Trust and well-being of postpartum women during the COVID-19 crisis: Depression and fear of COVID-19

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ABSTRACT

During crisis, trust has been found to have a buffering effect in the prevention of the deterioration of mental well-being, as trust is considered to reflect the individual's capability to gain social resources including both formal and informal support. Additionally, during the COVID-19 pandemic, political trust has been found to reduce anxiety. Taking these findings into account, this study explores the association of generalised and political trust with mental well-being on current postpartum women who were particularly at risk due to a decline in social support leaving them an increased burden of caring newborns during the pandemic. We conducted a crosssectional survey in October 2020 in Japan (n=558). Depressive symptoms (above the cutoff of the Edinburgh Postnatal Depression Scale (EPDS)) and Fear of Coronavirus-19 Scale (FCV–19S) scores were used as mental well-being indicators. Generalised and political trust were captured by binary variables. Results of regression analyses, in which covariates were fully adjusted, showed that higher generalised trust had a statistically significant association with lower possibility of depressive symptoms and a lower FCV-19S score, while political trust was not significantly associated with either indicator. For further understanding, we divided respondents into two groups; women living in cities where higher COVID-19 cases were reported and women living in areas with lower COVID-19 cases, to test whether the role of trust differs depending on the infection spread status. It was found that a higher generalised trust was significantly associated with a lower probability of having depressive symptoms in the areas with lower COVID-19 cases. However, statistical significance was not observed in the areas with high COVID-19 cases. This highlighted that even postpartum women who were normally capable of receiving formal and informal social support need to be taken care of in the current situation.

1. Introduction

The World Health Organization declared the coronavirus disease (COVID-19) a pandemic on 11 March 2020, that has since impacted the global community in all aspects of life. It has caused crises that has affected people's well-being by limiting their mobility and social interaction, which was enforced to contain the infection. The consequence of this is severe. A growing number of studies have shown that a decline in social interaction hampers mental health, resulting in an increased incidence of depressive symptoms, anxiety, and sleep problems (Li et al., 2021; Elmer et al., 2020; Bailey, 2021; Creese et al., 2021; Xiao et al., 2020a). Postpartum women, which is the population focused on in this paper, are one of the most affected members of society. Reports from various countries and regions have shown an alarmingly high rate of depressive symptoms in postpartum women (Zanardo et al., 2020; Ceulemans; Hompes; Foulon 2020; Liang et al., 2020), and Japan is no exception to this (Matsushima & Horiguchi, 2020; Suzuki, 2020). Postpartum women are considered to be particularly vulnerable during the COVID-19 pandemic in due to three reasons. First, for all women, the postpartum period is associated with the highest risk of depression compared to that in other periods of their life course. Second, social support to help with the care of newborns is more important during the postpartum period than other times for its intensity and consistent demand from a baby. Elevated anxiety and stress due to lack of social support caused by the closure of formal childcare support services and the voluntary avoidance of informal childcare would further put

vulnerable postpartum women at an even higher risk of mental unwellness. Third, the risk of COVID-19 infection in newborns has not been clarified. This uncertainty may escalate the mothers' fear of COVID-19.

Trust is commonly understood as defined by Fukuyama (1995), that it is the expectation of regular, honest, and cooperative behaviour from others that arise within a community. There is extensive literature to show that trust has a robust positive impact on mental health during ordinary times and after disasters (Ehsan & De Silva, 2015; De Silva & et al, 2005; Wind et al., 2011). In health literature using individual and community level data in particular, positive correlations between health and social trust, trustworthiness of neighbourhood to be more precise, has gained attention showing how neighbourhood environment including social relationship affect one's health. Two studies that focused on perinatal women also concluded that trustworthiness of neighbourhood has a favourable impact on mental health (Krisotakis et al., 2013; Morozumi et al., 2020). The effect of social trust on mental health in the context of the COVID-19 pandemic is not yet known. Hence, it is a topic worth investigating. Lindstrom (2008) explained the positive relationship between trust and mental wellness as follows: as higher trust reflects one's ability to gain social support and resources, it leads to a lower stress level and more stable mental health. Yamaguchi and et al. (2019) suggested that a higher trust encourages more social participation and lowers the risk of depression. However, both assertions are unlikely with a high infection rate, and people are requested to stay home and unable to meet with others, which reduces informal support. In contrast, when the spread of infection is controlled and travel restrictions and requests to stop family gatherings are lifted, informal support becomes available. During this time, a higher level of social trust may be strongly associated with mental well-being. If people trust neighbours, they may be more confident that their neighbours are following infection control measures, such as washing hands, wearing masks, and maintaining physical distance. This can reduce the anxiety and fear of COVID-19. They may also participate in more social activities within their residential community, if the infection rate is not severe and infection risk remains at a minimum. This aligns well with the pathway suggested by Yamaguchi and et al. (2019).

