

BMJ Open Information-seeking behaviour of community pharmacists during the COVID-19 pandemic: an ecological study

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ABSTRACT

Objective To evaluate the information-seeking behaviour of pharmacists during the COVID-19 pandemic and its relation to COVID-19 and related infections and deaths within the local prefecture.

Design Ecological study.

Setting Japan—47 prefectures.

Methods The number of accesses to a Japanese web page established by the Pharmacy Informatics Group to disseminate information about infection control and the number of infections and deaths in 47 prefectures were investigated from 6 April to 30 September 2020 using the access information on the web page and publicly available information.

Results During the first 6 months of the COVID-19 pandemic, the total number of accesses was 226 130 (range: 10 984–138 898 per month), the total number of infections was 78 761 (1738–31 857) and the total number of deaths was 1470 (39–436). The correlation between the total number of accesses and that of infections per 100 000 individuals in 47 prefectures was $r=0.72$ (95% CI 0.55 to 0.83, $p<0.001$), and between the total number of accesses and deaths per 100 000 individuals in 47 prefectures was $r=0.44$ (95% CI 0.17 to 0.65, $p=0.002$).

Conclusions The information-seeking behaviour of community pharmacists correlated positively with infection status within the community.

BACKGROUND

The COVID-19 pandemic has highlighted various problems in obtaining and using accurate information. Infodemics have become a problem owing to the large amount of information available, including rumours and false claims.¹ Language and other barriers to timely access to accurate information are also problematic.^{2,3} To consider the handling of information in emergencies such as the COVID-19 pandemic, it is important to focus on both information providers and seekers.⁴

Pharmacists play an important role in providing pharmaceutical information in emergencies.⁵ Based on the concept of the Seven-Star Pharmacist proposed by the

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ This nationwide ecological study assessed the relationship between the information-seeking behaviour of Japanese pharmacists and the local infection situation during the COVID-19 pandemic.
- ⇒ In this study, we attempted to use the web page access data with respect to its potential as an objective evaluation index for the information-seeking behaviour of Japanese pharmacists.
- ⇒ This study used the access data available from a web page containing infection control information for community pharmacists from the early stage of the COVID-19 pandemic.
- ⇒ The possibility of a bias in the accessed information cannot be over-ruled due to the access by users other than non-community pharmacists.

World Health Organization, pharmacists are expected to play the role of ‘Communicators’ in the healthcare system.⁶ Pharmacists working in community pharmacies should fill prescriptions issued by medical institutions and provide appropriate information to help patients achieve self-medication.⁷ Therefore, even during the COVID-19 pandemic, pharmacists were expected to be proactive in providing correct and timely information to the community.^{8–12}

In Japan, almost all pharmaceutical education is conducted in Japanese and, as in other countries where English is not the native language, many pharmacists have limited access to English information. In the early stages of the pandemic, there was a lack of infection control information in Japanese available to community pharmacists. Moreover, there was a delay in the provision of information in languages other than Japanese by the government. Many foreigners from Asian countries, such as China and Vietnam whose native languages are other than English, live in Japan.¹³ Therefore, non-Japanese residents who were not fluent



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in Japanese were unable to access reliable information, which increased their anxiety.¹⁴ As the Japanese government does not refer to the Centers for Disease Control and Prevention (CDC), even native English speakers lack information in English compared with those living in English-speaking countries.

The Pharmacy Informatics Group (Kyoto University, Kyoto, Japan) was concerned about the spread of COVID-19 through pharmacies and consequently launched the COVID-19 Countermeasure Support Project (Project) for pharmacies and pharmacists. The Project launched a web page on 6 April 2020 and began disseminating infection control information in Japanese.¹⁵ In general, many pharmacists working at community pharmacies, unlike hospitals, have limited opportunities to receive direct explanations from infectious disease specialists or to interact with other experts, making it difficult for them to obtain information. Therefore, posters and leaflets based on information from academic societies and infection control organisations were made available free of charge on the Project's web page. In cooperation with an infectious disease expert, several videos were created to help pharmacists combat COVID-19; they were distributed via social media.¹⁶

To date, little is known about the information-seeking behaviour of Japanese pharmacists during disasters such as the COVID-19 pandemic. A previous study has reported that pharmacists use web pages as a strategy to obtain information about COVID-19.¹⁷ A previous public survey on social media¹⁸ and a report on the effect of COVID-19-related information and communication on pharmacists used questionnaires to assess information-seeking behaviour.¹⁹ However, it is burdensome and difficult to request frequent survey cooperation from healthcare professionals such as pharmacists. In this study, we focused on the number of accesses to a web page designed for community pharmacists, expecting that it can serve as an objective evaluation index for people accessing information.

