,205 (69.0)
Present	530 (30.3)
Data missing	12 (0.7)
Number of chronic conditions	
0	790 (45.2)
1	453 (25.9)
≧ 2	433 (24.8)
Data missing	71 (4.1)

Ecology of medical care during the pandemic

Table 2 shows the monthly number of health care use for symptoms or health-related events per 1,000 Japanese individuals during the COVID-19 pandemic. The most frequently used health care resources were the physicians' offices. We observed that 93 participants used an OTC drug, 113 visited a physician's office, 37 visited a hospital outpatient clinic, nine visited a university medical center, two received care in an emergency room, two received home health care, 19 visited a provider of CAM care, and 10 were hospitalized. Table 2 also shows the results of subgroup analyses by age, sex, years of education, annual household income, social isolation, and the number of chronic conditions. The frequency of OTC drug use was higher among non-elderly adults, women, those with more than high school education, those without chronic conditions, and socially isolated individuals. Moreover, women were more likely to report physician's office visits and CAM use. Elderly participants were heavier users of university medical centers and CAM and were more frequently hospitalized than non-elderly adults. In addition, participants with one or more chronic conditions were heavier users of hospital outpatient clinics, university medical centers, and CAM and were more frequently hospitalized than those without chronic conditions.

Table 2
Ecology of Medical Care in Terms of Type of Care Stratified by Participants' Characteristics

Number per 1,000 persons (95% CI)								
	OTC drug use	Physician's office visit	Hospital outpatient clinic visit	University medical center visit	Emergency room visit	Home health care use	CAM use	Hospitalization
Overall	93 (80 – 107)	113 (99 – 129)	37 (28 – 47)	9 (5 – 14)	2 (1 – 6)	2 (1 – 6)	19 (14 – 27)	10 (6 – 16)
Age								
20 – 64	104 (88 – 122)	113 (97 – 131)	34 (25 – 45)	7 (3 – 13)	2 (0 – 6)	3 (1 – 8)	17 (11 – 25)	6 (3 – 12)
≧ 65	53 (33 – 81)	115 (85 – 150)	46 (27 – 71)	15 (6 – 33)	3 (0 – 14)	0 (0 – 9)	28 (14 – 50)	23 (11 – 43)
Gender								
Male	81 (63 – 101)	91 (73 – 112)	46 (33 – 62)	7 (3 – 15)	2 (0 – 8)	4 (1 – 10)	13 (6 – 23)	11 (5 – 20)
Female	104 (85 – 126)	134 (113 – 159)	28 (18 – 41)	10 (5 – 19)	2 (0 – 8)	1 (0 – 6)	26 (16 – 39)	9 (4 – 18)
Education								
Less than or equal to high school	64 (47 – 86)	126 (101 – 154)	49 (33 – 68)	9 (3 – 20)	3 (0 – 11)	3 (0 – 11)	24 (13 – 39)	13 (5 – 25)
More than high school	109 (90 – 129)	105 (87 – 125)	30 (21 – 42)	8 (4 – 16)	2 (0 – 7)	2 (0 – 7)	17 (10 – 26)	8 (4 – 16)
Annual household income, million JPY								
< 3.00 (≒ 27,000 US dollar)	81 (52 – 119)	126 (90 – 171)	28 (12 – 55)	14 (4 – 36)	0 (0 – 13)	0 (0 – 13)	32 (15 – 59)	4 (0 – 19)

