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Supporting information

Additional Supporting Information may be found in the online version of this article at the publisher's web-site:

Table S1. Frequency and missing percentage of demographic and psychiatric characteristics.

Table S2. Median (IQR) of Depression, Anxiety, and Stress Scale score according to demographic characteristics.

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Received 4 June 2020; revised 16 June 2020; accepted 18 June 2020.

Exposure to media and fear and worry about COVID-19

doi:10.1111/pcn.13095

Too much exposure to the media is known to be associated with greater fear and worry and poorer mental health in a health crisis.^{1, 2} Repeated media exposure was reported to have a negative impact on mental health after the New York terrorist attack on 11 September 2001,³ the Ebola outbreak,⁴ and the Great East Japan Earthquake and Tsunami.⁵ The use of social media as an information resource was associated with greater fear and worry about adverse health effects of possible radiation exposure after the Fukushima Nuclear Power Plant accident.⁶ It has been argued that the same pattern may be observed in the outbreak of the new coronavirus disease 2019 (COVID-19),² and it is recommended to limit the frequency of access to the media and to choose a reliable information source to keep better mental health.⁷ A study from Wuhan, China reported that social media exposure (such as Weibo and WeChat) was associated with depression and anxiety during the COVID-19 outbreak.⁸ However, evidence is still limited in the current outbreak of COVID-19. Here, we report additional evidence based on a secondary analysis of data collected from a sample of employees in Japan in mid-March 2020 during the early phase of the COVID-19 outbreak in Japan.

The authors conducted a cross-sectional online survey to examine the relation between the type of media use and fear and worry about COVID-19 by using a sample from the cohort of full-time employees in February 2019 ($n = 4120$). Participants were assured that their anonymity would be preserved and provided online informed consent. This study was approved by the Research Ethics Committee of The University of Tokyo (No. 10856-(2)). Participants ($n = 1420$) completed an online self-report questionnaire during 19–22 March 2020. Participants included managers (8.8%), white-collar workers (62.8%), and blue-collar workers (28.4%); 13.5% of participants engaged in the medical and welfare sector. Detail information is available elsewhere.⁹ The type of media as information source about COVID-19 was requested by using a list of 14 sources (e.g., television, radio, newspaper, Web media, any social network service [SNS; e.g., YouTube, Twitter, Facebook, and other SNS], governmental or organizational websites, chat with family or friends, workplace, medical organization or staff, academic papers, and others) with each item rated *Yes* (= 1) or *No* (= 0). Fear and worry about COVID-19 were measured by asking one item ('Do you feel anxiety over COVID-19?') on a 6-point Likert-type scale (ranging from 1 [*Not at all*] to 6 [*Feel strongly*]). The prevalence rates of media use were: television (89.9%), radio (11.3%), newspaper (27.7%), Web media (66.1%), any SNS (17.5%), governmental or organizational websites (15.6%), chat with family or friends (30.1%), workplace (27.7%), medical organization or staff (9.5%), academic papers (1.1%), and others (0.1%). A linear regression analysis revealed that the use of television ($\beta = 0.133$, $P = 0.000005$) and Web media ($\beta = 0.113$, $P = 0.000031$) as information sources about COVID-19 significantly and positively correlated with fear and worry about COVID-19, after adjusting for sex, age, marital status, having at least one child, and occupational type. None of the other media use types significantly correlated with fear and worry about COVID-19.

Our survey was limited in many ways: the cross-sectional study design, nonrepresentative sample of employees, and lack of information about duration and frequency of the media use. However, our findings suggest that television and Web media as information sources about COVID-19 are associated with greater fear and worry about the disease in the general working population in Japan. Television broadcasts news and provides information about COVID-19 almost all day. Web media is

accessible anytime in the day and night. People may have access to these media very frequently. Media exposure with visual images, such as TV viewing, is known to be related to psychological distress and post-traumatic stress disorder^{5, 10}; however, few studies have shown such an association with print or audio media. Social media also sometimes provides disinformation or false information⁸ that may exaggerate anxiety about COVID-19. Too much access to these media may lead people to overestimate the risk of COVID-19, then increase fear and worry about the disease.

Based on our findings, together with a previous study in China,⁸ we believe that people living under the COVID-19 outbreak should limit the frequency and amount of access they have to television and Web media to obtain information about COVID-19. This recommendation should be effective in preventing mental health problems in the workplace. We of course realize the critical role of the media in a health crisis to convey correct, essential, and useful information. Importantly, people should be aware of the psychological risk of too much exposure to the media and control their own access to it in a health crisis, such as the COVID-19 outbreak.

Acknowledgment


This work was supported by internal funds of the Department of Mental Health, Graduate School of Medicine, The University of Tokyo.

Disclosure statement

The sponsors had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication. The authors have no conflicts of interest to declare.

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Received 11 May 2020; revised 9 June 2020; accepted 19 June 2020.

Perinatal mental health and COVID-19 in Japan

doi:10.1111/pcn.13091

Perinatal mental health is critically important because depression and other stresses not only cause psychological distress to pregnant and postpartum women, but can also have adverse effects on the growth and development of their children and the mental health of their partners.¹ The novel coronavirus disease (COVID-19) outbreak has had a wide range of effects on perinatal mental health.

Pregnant women have a variety of concerns and anxieties. The results of an online survey conducted by MTI Ltd. about attitudes toward COVID-19 in pregnant women were released on 23 April 2020. MTI provides the most widely used ovulation-day-prediction app and the most widely used information-distribution app for pregnant women in Japan. A total of 2872 pregnant women participated in the survey and reported their main concerns as: the effect on the fetus when infected by COVID-19 (91.0%), the possibility of themselves having serious complications when infected (74.3%), the lack of therapeutic drugs to treat COVID-19 (71.2%), infections of children after childbirth (69.1%), and infections at medical institutions (64.8%).² In addition, 68.4% answered that antenatal support was insufficient.²

This survey has some limitations, such as a nonrepresentative sample of pregnant women, but given that the annual number of childbirths in Japan in 2019 was 864 000³ and that there are approximately 270 000 reports of pregnancy from the app's users, it can be assumed that the results generally reflect the voices of pregnant women.

To support pregnant women, on 17 April 2020, the Governor of Tokyo announced plans to distribute tickets that could be used for taking taxis to pregnancy checkups. Also, Tokyo Midwives' Association conducted a survey of 62 district midwife chiefs who have provided maternal and child health services in municipalities during the COVID-19 crisis. According to the data from 49 respondents, 33% of home-visiting services and all mothers' classes meeting face-to-face had been canceled, though midwives had begun to provide alternative services, such as telephone visits, online visits, and online parenting classes (Tokyo Midwives' Association, unpublished observations; the first author as a member has permission to use the association's data).

Furthermore, due to COVID-19, pregnant women cannot choose the unique Japanese cultural custom of *satogaeri* childbirth. Many Japanese women plan to return to their parents' home when they are close to the delivery date and stay there for a few months of nurturing care for both mother and baby. A previous study showed that *satogaeri* childbirth was negatively associated with maternity blues,⁴ though another study showed it did not lower the incidence of post-partum depression.⁵ As part of the COVID-19 response, Japanese government and public health specialists have recommended avoiding visits to other prefectures. The Japan Society of Obstetrics and Gynecology has urged pregnant women not to visit their hometowns where their parents live but to give birth at their local hospitals in order to prevent further spread of the virus.⁶ Pregnant women who had registered with a hospital near their parents' home in another prefecture have been forced to change hospitals. According to the news of 24 April, a woman who intended to