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Research Paper

Fear of novel coronavirus disease (COVID-19) among pregnant and infertile women in Japan

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ABSTRACT

Background: Pregnant women and fertility patients are particularly vulnerable to major disease outbreaks. Regarding COVID-19 in particular, much is unclear about the impact on mothers and fetuses. The purpose of this study was to determine the fear of COVID-19 among Japanese pregnant and infertility patients amid the coronavirus disaster.

Methods: An online survey of 292 pregnant Japanese women and 13 Japanese women undergoing fertility treatment was conducted during the COVID-19 epidemic from May 19 to June 6, 2020. All participants responded to the Japanese version of the Fear of COVID-19 Scale and risk factors.

Results: Japanese pregnant women had higher fear of COVID-19 scores than Japanese fertility patients. In addition, fear of COVID-19 among pregnant women in Japan was positively associated with stockpiling and health monitoring, and an emphasis on websites and social networking sites among pregnant women was associated with lower fear of COVID-19.

Limitations: This study was a cross-sectional survey, which means that it is not possible to determine the causal relationship between fear of COVID-19 and related factors. Additionally, we were not able to research the web and social networking content that pregnant women consider most important.

Conclusion: Pregnant women in Japan have high levels of anxiety, and websites and social networking sites may be effective in alleviating their anxiety. When communicating information, there will be a need to provide not only accurate information about preventing infectious diseases, but also information that will ease the anxiety of pregnant women.

1. Introduction

Infections caused by new coronaviruses (coronavirus disease 2019, or COVID-19) are continuing to spread on a global scale. As of January 1, 2021, there were approximately 83 million infections (confirmed cases) and 1,826,176 deaths worldwide (Johns Hopkins University, 2021). The psychological problems associated with COVID-19 have also been increasing in light of the spread of the pandemic.

One of the most noted psychological problems caused by a pandemic is anxiety (e.g. Ahmed et al., 2020; Ahorsu et al., 2020b; Soraci et al., 2020). Fears of COVID-19 can affect not only mental health issues such as depression (Sakib et al., 2020), but also social behaviors such as hoarding groceries and necessities (Corbett et al., 2020; Wakashima et al., 2020). Based on these contextual concerns, the Fear

of COVID-19 Scale (FCV-19S) was developed to enable individuals to assess their fear of COVID-19 (Ahorsu et al., 2020b).

Other factors that increase coronavirus-related anxiety include having a low educational status, being married, and being a healthcare worker (Doshi et al., 2020). Anxiety is associated with urban residence (Cao et al., 2020) and life and financial concerns related to the lockdown (Sakib et al., 2020). Women, in particular, have been found to score higher on the Fear of COVID-19 Scale than men (Doshi et al., 2020; Reznik et al., 2020).

Pregnant women, on the other hand, have different concerns than others. Pregnant women and fetuses are particularly vulnerable to natural disasters and major disease epidemics (Favre et al., 2020; Watanabe et al., 2016). It is not clear whether COVID-19 increases the risk of miscarriage or stillbirth, or whether it is vertically transmitted to children (Liang and Acharya, 2020; Qiao, 2020). In various coun-

tries, pregnant women have refrained from visiting healthcare facilities for fear of infection due to hospital visits, or have felt isolated from social support networks and healthcare facilities designated for pregnant women suspected of having COVID-19. A study of pregnant Chinese women has shown that the perceived stress, depression, and anxiety of pregnant women in a pandemic situation are higher than those of normal pregnant women (Jiang et al., 2020). On a couple level, wives' depression, anxiety, suicide intention, mental health quality of life, and preventive COVID-19 behaviors are associated with husbands' anxiety (Ahorsu et al., 2020a).

Concerns have been raised about delays in treatment for those undergoing fertility treatments (Rowe and Quinlivan, 2020; Vaughan et al., 2020). A survey of fertile women in New England and the United States looked at stressors in January before the pandemic began, in March when the pandemic began, and in April when the pandemic was in progress, with infertility being the top stressor in each case (Vaughan et al., 2020). Thus, fertile women face the stressor of fertility treatment, even in usual times. However, under a pandemic, it can be suggested that they face additional stressors such as delayed treatment.