Political trust has also gained attention during COVID-19. Bargain and Aminjonov (2020) revealed that a higher political trust led to a larger reduction in non-essential mobility following Europe's implementation of the government containment policy in March 2020. Honjo et al. (2018 Nov) and Olsen and Hjorth (2020) also found better compliance to government policies among citizens when political trust was high in China and Denmark, respectively. Moreover, the recently published paper by Gotanda et al. (2021) revealed the this was the case in Japan during the same time as our paper's study period. If people's mental health has deteriorated partly due to fear of COVID-19, political trust may indirectly benefit mental health by reducing the fear and anxiety surrounding COVID-19.

This study aimed to add new insights to better understand the current scenario of mental health of postpartum women by exploring the association between mental well-being and trust. We used two mental well-being indicators, namely the Edinburgh Postnatal Depression Scale (EPDS) and Fear of Coronavirus-19 Scale (FCV–19S) scores, to examine how social and political trust are associated with these indicators. Although trust can be regarded as 'social capital', we avoid using the term 'social capital' since we only focus on individual level trust, and not community level because of limited data availability. Also, a strand of literature on relationship between social capital and people's behaviour during the COVID-19 uses more comprehensive social capital index at community level such as the U.S. Joint Economic Committee (JEC) measures of social capital that includes family structure and stability, family interaction and investment, civil society, trust and confidence in institutions, community cohesion, institutions, volunteerism, and social organisation (Wu, 2020; Makridis & Wu, 2020; Borgonovi et al., 2021) or composite indicators including community attachment, social trust,

family bond, and security (Xiao et al., 2020a, Arachchi & Managi, 2021). In order to prevent confusion in results and implications by mixing up with these previous literatures, we do not mention other aspects of social capital in this paper, and keep our focus on individual social and political trust alone.

2. Methods

2.1. Study design

We used data of postpartum women from a population-based internet-based questionnaire survey, Japan COVID-19 and Society Internet Survey (JACSIS), which was started in October 2020 by panellists from Rakuten Insight, Inc., which as of 2019, holds approximately 2.2 million panellists (for the detailed study design, refer to Miyawaki et al. (2021)). A cross-sectional survey of perinatal women was conducted in 15–25 October 2020 based on the recruitment of women who had given birth after October 2019 or were expected to give birth by March 2021 by using simple random sampling from the pooled panel of 4373. Data were collected until we reached the target sample size of 1000 (participation rate, 22.9%), which comprised 600 postpartum women and 400 pregnant women. We then analysed the data of the postpartum women. Due to the low participation rate, we have to be careful with over-generalising our results. Compared to those of the largest nationally representative perinatal women's data, the Japan Environment and Children's Study (JECS), the socio-demographic characteristics of JACSIS data samples have a higher education level (women with undergraduate education or more accounts for 21.8 % and 51.1% for JECS and JACSIS, respectively) and a higher percentage of full-time workers (22.0% and 40.9% for JECS and JACSIS, respectively) (Honjyo et al., 2018). These differences suggest that our results may not be satisfactory enough to capture the populations that have low education levels and no full-time work.

3. Data availability

Due to confidentiality and restrictions being imposed by of data the Research Ethics Committee of the Osaka International Cancer Institute, the data used in this study are not deposited in a public repository. The person responsible for data management is Dr. Takahiro Tabuchi. Data inquiries should be addressed by e-mail (tabuchitak@gmail.com.)

3.1. Ethical issues

All procedures were conducted following the ethical standards of the Helsinki Declaration of 1975, as revised in 2013. Ethical approval number 20084 was given on 19 June 2020 by the Research Ethics Committee of the Osaka International Cancer Institute that reviewed the study protocol. The Internet survey agency protected personal information by strictly following the Act on the Protection of Personal Information in Japan. A web-based informed consent form was obtained when signed by respondents before proceeding to the online questionnaire. Credit points ('Epoints') were provided as incentives, which can be used for online shopping or converted to cash.

3.2. Measurement of well-being

3.2.1. Postpartum depression

The EPDS is a self-report screening questionnaire developed by Cox et al., in 1987 to detect postnatal depression (Cox et al., 1987). It is a standard international postpartum depression screening tool. It was translated into Japanese and validated by Okano (1996). The EPDS has 10 items, and the answer for each item is scored from 0 to 3, with some items having reverse scoring. The total score ranges from 0 to 30. Higher scores indicate greater depressive symptoms in postpartum women. There are several different cut-off scores for suspected symptoms of

postpartum depression, depending on the country. In Japan, the cut-off score was set as 9 (Okano, 1996). The Japanese version of the EPDS used in our study showed good internal consistency (10 items) and had a Cronbach's alpha of 0.86.