	Number per 1,000 persons (95% CI)							
3.00−4.99	87 (65 – 115)	122 (95 – 153)	47 (29 – 67)	8 (2 – 19)	2 (0 – 11)	0 (0 – 7)	23 (12 – 40)	10 (3 – 22)
≧ 5.00	100 (82 – 122)	104 (85 – 125)	35 (24 – 49)	7 (2 – 14)	3 (1 – 10)	4 (1 – 11)	13 (7 – 23)	11 (5 – 20)
Social isolation								
Absent	85 (70 – 103)	116 (99 – 136)	36 (26 – 48)	8 (4 – 15)	2 (1 – 7)	3 (1 – 8)	17 (10 – 26)	10 (5 – 17)
Present	111 (86 – 141)	108 (82 – 137)	40 (25 – 60)	2 (0 – 10)	2 (0 – 10)	0 (0 – 7)	26 (15 – 44)	9 (3 – 22)
Number of chronic conditions								
0	111 (90 – 135)	97 (78 – 120)	22 (13 – 34)	4 (1 – 11)	1 (0 – 7)	3 (3 – 9)	13 (6 – 23)	3 (3 – 9)
1	84 (60 – 113)	126 (97 – 160)	38 (22 – 59)	13 (5 – 29)	4 (1 – 16)	2 (0 – 12)	18 (8 – 34)	15 (6 – 32)
≧ 2	67 (45 – 95)	122 (93 – 157)	69 (47 – 97)	12 (4 – 27)	2 (0 – 13)	2 (0 – 13)	32 (18 – 54)	18 (8 – 36)
Abbreviations: OTC, over-the-counter; CAM, complementary or alternative medical.								

Comparison With The Pre-pandemic Study

Figures 1 and 2 show the comparisons of the results of the present study with the ecology of medical care study conducted in Japan in 2013 before the COVID-19 pandemic. In both non-elderly and elderly groups, the present study showed lower frequencies of OTC drug use, physician's office visits, and hospital outpatient clinic visits than those in the 2013 study. Especially in the elderly group, OTC drug use decreased to approximately one-seventh, and visits to physicians' offices and hospital outpatient clinics decreased to approximately one-third.

Associations Of Sociodemographic And Clinical Factors With Health-seeking Behaviors

during the pandemic

Table 3 shows the results of multivariable logistic regression analyses, examining the associations of sociodemographic and clinical factors with health-seeking behaviors during the pandemic, including OTC drug use, physician's office visits, and hospital visits. Social isolation, female sex, and years of education were positively associated with OTC drug use. Female sex was also associated with increased number of physician's office visits. In addition, the number of chronic conditions was positively associated with hospital visits.

Table 3

Adjusted Odds Ratio (95% CI) for Health-seeking Behaviors by Sociodemographic and Clinical Factors (N = 1,747)

	OTC drug use	Office visit	Hospital visit[a]
Age			
20 – 64	Reference	Reference	Reference
≧ 65	0.66 (0.38 – 1.11)	0.89 (0.58 – 1.34)	1.02 (0.58 – 1.74)
Gender			
Male	Reference	Reference	Reference
Female	1.44 (1.02 – 2.04)[b]	1.55 (1.12 – 2.15)[b]	0.88 (0.56 – 1.37)
Education			
Less than or equal to high school	Reference	Reference	Reference
More than high school	1.69 (1.16 – 2.52)[b]	0.87 (0.63 – 1.20)	0.73 (0.46 – 1.14)
Annual household income, million JPY			
< 3.00 (≒27,000 US dollar)	Reference	Reference	Reference
3.00–4.99	1.15 (0.67 – 2.03)	1.04 (0.66 – 1.66)	1.74 (0.88 – 3.73)
≧ 5.00	1.10 (0.66 – 1.91)	0.87 (0.55 – 1.39)	1.69 (0.85 – 3.64)
Social isolation			
Absent	Reference	Reference	Reference
Present	1.49 (1.03 – 2.13)[b]	0.92 (0.64 – 1.29)	1.10 (0.67 – 1.76)
Number of chronic conditions			
0	Reference	Reference	Reference
1	0.84 (0.55 – 1.26)	1.32 (0.90 – 1.92)	2.47 (1.39 – 4.48)[b]
≧ 2	0.76 (0.46 – 1.22)	1.25 (0.82 – 1.90)	3.26 (1.80 – 6.00)[b]
Abbreviations: OTC, over-the-counter.			
[a]Included hospital outpatient clinic visit, university medical center visit, and emergency room visit.			
[b]Significant difference, $P < .05$.			

Discussion

This nationwide study of the Japanese adult population revealed that OTC drug use, physician's office visits, and hospital outpatient clinic visits decreased drastically during the COVID-19 pandemic compared with the pre-pandemic levels. The decrease in the use of medical facilities was especially pronounced among the elderly. The present study also found that sociodemographic and clinical factors were differently associated with health-

seeking behaviors during the pandemic. Social isolation and years of education were positively associated with OTC drug use, while female sex was associated with increased OTC drug use and physician office visits. In addition, the number of chronic conditions was associated with increased hospital visits.