In Japan, the fear of COVID-19 not only directly increased engagement in all coping behaviors, but also indirectly increased stockpiling through conforming behavior (Wakashima et al., 2020). In Japan, the social environment surrounding pregnant women has also changed because of the pandemic, with companies forcing pregnant women to go to work (Koizumi, 2020), and expectant mothers living in large cities are asked to refrain from giving birth in their hometowns (Ichino, 2020). With regard to infertility treatment, about 90% of medical institutions offering infertility treatment reported that the number of patients had decreased (Japan Society of Fertilization and Implantation, 2020). Therefore, fertility patients face the dilemma of postponing treatment to reduce the risk of infection and the loss of opportunity for pregnancy due to postponement.

Traditionally in Japan, women have been asked "Are you married?" as a greeting or "Do you have children?" without hesitation. Moreover, some older people criticize childless women and believe that women are the cause of infertility. Therefore, Japanese infertility patients have higher psychological stress than pregnant women (Matsubayashi et al., 2001). This trend is also observed in countries with similar beliefs about pregnancy (Fido and Zahid, 2004). However, these results indicate situations before the spread of COVID-19. Currently, pregnant women and fertility patients are subjected to daily stressors as well as social stresses described above.

Despite this social context, there has been no research on the reliability and validity scale of the concerns of pregnant women and infertility patients. The purpose of this study was to clarify the fears of pregnant and infertile patients in Japan about COVID-19. We also compared the FCV-19S scores of pregnant women in Japan with those in Iran (Ahorsu et al. 2020a) as a supplementary measure, especially since the Japanese version of the FCV-19S does not have a cutoff point.

2. Method

2.1. Participants and procedure

Data were collected in Japan. A total of 404 pregnant women and 36 infertile patients were recruited through an online service (SurveyMonkey). To confirm that participants are pregnant or undergoing fertility treatment, they were asked the questions: "Are you currently pregnant?"; "Are you currently undergoing fertility treatment?" Participants were excluded if they responded they are (1) not pregnant or infertile patients, (2) were men, and (3) did not respond completely to all measures. In all, responses from 292 pregnant women (aged 23 to 42; mean age =31.18 (SD = 3.89)) and 13 infertile patients (aged 33 to 43; mean age =37.69 (SD = 3.64)) were analyzed.

With regard to pregnant women, the purpose of the survey and links to the questions were published on a free information website for pregnant women (https://ninps.com/), and responses were requested on a voluntary basis between May 21 and May 31, 2020. With regard to infertile patients, the purpose of the survey and links to the questions were published on the websites of fertility clinics, and responses were requested on a voluntary basis between May 19 and June 6, 2020. The participants read the descriptions of the study and agreed to take part in it by opting into the study.

2.2. Measures

2.2.1. Fear of the COVID-19 Scale (FCV-19S)

The FCV-19S developed by Ahorsu et al., (2020b), was used to assess pregnant and infertile patients' fear of COVID-19. It is a unidimensional, seven-item scale. Items are answered on a five-point Likert-type scale (strongly disagree = 1 to strongly agree = 5). The total score (sum of individual response items) ranges from 7 to 35, with higher scores indicating a higher fear of COVID-19. A Japanese version (Wakashima et al., 2020) was used.

2.2.2. Their actions taken to cope with COVID-19 and reasons

We asked participants what actions they take to cope with COVID-19 and their reasons (Wakashima et al., 2020). Behavior to cope with COVID-19 is a 13-item scale comprising eight items relating to being careful in daily life (e.g., avoiding places with large crowds), two items relating to stockpiling (e.g., purchasing food in larger quantities than usual), and three items relating to health monitoring (e.g., monitoring heath condition more carefully than before). Reasons for behavior to cope with COVID-19 is a five-item scale comprising two items relating to self-determination (e.g., I did it because I felt it was necessary for myself) and four items relating to conforming behavior (e.g., I did it because other people told me to). Items were answered on a six-point Likert-type scale (strongly disagree = 1 to strongly agree = 6).