3.2.2. Anxiety and fear of COVID-19

The FCV-19S was developed to assess anxiety and fear of COVID-19. COVID-19 associated anxiety and fear have been positively correlated with anxiety and depression and perceptions of vulnerability to infection (Ahorsu et al., 2020). Originally developed in Persian (Ahorsu et al., 2020), it has since been validated in various languages including English (Winter et al., 2020), Spanish (Broche-Pérez et al., 2020), French (Mailliez et al., 2020), Russian (Reznik et al., 2020) and Italian (Soraci et al., 2020). Also, it is validated in Asian and African languages such as Vietnamese (Nguyen et al., 2020), Bangla (Sakib et al., 2020), Malay (Pang et al., 2020), and Ethiopian (Elemo, Satci, and Griffiths 2020). In Japan, three studies have validated the FCV-19S (Wakashima et al., 2020; Masuyama et al., 2020; Midorikawa et al., 2021). We used Japanese translation developed by Tachikawa et al. (2020). The scale consists of seven statements: '1) My heart races or palpitates when I think about getting coronavirus-19, 2) I cannot sleep because I'm worrying about getting coronavirus-19, 3) My hands become clammy when I think about coronavirus-19, 4) When watching news and stories about coronavirus-19 on social media, I become nervous or anxious, 5) It makes me uncomfortable to think about coronavirus-19, 6) I am most afraid of coronavirus-19, and 7) I am afraid of losing my life because of coronavirus-19.' Responses to the statements were recorded as the degree of agreement using a five-point scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The total score was calculated by adding up each item score to get a range of 7–35. The higher the score, the greater the fear of COVID-19. Cronbach's alpha for the seven items was 0.82, indicating good internal consistency.

3.3. Measurement of trust

We measured two types of trust: social trust and political trust. To measure social trust, the question, 'In general, would you say that your neighbours can be trusted?' was asked. The response was selected from a 4-point Likert scale: 'yes', 'somewhat yes', 'somewhat no', and 'no'. This question measures an individual's perception of the trustworthiness of his or her neighbours. Note that trust has been measured in various ways, and there is an extensive discussion on the difficulties associated with measuring it. To date, the question that has been used most widely and longest is, 'Generally speaking, would you say that most people can be trusted, or that you cannot be too careful in dealing with people?', which is a modified version of the very first question that attempted to quantify peoples' trust and that was introduced by the Office of Public Opinion Research Survey 213 'War' in 1942 (Bauer 2015). This wording or slightly modified wording is still used in the standard questions found in many national attitudinal surveys, including the General Social Surveys conducted in the U.S., Japan, and European countries, as well as globally conducted surveys, such as the Gallup world poll and the World Values Survey (WVS). Investigations on the relationship between trust and health at the macro-level (country's mortality level, for instance) are likely to rely on these widely available large-scale international data sets and use this question to capture generalised trust (Kawachi et al., 1997, for instance). In addition, in the recent health literature focusing more on the individual level, trustees are often being identified as 'neighbours' (Harpham et al., 2002), and this is one of the sub-concepts of the overall trust concept along with political trust. Although measuring trust using an attitudinal question has limitations, particularly the fact that it is incapable of capturing trust behaviour as revealed by Glaeser et al. (2000), rigorous econometric analysis has revealed that trustworthiness is strongly predicted by attitudinal survey questions. Therefore, the question used in this study can capture the trustworthiness of neighbours. In practice, this is a standardised question that has

been used in various health literature (Bassett & Moore, 2013; Subramanian et al., 2002). One shortcoming of this indicator is that we cannot capture the perceived norms of social trust in the community; this can be captured by the question, 'Do you think that people in your neighbourhood trust each other?' (Fujiwara & Kawachi, 2008; Ueshima et al., 2010). In other words, what we capture in this study is limited to the individual level of trust and does not have implications for community-level trust.

For political trust, the question, 'Do you trust the government?' was asked. The response was selected from the same 4-point Likert scale as above. For our analysis, we organised this indicator into a dummy variable with 1 representing 'yes' and 'somewhat yes', and 0 representing 'no' and 'somewhat no'. Measuring political trust is certainly not a simple task, and there is no single agreed-upon measurement method: they vary and are complex.(Saris and Gallhofer 2007). One of the oldest and still frequently used questions is 'How much of the time do you think you can trust the government in Washington to do what is right?'; it was first used in the US National Election Study (NES) in 1958 (Levi & Stoker, 2000). Our measurement uses the simplified version of this classic question. The criticism against this measurement is that it does not capture the people's attitudes towards the political system in general; rather, it evaluates the incumbent political actors (Citrin, 1974). The recent studies use multiple indicators to distinguish between political institutions and representatives, or parliament and the legal system (Davidov and Coromina, 2013), and internationally comparative data, such as WVS and OECD, offer sets of questions to capture political trust, asking about people's confidence in the government, justice system/courts, parliament, civil service (WVS), as well as the national government and judicial system. Although multiple indicators are desirable, due to data limitations, we can only use a single question to inquire about trust in the government in our study. Therefore, it should be kept in mind during interpretation that political trust may mean trust in the incumbent political actors, and over-interpretation should be avoided. In Japanese, 'government' refers to 'national government (both ruling and opposition parties)' and does not imply the judicial system or civil service. Hence, the interpretation should be limited to the relationship between people's trust in government (as well as politicians) and mental well-being.