Our findings were consistent with prior studies, showing a decrease in office visits during the early stages of the pandemic.[1-3] In the present study, using the ecology of medical care model, the number of visits at lower-level medical institutions such as physicians' offices and hospital outpatient clinics, where residents are mainly seen for minor health problems, decreased remarkably compared with the pre-pandemic levels. On the other hand, the number of visits at higher-level medical institutions such as university medical centers and emergency rooms, which accept patients with severe symptoms, and hospitalizations were at the same level as those before the pandemic. Although a cross-sectional survey is a common method for conducting the ecology of medical care studies,[8,9,11] health care use may be underestimated compared with a health diary method, which was used in previous studies in Japan.[13,14] However, the changes in health care utilization were drastic and cannot be explained by differences in the methods alone.

One of the causes of the decline in OTC drug use, physician's office visits, and hospital outpatient clinic visits may be the decreased number of common infectious diseases due to the prevention measures against the spread of infection such as hygiene and physical distancing policies. [21,22] An increase in the threshold for health care use due to fear of being infected by COVID-19 at medical facilities may also have caused these results. [3] Because Japanese residents tend to be more risk-averse than those in other countries,[23] the risk preference for COVID-19 infection may have influenced health-seeking behaviors, especially among the elderly who are at higher risk of experiencing severe infection. In Japan, because the application and spread of telemedicine have been slow even during the pandemic,[24] access to care, especially for new health-related events, is impaired in the population. Thus, it is necessary to improve access to health care by telemedicine expansion while considering the quality and safety of care and usability.

Our study also reported the association between social isolation, which is a major health problem and has increased globally due to the pandemic, and health care utilization. The health-seeking behaviors of socially isolated people during the pandemic have been unclear worldwide. The results of this study indicated that a pharmacy is an important source of health care in the population with social isolation during the pandemic. A previous study showed that social isolation was associated with negative patient experience in primary care clinics.[25] Therefore, strengthening the primary care function of pharmacies as a more accessible gate opener may be effective in improving the quality of care and health outcomes in socially isolated populations. In addition, we observed that women were more likely to visit a physician's office, and patients with chronic conditions were more likely to visit a hospital. These findings were consistent with those of previous studies conducted before the COVID-19 pandemic.[10,14,26,]

This is the first study to report the ecology of medical care in the general Japanese population during the COVID-19 pandemic. The ecology of the medical care model is a useful framework for understanding the patterns of an individual's choices in seeking medical care for health-related events. A key strength of our study is the use of data from a nationwide study, with a sample representative of the Japanese adult population, which allows for generalization of its results to the wider population. Another strength of this study is the high response rate.

The present study has several limitations. First, the survey was retrospective, and the questions about health care utilization were asked with respect to the last month; thus, recall biases could have affected our results. Second, our data were collected during a single month, and seasonal variation of disease incidence may result in estimates that are different from the present study. Third, we used a validated list of chronic conditions; however, self-reported data for identifying chronic conditions may have introduced misclassification bias.

Conclusions

Our ecology of medical care study during the COVID-19 pandemic in Japan revealed that the use of medical facilities for health-related events decreased drastically, especially among the elderly, compared with the pre-pandemic levels. Moreover, a pharmacy is an important source of health care in a population with social isolation during the pandemic. These findings may be useful to researchers and policymakers in rethinking health care systems during and after the pandemic.

Declarations

Conflict of Interest: Drs Aoki and Matsushima received lecture fees and lecture travel fees from the Centre for Family Medicine Development of Japanese Health and Welfare Co-operative Federation. Drs Aoki and Matsushima are advisers of the Centre for Family Medicine Development practice-based research network. Dr. Matsushima's son-in-law worked at IQVIA Services Japan K.K. which is a contract research organization and a contract sales organization. Dr. Matsushima's son-in-law works at SYNEOS HEALTH CLINICAL K.K. which is a contract research organization and a contract sales organization.

