Overdose-Related Trends in Online Search Behavior in Japan: An Analysis Using Infodemiological Methods

Miyu Eguchi, Soichiro Ushio, Satoru Esumi, Yukiomi Eguchi, Toshinobu Hayashi, Taisuke Kitamura, Kenichi Mishima, Takashi Egawa

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Abstract

Overdoses of medications, including over-the-counter (OTC) and prescription drugs, have increased in Japan, with digital platforms contributing to inappropriate use patterns. This study analyzed overdose-related online search trends by using data from Yahoo! JAPAN between 2020 and 2024. Search volume for "overdose" increased approximately fivefold, from 89,800 in 2020 to 240,000 in 2024. Female individuals accounted for 52.67%-72.11% of the users who conducted overdose-related searches. The most frequently searched medication class (36.6%) in the context of overdose was benzodiazepines. Furthermore, compounds contained in OTC drugs accounted for approximately 11.8% of all medication-related searches. These findings reveal a concerning trend in medication overdose risk in Japan and underscore the importance of developing targeted prevention strategies based on the digital surveillance of online search patterns.

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Research Letter

Overdose-Related Trends in Online Search Behavior in Japan:

An Analysis Using Infodemiological Methods

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Keywords

overdose; search engine; infodemiology; over-the-counter

Introduction

Overdose incidents involving over-the-counter (OTC) and prescription drugs have increased worldwide with the coronavirus disease 2019 pandemic [1]. In Japan, OTC drug overmedication has become a major social issue. With the rapid proliferation of digital platforms such as the Internet and social media, which have become essential for accessing medical and health information, the increase in drug overdose information on these platforms has increased concern [2, 3]. This study aimed to investigate overdose-related online search trends in Japan by using infodemiological methods.

Methods

Data sources

Online search data on Yahoo! JAPAN, among the most frequently used search engines in Japan [4], were obtained from DS.INSIGHT (last accessed on January 6, 2024). It provides data on search behaviors over time among different demographics, such as search volume by sex. The search volume obtained from DS.INSIGHT is based on the number of users who searched Yahoo! JAPAN and is an expanded estimate using the Ministry of Internal Affairs and Communications' Telecommunications Usage Trends Survey. Online search data from January 2020 to December 2024 were extracted. To determine which drugs individuals searching for "overdose" were specifically interested in, queries containing references to drugs were extracted. Search terms with volumes exceeding 100 were then analyzed. The analysis focused on searches conducted within 1 week before and after the identified "overdose" queries. The extracted drugs were subsequently categorized.

Results

The search volume for "overdose" from 2020 to 2024 is shown in Figure 1. The number of "overdose" queries in 2024 (240,000) was approximately fivefold that in 2020 (89,800). Searches by

female searchers accounted for 52.67%-72.11% of the search volume.