3.4. Covariates

Covariates included respondents' socio-demographic information, pregnancy and birth-related information, history of illnesses, and social support indicators. Socio-demographic information included age, marital status, number of household members, education, working status, income, and type of housing. Pregnancy and birth-related information included parity, birth complications, and whether pregnancy was planned/wanted or not. History of illnesses included both physical and mental illnesses. The variables and definitions are summarised in Table 1.

3.5. Statistical analyses

In total, we excluded 42 inaccurate responses for the following respondents. First, we dropped those who selected other than 'D' out of the choices A, B, C, D, and E for the question, 'Please select the second option from the bottom' (35 cases dropped and 565 remained). Next, we dropped those who responded as 'using some times or almost every day' to all nine items on alcohol products or drug usage (five cases dropped and 560 remained). Third, those who selected 'yes' to all listed diseases for the question 'Do you have the following diseases?', which had more than 16 items listed (two cases dropped 558 remained) In this analysis, 558 were remained as valid responses.

First, each well-being indicator of social trust and political trust at individual level was analysed by keeping all the covariates adjusted. Logistic regression was performed with EPDS as the dependent variable.

Table 1

Summary statistics.

Variables	Definition	All survey samples				Areas divided by the COVID-19 reported cases (% per population)		
						Lower (n=291)	Higher (n=267)	T-test
		Percentage/ Mean [1]	Standard Deviation	Mini-mum	Maxi-mum	Percentage/ Mean	Percentage/ Mean	Differences
EPDS >=9	1: EPDS total score 9 or above 0: EPDS total score less than 9	28.67%	0.45	0	1	28.20%	29.20%	−0.01
FCV-19S Total score	FCV-19S total score (score range: 5–35)	17.53	5.12	7	35	17.52	17.54	−0.02
Trust								
Trust in neighbours	1: Neighbours can be trusted (Yes/ Somewhat yes) 0: Neighbours can be trusted (No/ Somewhat no)	67.56%	0.47	0	1	66.30%	68.90%	−0.03
Trust in the government	1: Do you trust the government ? (Yes/Somewhat yes) 0: Do you trust the government ? (No/Somewhat no)	43.55%	0.50	0	1	42.95%	44.20%	−0.01
Support/Family function								
Neighbours helpful	1: Neighbours try to help the others in many cases (Yes/ Somewhat yes) 0: Neighbours try to help the others in many cases (No/ Somewhat no)	56.99%	0.50	0	1	55.35%	58.80%	−0.04
Family Support score	The Family APGAR score (score range: 0–10) [2]	7.69	2.80	0	10	7.59	7.79	−0.19
Partners' support score	The Partners' support score (score range: 0–6) [3]	4.37	1.92	0	6	4.30	4.45	−0.15
Illness								
Had or currently having mental illness (including depression)	1: Had or currently having mental illness 0: Not had or having mental illness	13.80%	0.35	0	1	14.10%	13.50%	0.01
Number of illness (physical)	Number of illness (physical)	0.28	0.71	0	7	0.29	0.28	0.01
Birth related matters								
Planned/Wanted pregnancy	1: Planned/Wanted pregnancy 0: otherwise	85.30%	0.35	0	1	83.50%	87.25%	−0.04
Number of birth complication (s)	Number of complications the respondents had	0.66	1.17	0	14	0.71	0.61	0.10
Age								
Age (Under 29)	1: Age under 29 0: Age 30 or above	25.09%	0.43	0	1	27.85%	22.10%	0.06
Age (30–39)	1: Age 30–39 0: otherwise	70.25%	0.46	0	1	66.00%	74.90%	−0.09 *
Age (40–49)	1: Age 40-49-39 0: otherwise	4.66%	0.21	0	1	6.20%	3.00%	0.03
Parity								
Multipara	1: Multipara 0: Primipara	4.12%	0.20	0	1	5.15%	3.00%	0.02
Income								
Income (the lowest quantile)	1: Income, the lowest quantile 0: otherwise	30.65%	0.46	0	1	35.40%	25.45%	0.10 *
Income (the 2nd lowest quantile)	1: Income, the 2nd lowest quantile 0: otherwise	22.04%	0.41	0	1	21.65%	22.45%	−0.01
Income (the 2nd highest quantile)	1: Income, the 2nd highest quantile 0: otherwise	25.81%	0.44	0	1	21.30%	30.70%	−0.09 *
Income (the highest quantile)	1: Income (the highest quantile) 0: otherwise	10.04%	0.30	0	1	6.85%	13.50%	−0.07 *
Income (Do not know/Do not want to answer)	1: Income, Do not know/Do not want to answer 0: otherwise	11.47%	0.32	0	1	14.80%	7.85%	0.07 *
Own a house	1: Own a house 0: otherwise	47.13%	0.50	0	1	49.15%	44.95%	0.04
Marital status								
Married (including having a partner)	1: Married, including having a partner 0: otherwise	99.28%	0.08	0	1	98.95%	99.65%	−0.01
Education								
Education (University or above)	1: Education (University or above) 0:otherwise	51.08%	0.50	0	1	44.65%	58.05%	−0.13 *
Working status								
Full-time worker	1: Full time worker 0: otherwise	40.86%	0.49	0	1	42.25%	39.35%	0.03
Contract worker	1: Contract worker 0: otherwise	7.89%	0.27	0	1	6.20%	9.75%	−0.04
Part-time worker	1: Part time worker 0: otherwise	23.12%	0.42	0	1	24.05%	22.10%	0.02
Household wife and others	1: Household wife and others 0: otherwise	28.14%	0.45	0	1	27.50%	28.85%	−0.01
Number of household members	Number of household members	2.71	0.91	1	7	2.81	2.60	0.20 *
Rate of COVID-19 reported case (prefectural level)	Rate of COVID-19 reported case per population	53.66	40.15	1.133	137.28	24.52	85.43	−60.91 ***