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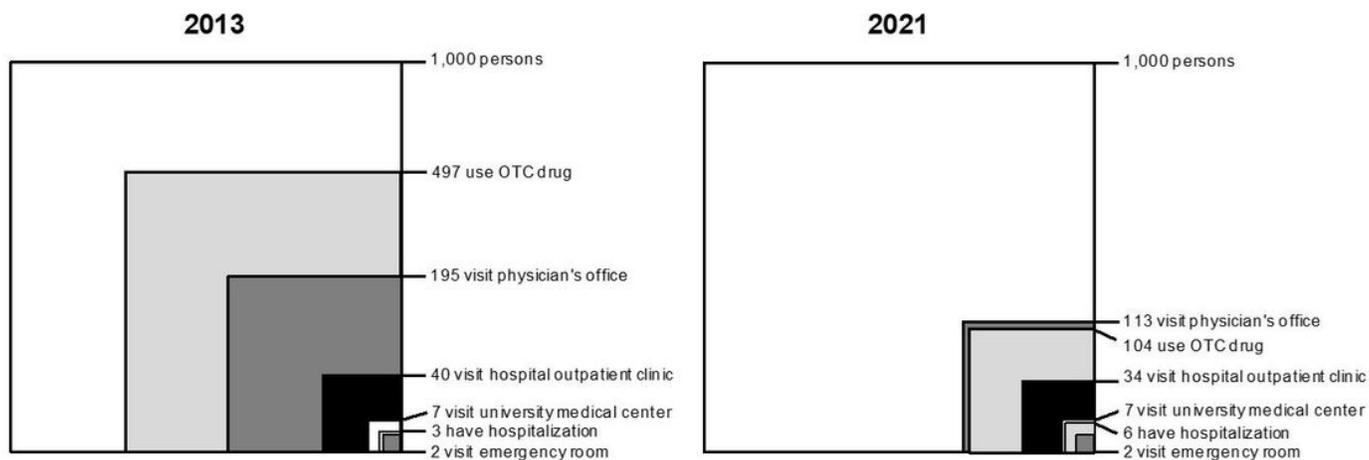
Figures

Figure 1

Comparison of Health-seeking Behaviors Among Non-elderly Adults (< 65 years old) Between the Previous Study in 201314 and the Present Study in 2021
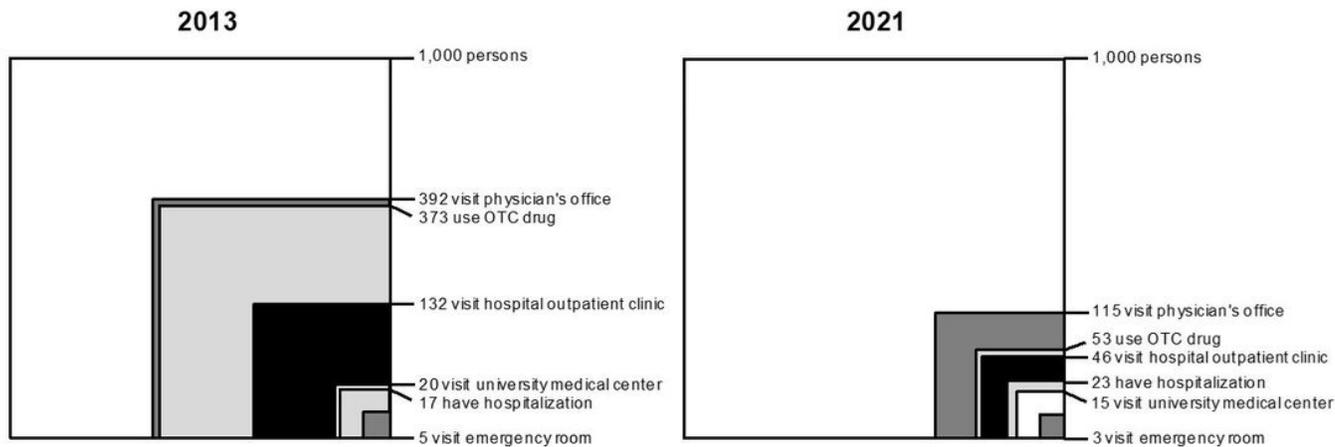

Figure 2

Comparison of Health-seeking Behaviors Among Elderly (≥ 65 years old) Between the Previous Study in 201314 and the Present Study in 2021