2.2.3. Demographic variables and risk factors

As with Wakashima et al., (2020), questions concerning the demographic characteristics of participants (age, smoker, living with family) and risk factors such as current health condition, disease undergoing treatment, employment status, family communication in the last month, family conflict in the last month, the most important source of information, presence of infected people in your area (prefecture), and presence of infected acquaintance were included in this survey. Especially, for the most important source of information, we considered it to be a risk factor that could affect mental health because COVID-19 related information changes rapidly.

2.3. Ethical consideration

This study was approved by the Tohoku University Graduate School of Education's ethics committee (ID: 20-1-003). Participants were informed of the purpose of the survey, that participation was voluntary, that the survey was anonymous, and that personal information would not be disclosed to third parties. Only those who agreed to complete the survey were allowed to proceed with it.

2.4. Data analysis

To investigate the association between each variable and pregnant and infertile patients, Fisher's exact test was conducted for qualitative variables, and Wilcoxon rank-sum tests were conducted for quantitative variables. For pregnant women, a t-test was conducted for comparison with data on the fear of pregnant women in Iran (Ahorsu et al., 2020a). In addition, multiple regression analysis was conducted to identify the relationship between each variable and anxiety. As for infertile patients, only pregnant women were included in the study because the number of participants was small. In the multiple regression analysis, employment status and the most important source of information were grouped into

Table 1
Participants' basic characteristics.

	Pregnant N = 292		Infertile N = 13		
20s	107	36.64%	0	0.00%	p<.001
30s	178	60.96%	9	69.23%	
40s	7	2.40%	4	30.77%	
In normal condition	268	91.78%	13	100.00%	n.s.
Having a symptom	24	8.22%	0	0.00%	
Smoker	54	18.49%	2	15.38%	n.s.
Non-smoker	238	81.51%	11	84.62%	
Disease undergoing treatment	51	17.47%	3	23.08%	n.s.
No disease undergoing treatment	241	82.53%	10	76.92%	
Full-time worker	182	62.33%	7	53.85%	n.s.
Part-time worker	21	7.19%	1	7.69%	
Maternity leave	47	16.10%	0	0.00%	
Students/Unemployed	42	14.38%	5	38.46%	
Living with family	273	93.49%	13	100.00%	n.s.
Not living with family	19	6.51%	0	0.00%	
Family communication (1:decrease ~7:increase; N=273)	4.71	(1.23)	4.92	(1.12)	n.s.
Family conflict (1:decrease~7:increase; N=273)	3.95	(.90)	4.15	(.38)	n.s.
Most important source of information					
Newspaper	10	3.42%	1	7.69%	n.s.
News/Talk shows on TV	110	37.67%	8	61.54%	
Websites of public organizations	94	32.19%	3	23.08%	
News on the Internet	41	14.04%	1	7.69%	
SNS	37	12.67%	0	0.00%	
A patient with coronavirus in the area where I live	261	89.38%	12	92.31%	n.s.
Not a patient with coronavirus in the area where I live	31	10.62%	1	7.69%	
Someone I know has the coronavirus.	8	2.74%	0	0.00%	n.s.
No one I know has the coronavirus.	284	97.26%	13	100.00%	
FCV-19S	22.96	(5.69)	18.23	(5.10)	p=.006 Z= -2.72
Being careful in daily life	41.38	(3.9)	40.23	(6.27)	n.s.
Stockpiling	7.58	(2.66)	6.77	(3.3)	n.s.
Health monitoring	13.45	(2.64)	13.62	(2.63)	n.s.
Self determination	9.99	(1.65)	9.38	(1.12)	p=.074 Z= -1.79
Conforming behavior	10.59	(3.69)	11.31	(2.63)	n.s.

Parentheses indicate standard deviation.

two groups. Specifically, full-time workers and part-time workers were grouped together as the working group, and maternity leave and students/unemployed were grouped together as the non-working group. Regarding the most important source of information, newspaper and news/talk shows on TV were categorized as traditional media viewing group, referring to Riehm et al., (2020). Websites of public organizations, news on the Internet, and SNS were categorized as Internet and social media use groups. All analyses were performed using Mplus 8.1 (Muthén and Muthén, 2017) and R statistical software (R 3.6.3 (R Core Team, 2020)). Two-tailed tests were used for all statistical analyses. In all statistical evaluations, a *p*-value of less than 0.05 was considered to indicate a significant difference. For missing data, pairwise deletion was used.