COVID-19 situation in Japan

COVID-19 spread rapidly throughout Japan after the confirmation of the first case on 16 January 2020 (online supplemental table S1). The number of COVID-19 cases increased continuously, and on 7 April, a state of emergency was declared in areas with the highest number of COVID-19 cases (Tokyo, Kanagawa, Saitama, Chiba, Osaka, Hyogo and Fukuoka). The emergency was later extended to the entire country.^{20 21} With the prohibition of unnecessary outings, the number of infections began to decline, and the declaration was cancelled on 25 May. The Japanese government announced a new lifestyle to prevent the spread of COVID-19, including a reminder to avoid the three Cs—Closed spaces, Crowded places and Close-contact settings. In addition, the use of masks and regular hand washing were recommended.²²

Pharmacy Informatics Group

The Pharmacy Informatics Group was established in April 2019 with HO as its leader. The group examines the effectiveness of community pharmacists' interventions on patients with chronic diseases and their cost-effectiveness. The group is also involved in research activities aimed at improving communication with non-Japanese patients in pharmacies. In addition to these goals, the group tries to establish educational programmes for pharmacists.^{23–25}

In March 2020, when there was an increase in apprehension regarding the spread of COVID-19 in Japan, the group recruited volunteers and launched the Project on 26 March (online supplemental table S1). The Project held frequent online meetings among members to determine the information to be posted on the web page. On 1 April, a survey was conducted among community pharmacists working on the front lines to collect their opinions. Based on the survey results, the required information was organised, and a web page was created to summarise the six areas (handouts, videos, links, blogs, infection control and support for non-Japanese). To prevent the spread of infection through pharmacies, the group prepared materials including a checklist in Japanese using the guidelines of the CDC (USA) as a reference. The group also compiled links to sources of information in Japanese and posted them on the web page (figure 1, online supplemental figures S1–S4). On 6 April, the web page was opened for the general public including community pharmacists. Publicity for the project was directed to professional associations and pharmacists in conjunction with the release of the web page.

Purpose of this study

To evaluate the information-seeking behaviour of community pharmacists during the COVID-19 pandemic by examining the relationship between the number of accesses to the Project's web page and the local infection situation.

MATERIALS AND METHOD

Study design

This was an ecological study comprising all 47 prefectures of Japan.

Data collection

The access data after 6 April 2020, when the web page was released, were obtained from Wix (Wix.com, Tel Aviv, Israel), the website manager. The number of infections and deaths in the 47 prefectures was available from the Japan Broadcasting Corporation (Nippon Hoso Kyokai).²⁶ The population of the 47 prefectures was based on information published by the online portal of official statistics of Japan (e-Stat) in 2018.²⁷

Patient and public involvement

Patients and/or the public were not involved in the design, conduct, reporting or dissemination plans of this research.



Figure 1 Project web page (top).

Statistical analysis

Descriptive analysis

The number of pharmacists was sourced from information published by the Ministry of Health, Labour and Welfare in 2018.²⁸ The total number of accesses (TA) during the period (6 April to 30 September 2020) was determined. Accesses from outside the 47 prefectures were excluded after identification using code numbers. The total number of infections (TI), the total number of deaths (TD), TI per 100 000 individuals, TD per 100 000 individuals and the number of pharmacists per 100 000 individuals during the study period were calculated from publicly available information for the 47 prefectures. Each total number, and Pearson's correlation between TA and TI per 100 000 individuals and between TA and TD per 100 000 individuals, were calculated.

Map creation

The regional distribution of TA and TI per 100 000 individuals, TD per 100 000 individuals and the number of pharmacists per 100 000 individuals during the study period were displayed on a map of the 47 prefectures. For this purpose, we used the geographic information system QGIS V.3.16.2.

Multiple regression analysis

With TA as the objective variable and TI or TD per 100 000 individuals, the number of pharmacists per 100 000 individuals as the explanatory variables was assessed. The significance level was set at 5%, two sided. The analysis was performed using JMP Pro V.14.2.0 (SAS Institute, Cary, North Carolina, USA).

RESULTS

Descriptive analysis and map creation

Descriptive data are presented in [table 1](#). There were 226 130 (range: 10 984–138 898 per month) TA, 78 761 (1738–31 857) TI and 1470 (39–436) TD. TA ([figure 2](#)), TI per 100 000 individuals ([figure 3](#)), TD per 100 000 individuals ([figure 4](#)) and the number of pharmacists per 100 000 individuals ([figure 5](#)) were mapped for the 47 prefectures. Detailed access data by 47 prefectures in Japan are presented (online supplemental table S2). The Pearson's correlation between TA and TI per 100 000 individuals was $r=0.72$ (95% CI 0.55 to 0.83, $p<0.001$) ([figure 6A](#)), and between TA and TD per 100 000 individuals was $r=0.44$ (95% CI 0.17 to 0.65, $p=0.002$) ([figure 6B](#)). The results accounting for outliers are shown in online supplemental figures S5a,b and S6a,b.