*** Significant at 0.1% level, ** 1% level, * 5%level.

(1)Percentage of the respondents who chose '1′ in the definition is reported when the variable is binary. Mean is shown when the variable is non-binary including scores, numbers and percentage.

(2)We used the Family APGAR score to measure family's support. The Family APGAR score is developed by Smilkstein (1978) as a brief screening questionnaire designed to elicit five areas of family function. The acronym APGAR stands for these five areas: Adaptability, Partnership, Growth, Affection, and Resolve. It is a five-item questionnaire. These items were: 'I am satisfied with the help that I receive from my family when something is troubling me.', 'I am satisfied with the way my family discusses items of common interest and shares problem solving with me.', 'I find that my family accepts my wishes to take on new activities or make changes in my life-style.', 'I am satisfied with the way my family expresses affection and responds to my feelings such as anger, sorrow, and love.', and 'I am satisfied with the amount of time my family and I spend together'. Originally, choices of answers and their scores are: 'Almost always'(2 points), 'Some of the time'(1 point), or 'Hardly ever' (0 points). In our survey, choices of answers were set as 'Almost always', 'Some of the time', 'Hardly ever' and 'Never'. Therefore, we aggregated the latter two answer choices and set the score as '1' to follow the 3 points scale.

(3)The partners support was captured by three item questionnaires: 'My partner helps me when something is troubling me', 'My partner responds to my emotional needs', and 'My partner plays sufficient part in child care and household chore'. The choices of responses were same as The Family APGAR, and we also set the score ranging from 0 to 2 for the partner support score.

We applied logistic regression by defining 1 as an EPDS score of 9 or higher (having depressive symptoms) and 0 as an EPDS score of less than 9. For FVC-19S, we used the total scores for as continuous variables, and the ordinary least squares (Linear regression model) with robust standard errors were used by considering heteroskedasticity. Then, we conducted a sub-population analysis by dividing the observations into two groups using the prefectural level of COVID-19 reported case ratio: higher than the average group (women living in cities with high COVID-19 reported cases) and the average or below average group (women living in cities with low COVID-19 reported cases). Statistical analyses were conducted using STATA/MP version 15.1. For all analyses, we set significant level at 10%, 5% and 1 %.

4. Results

Of the 558 respondents, 28.7% were identified as having a risk of depression. The mean FCV-19S score was 17.5. There were no statistically significant differences in these two variables between women living in cities with high COVID-19 infection cases with and the counter parts. As for trust, more than two-thirds of the respondents felt that they could trust their neighbours, but the percentage of people who trust the government was approximately 40%. Both social and political trust levels were higher among women living in cities with high COVID-19 infection cases than the counterparts, although the difference was not statistically significant.

The socio-demographic indicators, such as age, education, income level, and number of household members differed significantly. Compared to the cities with low COVID-19 infection cases, the cities with high COVID-19 infection cases had a higher percentage of women in their 30s, women with higher educational attainment and income levels, and women living in households with less number of members. These differences are probably due to the fact that larger cities were likely to have high COVID-19 reported cases than other areas, because these characteristics are more likely in larger cities in Japan.

4.1. Results of logistic regression analyses

Covariates fully adjusted regression analyses results (Table 2) showed that social trust had a statistically significant relationship with the mental wellness of postpartum women at least by 10 % significant level. The odds ratio of social trust was 0.59 (95% confidence Interval (CI) [0.32–1.08]) for EPDS scores and −2.32 (P-value: 0.00) for FCV-19S scores. These results suggest that if people feel that their neighbours can be trusted, they have more than 40% less chance of exhibiting depression symptoms, and having −2.32 points lower fear of COVID-19 than the counter parts. In contrast, political trust was not significantly associated with any of the indicators used. One caveat to be noted, however, is that we observed wide confidence intervals in the regression results for FCV-19S. As for the community trust variable, it was [−3.48, −1.16], suggesting the modest emphasis of estimation results (see Table 3).

When we checked the association between EPDS score and covariates, higher family support were associated with a lower probability of having depressive symptoms. Those who previously had or at the time of the survey had mental illness and/or pregnancy and/or birth-related complications were more likely to report mental unwellness. Findings indicated that the probability of having depressive symptoms did not differ between primipara or multipara, and a higher income was not necessarily associated with better mental health status. Furthermore, the prefectural level of COVID-19 reported cases increased the possibility of having EPDS score $\geq$ 9, although the magnitude was small (OR 1.01, CI [1.01–1.02] for EPDS).