3. Results

3.1. Participants' characteristics

Table 1 shows the participants' basic characteristics. There was a significant association between attributes (pregnant women and fertility patients) and age, and pregnant women had significantly higher FCV-

19S scores than fertility patients. Furthermore, when compared to the study by Ahorsu et al. (2020a) using FCV-19S for pregnant women, the fear scores of pregnant women in Japan were significantly higher than those of pregnant women in Iran (t (577.49) = 15.50, <.001; d=1.28, 95% CI (1.11, 1.46)).

3.2. Differences based on relevant variables

Multiple regression analysis showed a significant and positive relationship between the FCV-19S and stockpiling and health monitoring (Table 2). Regarding newspaper or TV information as the most important source was significantly and negatively associated with FCV-19S. Those who regarded the Internet or SNS as an important source were less anxious than those who regarded newspapers and TV as an important source.

4. Discussion

The purpose of this study was to investigate the fear of COVID-19 among pregnant and infertile patients in Japan. The findings showed that pregnant women had higher levels of anxiety about COVID-19 when

Table 2

Multiple regression analysis of the associations of variables with FCV-19S.

	FCV-19S				
	B	(95%CI)	β	P value	VIF
Condition (ref= In normal condition)	1.25	(-0.91 – 3.41)	0.06	0.256	1.07
Smoking (ref= nonsmoker)	1.51	(-0.01 – 3.04)	0.10	0.052	1.08
Disease undergoing treatment (ref = No disease undergoing treatment)	0.70	(-0.89 – 2.28)	0.05	0.388	1.07
Work (ref= full-time worker and part- time worker)	-1.11	(-2.34 – 0.12)	-0.09	0.077	1.02
Living with family (ref = Not living with family)	-0.68	(-2.89 – 1.52)	-0.03	0.544	1.04
The most important source of information (ref = Newspaper, News on TV, and Talk shows on TV)	-1.47	(-2.61 – -0.34)	-0.13	0.011*	1.03
A patient with coronavirus in the area where I live (ref = none)	-0.65	(-2.39 – 1.08)	-0.04	0.461	1.10
Someone I know has the coronavirus (ref = no)	3.10	(-0.64 – 6.84)	0.09	0.105	1.06
Being careful in daily life	0.09	(-0.08 – 0.25)	0.06	0.305	1.24
Stockpiling	0.26	(0.00 – 0.51)	0.12	0.046*	1.16
Health monitoring	0.75	(0.48 – 1.02)	0.35	<0.001***	1.41
Self-determination	0.21	(-0.19 – 0.61)	0.06	0.306	1.29
Conforming behavior	0.05	(-0.12 – 0.22)	0.03	0.575	1.21
R^2	.246***				

*$p < .05$, ***$p < .001$.

compared to infertile patients. This may have been influenced by the vulnerability of pregnant women and fetuses to natural disasters and major disease outbreaks (Favre et al., 2020; Watanabe et al., 2016) and the lack of clarity about the impact of COVID-19 on the fetus (Liang and Acharya, 2020; Qiao, 2020). Moreover, pregnant women in Japan had higher anxiety scores than pregnant women in Iran. In Japan, companies are forcing pregnant women to go to work (Koizumi, 2020), and pregnant women living in large cities are being asked to refrain from giving birth in their hometowns (Ichino, 2020). In Japan, many pregnant women have traditional support (Satogaeri bunben); they return to their parents' homes to receive assistance for childbirth (Ishikawa et al., 2011; Yoshida et al., 2001). However, this support is no longer available as the pandemic has restricted the movement of people. In addition, services other than maternity care (e.g., parents' classes for group education and communication) have been withdrawn from maternity facilities to prevent infection (Komatsu et al., 2020). These findings suggest that Japanese society views pregnant women as a social risk, and that pregnant women in Japan may have shown a high level of anxiety because they are placed in an unpredictable situation where they may not receive the care they expect.