Multiple regression analysis

The regression coefficients in the multiple regression analysis with TA as the objective variable and TI or TD

Table 1 Number of accesses, infections and deaths (6 April to 30 September)

	Access	Infection	Death
April	138 898	10 327	364
May	34 958	2408	436
June	17 294	1738	75
July	12 744	17 418	39
August	11 252	31 857	281
September	10 984	15 013	275
Total	226 130	78 761	1470

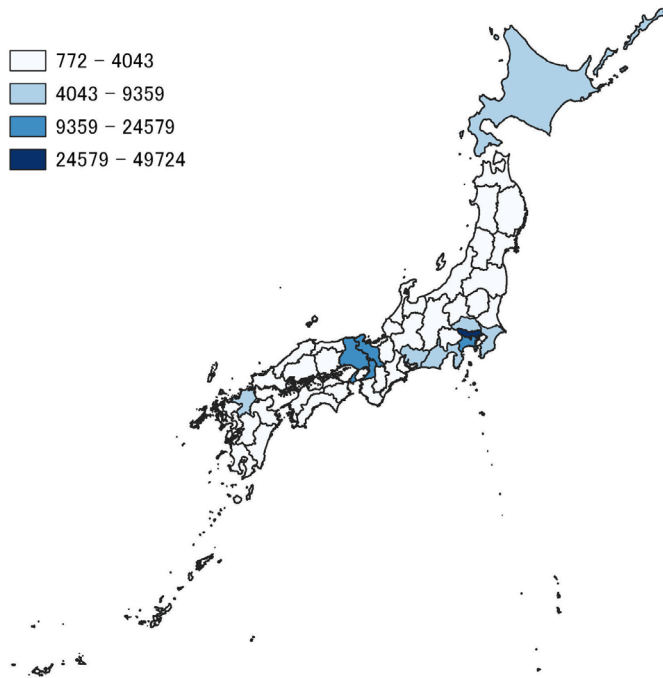


Figure 2 Total accesses (April to September 2020).

per 100 000 individuals and number of pharmacists per 100 000 individuals as explanatory variables were 1227 (95% CI 842 to 1611) for TI per 100 000 individuals and 87 (95% CI 49 to 124) for the number of pharmacists per 100 000 individuals (table 2), and 2314 (95% CI 230 to 4398) for TD per 100 000 individuals and 108 (95% CI 58 to 157) for the number of pharmacists per 100 000 individuals (table 3).

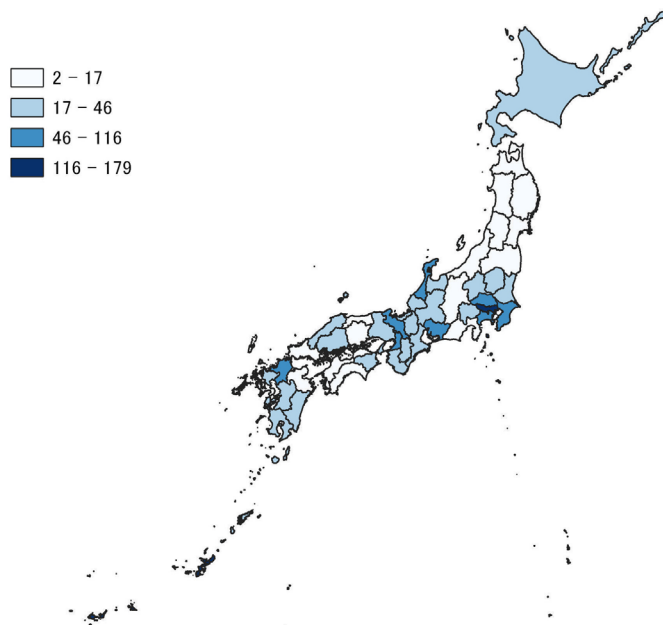


Figure 3 Total infections per 100 000 individuals (April to September 2020).