In the 2024 search queries, the most commonly searched drugs among "overdose" searchers were benzodiazepines, followed by antipsychotics, antidepressants, and respiratory drugs. Respiratory drugs included dextromethorphan hydrobromide hydrate and dihydrocodeine phosphate-containing OTC drugs (Table 1). Of the duplicate searches for overdoses, 11.8% were for compounds in OTC drugs. The compounds in OTC drugs were identified as including certain components of respiratory drugs, other sedative-hypnotics, and others.
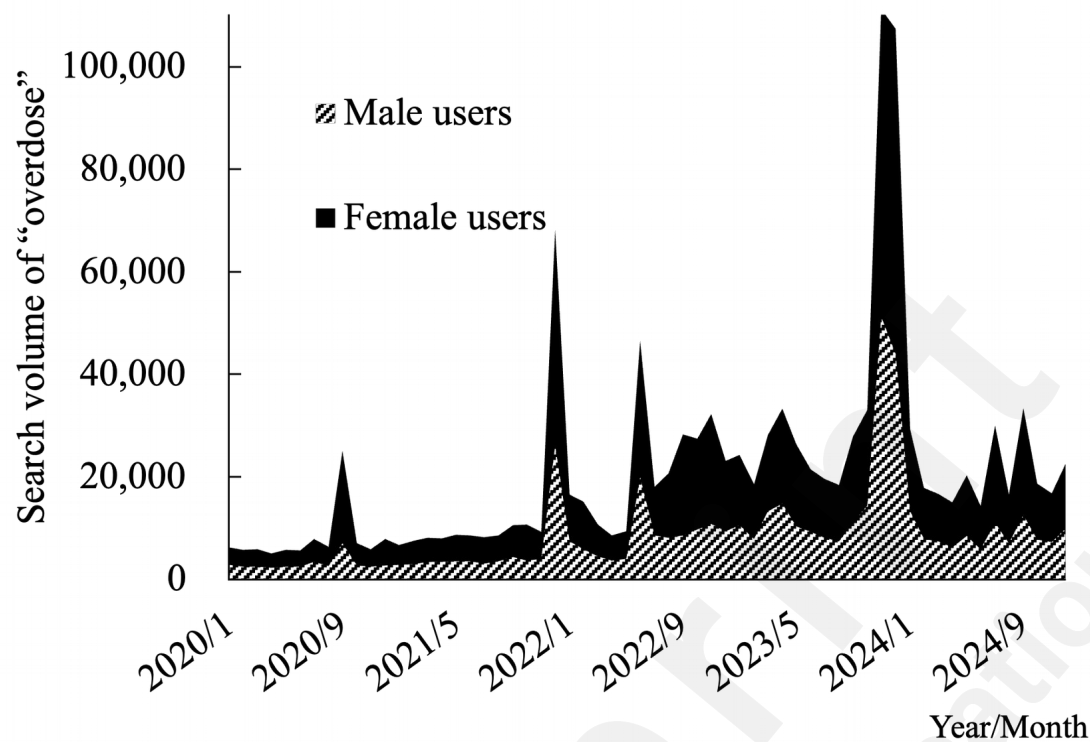
Figure 1. Monthly trends of search volume for "overdose" from 2020 to 2024

Drug class	Duplicate overdose volume (n, %)
Table 1. Drug classes queried by searchers for information on overdose	
Benzodiazepines and non-benzodiazepines	9320, 36.6
Antipsychotics	9010, 35.3
Antidepressants	2800, 11.0
Respiratory drugs	2220, 8.7
Mood stabilizers (e.g., lithium and valproic acid)	1000, 3.9
Other sedative-hypnotics (e.g., bromvalerylurea and allylisopropylacetylurea)	580, 2.3

Illegal drugs	560, 2.2
Others (e.g., potassium cyanide and herbal medicines)	810, 3.2

Discussion

In this study, we investigated overdose-related online search trends in Japan by using infodemiological methods. We found increased online interest in drug overdoses in Japan over the past 5 years. Previous reports have indicated that female individuals are more likely to engage in overdosing [5, 6]. In our study, we found that more than half of those searching for overdose information on the Internet were female, which was consistent with previous reports.

This study revealed that individuals searching for information on overdoses most frequently sought information on benzodiazepines, followed by antipsychotics, with similar search volumes observed for both categories. Tanaka et al. reported that benzodiazepines were the most frequently used drugs among patients who were urgently transported owing to drug intoxication, followed by antipsychotics and antidepressants [7]. In cases of drug intoxication, multiple drugs are often consumed. Our results were consistent with previous ones; however, it is difficult to compare actual usage rates by using search volume data. Some compounds are used in both OTC and prescription drugs; nevertheless, it was difficult to distinguish OTC drugs from prescription drugs by using search terms; therefore, we analyzed the retrieved compounds as OTC drugs. The results revealed that OTC drug-associated compounds accounted for 11.8% of all retrieved drug-related searches, a proportion lower than the 22.5% of OTC drug use reported for transported patients. OTC drug overdoses are more common in younger individuals. Because younger individuals tend to gather information from social media rather than Internet searches, these results may reflect a demographic bias toward older age groups in the analysis [8]. These older searchers may have been seeking information about the medications they used daily or investigating drugs commonly implicated in overdose cases.

In conclusion, our study suggests that online interest in overdosing is increasing rapidly in

Japan. This study provides insights into the public interest in overdose risks and the findings can help

guide monitoring for potential safety issues.

Conflicts of Interest

None.

Abbreviations

OTC: over-the-counter

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Supplementary Files

Figures

Monthly trends of search volume for "overdose" from 2020 to 2024.