In terms of factors associated with anxiety among pregnant women, the most important source of information, stockpiling, and health monitoring were found to be associated with the fear of COVID-19. Those who valued information from the Internet and social networking sites had a lower fear of COVID-19 than those who valued information from traditional media outlets such as newspapers and TV programs. For pregnant women, social networking sites and the Internet provided access to the information they need on their own. In China, antenatal health care information disseminated by hospitals using social media platforms was associated with a lower risk of stress, anxiety, and depression among pregnant women (Jiang et al., 2020). Therefore, the use of social media in Japan as a means of disseminating antenatal health care information can decrease anxiety among pregnant women.

On the other hand, newspapers and TV are aimed at a wider reader/audience base, so information that is not relevant to pregnant women is also received. Therefore, traditional media, such as newspapers and television, are associated with increased fears in pregnant women.

As for stockpiling, it was found to increase the fear of COVID-19 among pregnant women. Many also reported stocking up in a survey of pregnant women in Ireland (Corbett et al., 2020). Stockpiling is therefore considered to be a behavior that occurs across cultures.

Health monitoring was also found to increase anxiety. In the face of the COVID-19 disaster, a study of patients with inflammatory bowel disease (IBD) reported self-imposed prevention measures, including handwashing, after educational and instructional alerts on SNS were issued

(An et al., 2020). A survey of the general population also revealed that fear of COVID-19 enhances health monitoring (Wakashima et al., 2020). For the prevention of psychological problems associated with COVID-19, it is important to have accurate knowledge and a comprehensive understanding of relevant prevention methods (Liu et al., 2020). Although health monitoring is an important coping strategy for both the general public and pregnant women in protecting their health, the results of this study suggest an association between health monitoring and fear of COVID-19 among pregnant women. Therefore, when providing information on self-imposed prevention measures to pregnant women, it is necessary to provide information on infection prevention measures as well as information on the psychological care of pregnant women.

5. Limitations

This study has some limitations. The first concerns the methodology of the investigation. The data for this study are cross-sectional data collected through an online survey. Therefore, it is not possible to infer a strict causal relationship. In the present study, the factors of fear, including coping behaviors, were used as independent variables and the fear of COVID-19 as the dependent variable. However, Wakashima et al. (2020) examined a model that assumed a path from anxiety to coping behaviors. In other words, the relationship between coping behaviors and fear of COVID-19 could relate to both the possibility that coping behaviors evoke fear and the possibility that fear evokes coping behaviors. In future research, longitudinal data should be used to determine the causal relationships between anxiety and related factors.

The second limitation concerns the comparison with other countries. In this study, we compared the FCV-19S scores of Japanese pregnant women with those of Iranian pregnant women (Ahorsu et al., 2020a). However, this result does not consider the infection status of both countries. In the future, it is recommended to conduct epidemiological studies in multiple countries at the same time to compare the results regarding fear of COVID-19.

The third limitation concerns the content of the sources that pregnant women emphasize. The study asked about the sources of information that pregnant women considered important; however, the study did not ask about the content of the sources. Particularly, in the case of social networking sites, it is not just the aspect of gathering the information you need. There is also the aspect of being able to connect with others in a similar position. It is also conceivable that if pregnant women value information from the web or social networking sites, they may place more importance on information that is uncertain but reassuring to them than on the accuracy of the information. In addition, this study did not measure the amount of time participants spend on social media, which is also likely to influence the most important source of information and the

content they view. Future research will need to examine what aspects of the web and social networking sites have led to a decrease in the fear of COVID-19.

6. Conclusions

Despite the limitations described above, this is the first study to investigate the fear of pregnant women and infertility patients in Japan during the coronavirus disaster. This study revealed that pregnant women in Japan were more anxious than infertile patients and more anxious than pregnant women in other countries, and pregnant women's anxiety was associated with the information they valued, stockpiling, and health monitoring. In particular, health monitoring, while a necessary action to prevent infection, was associated with high levels of anxiety among pregnant women. Therefore, it will be necessary to provide not only accurate information about the prevention of infectious diseases but also information that will alleviate the anxiety of pregnant women.

Ethics

The study was approved by the Ethics Committee of Tohoku University Graduate School of Education (ID: 20-1-003).

Author contributions

KA and KW conceived, designed, and conducted the study with the help of ST and KK. KA analyzed the data and drafted the manuscript, and all authors reviewed and revised the manuscript equally.

Declarations of Competing Interest

None.

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