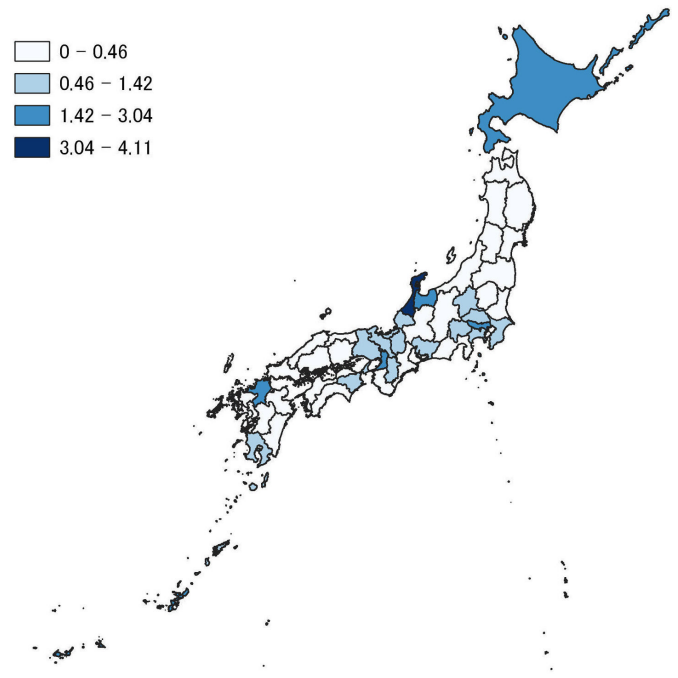


Figure 4 Total deaths per 100 000 individuals (April to September 2020).

DISCUSSION

Access to the COVID-19 web page, created for community pharmacists in Japan, was positively correlated with the number of infections and deaths in the 47 prefectures. The Project released the web page just before the declaration of the first state of emergency in Japan owing to an increase in the number of infections and deaths and concerns about the spread of infections. Although the website was created for community pharmacists, access was not restricted to the general public. The number of accesses to the web page was concentrated in April, immediately after the announcement. This may have been owing to the Project's publicity activities, which attracted

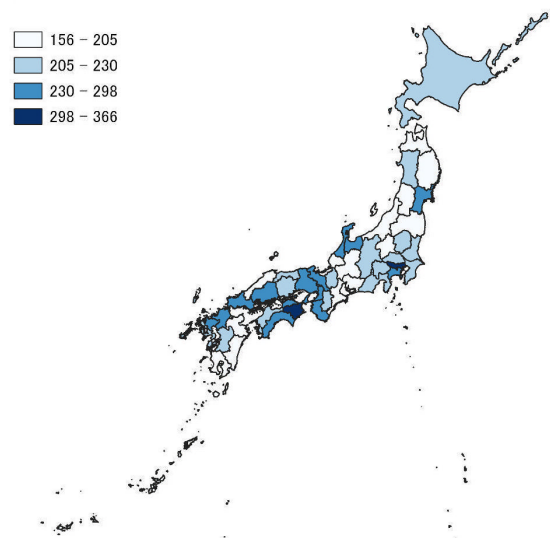


Figure 5 Number of pharmacists per 100 000 individuals.

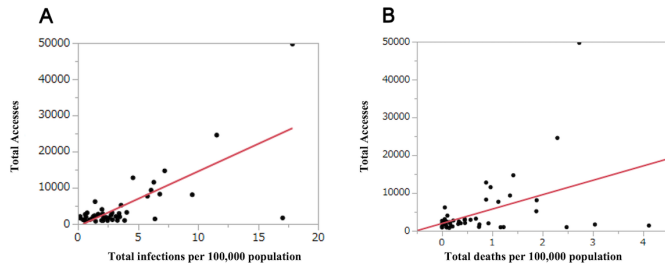


Figure 6 Correlation between total accesses and infections and deaths (6 April to 30 September). (A) Total number of infections per 100 000 individuals. A strong correlation was observed between total accesses and total infections ($r=0.72$, 95% CI 0.55 to 0.83). (B) Total number of deaths per 100 000 individuals. A weak correlation was observed between total accesses and total deaths ($r=0.44$, 95% CI 0.17 to 0.65).

the attention of pharmacists and professional associations.^{29 30} A previous study reported that the information-seeking behaviour surrounding the COVID-19 pandemic relies on social media as an information source.³¹ It is thought that the information disseminated using social media on the Project web page resulted in many accesses in a short period.

A visual map of TA, TI and TD showed that the spread of infection varied by prefecture, even after population correction. In terms of TA, the values for Tokyo and Okinawa differ from those of the other prefectures. In addition, there were several accesses from Kyoto and Osaka, where the main Project members reside. As for TI, even after adjusting for population, the metropolitan area where the state of emergency was declared had an outstandingly high number. The distribution was different from that of TD.