Regarding the fear of COVID-19, family support and birth complications did not demonstrate any significant associations. Those who previously had or at the time of the survey had mental illness tended to have lower scores, which is distinct from the results seen with EPDS score. Moreover, the prefectural level of COVID-19 reported cases was not significantly associated with FCV-19S score. Similar to the EPDS results, income did not have a linear relationship with FCV-19S scores.

To scrutinise the relationship between trust and mental wellness, we conducted further analyses by dividing our sample into two groups according to their residential prefectures' rate of COVID-19 reported cases per population. The results showed that a higher social trust was significantly associated with a lower probability of having EPDS score $\geq$ 9 in the areas with lower COVID-19 reported cases, with an odds ratio of 0.37. However, statistical significance was not observed and odds ratio became smaller in the areas with higher COVID-19 reported cases. There were some notable findings associated with the covariates for the areas with higher COVID-19 reported cases, where a high family support significantly associated with lower probability of having depressive symptoms, similar to that in the areas with lower COVID-19 reported cases. Having a mental illness and working as a contract worker had significant associations with a higher probability of having depressive symptoms in women living in areas with higher COVID-19 reported cases. Whereas, age (30–39), income (the 2nd height quantile), and number of household members became to have no statistically significant associations.

In addition to the above findings, social trust showed a positive association with a lower FCV-19S score, regardless of severity of COVID-19 reported case rates with nearly identical coefficients in both areas. Note that the results reported wide 95% confidence intervals, [-4.15, −0.80] and [-4.30, −0.68] for the reported lower and higher COVID-19 cases, respectively. These should be taken into account for the variability of the point estimate.

As for political trust, there was no statistical association with either depressive symptoms or FCV-19S scores in both the higher and lower COVID-19 reported cases' areas. Besides, the odds ratio of political trust on depressive symptoms exceed 1.5.

5. Discussion

Analyses were conducted to explore the role of social trust and political trust in mental wellness during the COVID-19 pandemic. In more detail, we used the measurements of individual perceived neighbourhood trustworthiness and government trustworthiness. The results

Table 2
Results of regression analyses (Fully adjusted).

	EPDS>=9 ORs [95%CI] [1]			FCV-19S Coeff [SE] [2]		
Trust						
Trust in neighbours (Ref: No trust in neighbours)	0.59	+	[0.32–1.08]	−2.32	***	(0.59)
Trust in the government (Ref: No trust in the government)	1.13		[0.72–1.78]	0.14		(0.46)
Support/Family function						
Neighbours helpful (Ref: Neighbours not helpful)	1.17		[0.65–2.11]	0.34		(0.56)
Family support score	0.78	**	[0.70–0.88]	−0.01		(0.12)
Partners' support score	0.99		[0.84–1.17]	0.07		(0.17)
Illness						
Had/Have mental illness (including depression) (Ref:Not had/have mental illness)	2.31	**	[1.30–4.11]	−1.26	*	(0.61)
Number of illness (physical)	1.07		[0.78–1.46]	−0.16		(0.27)
Birth related matters						
Planned/Wanted pregnancy (Ref:Not planned/Wanted pregnancy)	1.32		[0.71–2.46]	0.82		(0.62)
Number of birth complication (s)	1.19	+	[0.996–1.41]	0.18		(0.16)
Age (Ref: Under 29)						
Age (30–39)	0.8		[0.50–1.30]	−0.20		(0.49)
Age (40–49)	0.68		[0.22–2.09]	0.28		(1.33)
Parity (Ref: Primipara)						
Multipara	2.5		[0.78–8.05]	0.05		(1.01)
Quantile of annual household income during the previous year (Ref: Lowest quantile)						
Income (the 2nd lowest quantile)	0.79		[0.44–1.44]	−0.38		(0.66)
Income (the 2nd highest quantile)	0.54	*	[0.29–0.99]	−1.96	**	(0.63)
Income (the highest quantile)	0.68		[0.28–1.64]	−1.18		(-1.28)
Income (Do not know/ Do not want to answer)	1.12		[0.56–2.27]	0.04		(0.92)
Own a house (Ref:Not owning a house)	0.92		[0.59–1.43]	0.42		(0.76)
Marital status (Ref: Not being in an union)						
Married (including having a partner)	0.46		[0.03–6.49]	−1.45		(0.46)
Educational attainment (Ref: Lower than University)						
Education (University or above)	1.14		[0.73–1.77]	−0.26		(0.44)
Working status (Ref: full-time worker)						
Contract worker	1.91		[0.87–4.18]	0.88		(1.00)
Part-time worker	1.1		[0.61–1.98]	−0.64		(0.62)
Household wife and others	1.14		[0.66–1.99]	0.92		(0.59)
Number of household members	0.69	*	[0.50–0.94]	−0.35		(0.30)
Rate of COVID-19 reported case (prefectural level)	1.01	**	[1.02–1.01]	0.00		(0.01)
Pseudo R-squared/R-squared	0.16			0.08		

*** Significant at 0.1% level, ** 1% level, * 5% level, + 10 % level.
(1)Odds ratios are reported, and 95% intervals are shown in square bracket.
(2)Coefficients are reported, and robust standard errors are shown in parentheses.

showed that a higher of social trust correlated with a lower probability of having depressive symptoms and fear of COVID-19. However, political trust was not significantly associated with either depressive symptoms or FCV-19S scores.