The infection control information disseminated on the Project’s page may have led to infection control actions at community pharmacies. Prior to the project, a survey identified pharmacists’ wishes. The web page was created to fulfil those wishes and provided information in six areas (handouts, videos, links, blogs, infection control and support for non-Japanese). The results of a questionnaire survey of pharmacies conducted jointly with the Kyoto Pharmaceutical Association in May 2020 revealed that the rate of implementation of infection control measures at pharmacies had rapidly increased since April, when the Project page began disseminating information.³² The

Table 3 Total accesses, total deaths per 100 000 individuals and number of pharmacists per 100 000 individuals

Factor	Regression coefficient (95% CI)
	TA
TD per 100 000 individuals	2314 (230 to 4398)
Number of pharmacists per 100 000 individuals	108 (58 to 157)

TA, total number of accesses; TD, total number of deaths.

importance of infection was recognised worldwide in this period.¹² The contents based on careful consideration of the information needed by pharmacies were useful for infection control.

In Japan, the use of information in foreign languages, especially English, is not widespread. Many Japanese pharmacists have difficulty communicating in English. The language barrier may be one of the reasons why community pharmacists feel a lack of useful information on COVID-19 measures. The checklists for use in infection control published by the Project were created based on the CDC guidelines written in English, which were published in the early stages of the pandemic and were updated monthly. If pharmacists had no difficulty accessing CDC guidelines in English, they could have found it useful for infection control. The Project tried to disseminate information in Japanese, which was thought to match the information-seeking behaviour of a larger number of pharmacists.

The use of social media to disseminate information will be useful in the future for pharmacists and pharmacy professionals. The amount of information related to COVID-19 is rapidly increasing, and it is desirable to quickly access, review and use this information. In recent years in Japan, pharmacy students have had the opportunity to learn evidence-based medicine.³³ Pharmacists who receive such education have learnt how to critically analyse information by reading abstracts of research papers, but it is not common practice yet.³⁴ The project has prepared a web page that summarises the information for community pharmacists. Publicising the web page through Facebook, Twitter and other popular social media could be used to disseminate information and to serve as a forum for interactive discussion.

The number of accesses to the web page may be useful as an objective evaluation index of information-seeking behaviour.^{35 36} Most previous reports used questionnaires to examine the information-seeking behaviour of the target population. Questionnaires offer insight into qualitative indicators of community pharmacists’ behaviour. However, healthcare workers fighting on the front lines against COVID-19 infection may be exhausted; using questionnaires would be labour intensive and, thus, an unreasonable expectation. Indicators such as access

Table 2 Total accesses, total infections per 100 000 individuals and the number of pharmacists per 100 000 individuals

Factor	Regression coefficient (95% CI)
	TA
TI per 100 000 individuals	1227 (842 to 1611)
Number of pharmacists per 100 000 individuals	87 (49 to 124)

TA, total number of accesses; TI, total number of infections.

information that can be surveyed without burdening the medical staff are, therefore, highly useful.

Strengths of this study

In this nationwide ecological study, we explored the information-seeking behaviour of Japanese pharmacists during the COVID-19 pandemic. The study focused on the web page designed for community pharmacists and suggested that it could be used to assess objective information-seeking behaviour.

Limitations of this study

We evaluated a region-specific activity conducted in Japan and this raises some concerns about its generalisability.

First, this was an ecological study, and there may be an ecological fallacy in the relationship between the information-seeking behaviour of individual pharmacists and the infection status at the prefectural level. The information-seeking behaviour of individual pharmacists is likely to be influenced by infection status at the regional level rather than the prefectural level, which was used to assess infection status in this study. Second, data on the attributes of the accessors were not included. Because the web page was open to the general public, it is possible that the evaluation could not be truly limited to community pharmacists. In addition, this method does not provide information on the age of the accessor. We are concerned that we cannot adequately validate age bias, as younger generations are more likely to seek information via the internet and social media.

Third, the access information used in this study was obtained using the Wix analysis tool, and the accuracy of the data has not yet been verified. Finally, there is a potential for unmeasured confounding, which should be examined in the association between TA and COVID-19 infection status.

CONCLUSION

There was a positive association between the number of accesses to the web page for disseminating COVID-19-related information by community pharmacists and the number of infections and deaths caused by COVID-19 in the 47 prefectures during the target period (April to September 2020). Our findings indicate that information-seeking behaviour by community pharmacists was positively correlated with the local infection situation.

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Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval The study design was approved by the Kyoto University Graduate School and Faculty of Medicine Ethics Committee (R2832) and adheres to the Ethical Guidelines for Medical and Health Research Involving Human Subjects. Anonymised data were used in this study.

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