According to previous studies, a higher social trust reflects one's capability of gaining social support and resources which benefit mental well-being by reducing stress levels (Lindstrom, 2008), and it also facilitates active social participation (Yamaguchi & et al., 2019). Considering these mechanisms, the higher COVID-19 reported cases may influence the impact of trust on mental wellness because people were more likely to have stricter isolation and social distancing protocols. In JACSIS data for general population (n=25,483, refer Miyawaki et al., 2021 for details of this survey), we checked whether people living in areas with higher COVID-19 reported cases have reduced social contacts more than the people living in areas with lower COVID-19 reported cases. It was found that 84.7% and 81.6 % did not visit their friends at all, 71.6% and 65.05% did not visit their family members at all, and 82.5% and 79.2% did not have visitors in their home at all in areas with higher and lower COVID-19 reported cases, respectively. These differences are statistically significant.

On the other hand, in the areas with lower COVID-19 reported cases, the relationship between social trust and mental wellness became even stronger as indicated by a larger odds ratio. It is plausible that informal support dominated due to a decline in formal support. These results suggest that social trust has more statistical explanatory power for better mental wellness. Moreover, if one trusts their neighbours, joining community social activities when prevention measures are followed may bring some comfort.

As for fear of COVID-19, a higher social trust level correlated with lower FCV-19S scores. It is plausible that people may feel more confident in their neighbours to follow prevention measures to prevent the spread of COVID-19, or people may feel that people can help them or their family even if they became infected. Mertens et al. (2020) suggested that health anxiety, media exposure, and concerns about the health of loved ones are the predictors of fear of COVID-19. These have been repeatedly found during global pandemics, such as the 2009–2010 swine flu pandemic (Wheaton et al., 2012) and the 2015–2016 Zika virus outbreak (Blakey & Abramowitz, 2017). Because we could not include these covariates, we cannot identify exactly how trust works to reduce anxiety, yet our results are suggestive that fear towards human-to-human infection are influenced by relationship with the others including trust.

We found that political trust was not associated with depression and fear of COVID-19. Several studies on the COVID-19 pandemic have revealed that a higher political trust leads to better compliance with government policy including in Japan (Han et al., 2021; Olsen & Hjorth, 2020; Gotanda et al., 2021). Moreover, recent studies from Europe have suggested a positive relationship between political trust and mental wellness. For instance, Paolini et al. (2020) found that in Italy, trust in institutions and officials, including the Prime Minister and other politicians, had a positive relationship with the well-being of people during the COVID-19 pandemic. Esaiasson et al. (2020) reported that in Sweden there was a strong rally round the flag effect, which generally refers to an increase in presidential popularity, during the first COVID-19 wave. Indeed, past studies have suggested that a rally round the flag effect is observed during a crisis with a high level of collective uncertainty and existential threats (Hetherington & Nelson, 2003). In Japan, things may differ from European countries. As Vardavas et al. (2020) revealed, Japan demonstrated the lowest approval for governmental responses to the pandemic (35.0%), lowest rating for good governmental communication (33.6%), and lowest trust in government decisions (38.0%) among the G7 countries. Only Japan had rating percentages of less than 50%. The Edelman Trust Barometer also showed that Japan has a unique trend of a sharp decline in political trust during the COVID-19 pandemic, in contrast to that in other countries (Ono, 2021). Considering this unique Japanese reaction to politics, the lack of an association between

Table 3
Results by severity of COVID-19 reported cases (Fully adjusted).

	EPDS>=9 ORs [95%CI] [1]				FCV-19 Coeff [SE] [2]			
	COVID-19 reported cases (% per population)				COVID-19 reported cases (% per population)			
	Lower (n=297)		Higher (n=267)		Lower (n=297)		Higher (n=267)	
Trust								
Trust in neighbours *(Ref: No trust in neighbours)*	0.37	* [0.15–0.94]	0.80	[0.31–2.07]	−2.47	** (0.85)	−2.49	** (0.92)
Trust in the government *(Ref: No trust in the government)*	1.59	[0.77–3.27]	0.92	[0.48–1.78]	−0.02	(0.64)	0.24	(0.68)
Support/Family function								
Neighbours helpful *(Ref: Neighbours not helpful)*	1.16	[0.48–2.80]	1.34	[0.54–3.31]	0.87	(0.79)	0.14	(0.85)
Family support score	0.75	** [0.63–0.89]	0.74	** [0.61–0.89]	0.02	(0.17)	−0.01	(0.19)
Partners' support score	0.98	[0.77–1.26]	1.08	[0.82–1.41]	0.04	(0.24)	0.04	(0.23)
Illness								
Had/Have mental illness (including depression) *(Ref:Not had/ have mental illness)*	1.99	[0.85–4.67]	3.41	** [1.42–8.20]	−1.81	* (0.88)	−0.78	(0.23)
Number of illness (physical)	1.48	+ [0.98–2.24]	0.63	+ [0.38–1.04]	−0.18	(0.39)	−0.14	(0.94)
Birth related matters								
Planned/Wanted pregnancy *(Ref:Not planned/Wanted pregnancy)*	1.93	[0.75–5.00]	0.78	[0.30–2.00]	1.46	(0.79)	0.15	(1.03)
Number of birth complication (s)	1.20	[0.94–1.53]	1.20	[0.87–1.64]	0.11	(0.19)	0.24	(0.31)
Age (Ref: Under 29)								
Age (30–39)	0.45	* [0.22–0.93]	1.88	[0.85–4.19]	−1.08	(0.72)	0.76	(0.72)
Age (40–49)	0.77	[0.21–2.84]	0.33	[0.02–4.56]	0.27	(1.59)	−0.87	(2.25)
Parity (Ref: Primipara)								
Multipara	5.02	* [1.12–22.53]	1.16	[0.10–14.14]	−0.31	(1.39)	1.95	(1.57)
Quantile of annual household income during the previous year (Ref: Lowest quantile)								
Income (the 2nd lowest quantile)	0.71	[0.30–1.66]	0.93	[0.37–2.35]	−0.36	(0.86)	−0.17	(1.06)
Income (the 2nd highest quantile)	0.21	** [0.07–0.60]	0.89	[0.37–2.15]	−1.57	(0.91)	−2.40	** (0.92)
Income (the highest quantile)	0.84	[0.21–3.36]	0.62	[0.18–2.17]	−1.45	(1.36)	−1.29	(1.31)
Income (Do not know/Do not want to answer)	0.96	[0.36–2.55]	1.15	[0.33–3.98]	−0.22	(0.96)	0.03	(1.37)
Own a house*(Ref:Not owning a house)*	0.77	[0.39–1.52]	1.13	[0.58–2.20]	0.12	(0.67)	0.86	(0.68)
Marital status (Ref: Not being in an union)								
Married (including having a partner)	0.39	[0.02–5.58]	1.00	[1.00–1.00]	1.86	(2.30)	−7.21	** (2.57)
Educational attainment (Ref: Lower than University)								
Education (University or above)	1.51	[0.76–3.03]	0.82	[0.43–1.56]	−1.25	* (0.59)	0.60	(0.65)
Working status (Ref: full-time worker)								
Contract worker	0.91	[0.22–3.86]	2.55	+ [0.91–7.13]	0.27	(1.30)	1.05	(1.44)
Part-time worker	1.87	[0.76–4.60]	0.78	[0.32–1.91]	−0.55	(0.89)	−0.91	(0.97)
Household wife and others	2.10	[0.92–4.79]	0.72	[0.31–1.68]	1.01	(0.82)	0.57	(0.91)
Number of household members	0.60	* [0.38–0.94]	0.64	[0.37–1.10]	−0.22	(0.41)	−0.42	(0.49)
Rate of COVID-19 reported case (prefectural level)	1.03	* [1.00–1.05]	1.02	** [1.01–1.03]	0.05	** (0.02)	0.00	(0.01)
Pseudo R-squared/R-squared	0.25		0.18		0.12		0.12	

*** Significant at 0.1% level, ** 1% level, * 5% level, + 10 % level.
(1)Odds ratios are reported, and 95% intervals are shown in square bracket.
(2)Coefficients are reported, and robust standard errors are shown in parentheses.

political trust and mental wellness is not surprising. Additionally, in the areas with lower COVID-19 reported cases in particular, odds ratio of higher political trust exceeded 1.5. This is suggestive that the post-partum women who trust the government could have higher probability of having depressive symptoms. Although we cannot strongly claim this finding due to its statistical insignificance, it may be because women who trust the government were confused or felt disappointed for more or less uniform social restrictions imposed across Japan regardless infection rate.

6. Conclusion

This study strived to increase the understanding of the mental well-being of postpartum women in current situation by exploring their trust levels. We found that a higher social trust was associated with better mental health in general. However, this association was only observed in the areas with lower COVID-19 reported cases. Regarding the fear of COVID-19, a higher social trust was associated with less fear of COVID-19, irrespective of the rate of reported cases. Political trust was not associated with depressive symptoms or fear of COVID-19, and infection rates did not affect these results. This study contributes to discuss better policy for postpartum women's mental health particularly for those who live in areas with higher COVID-19 reported cases because a higher social trust did not significantly decrease the probability of having

depressive symptoms in these areas. This suggests that even those who normally have access to social resources may experience a deterioration of mental wellness when social interaction is cut off exogenously. Thus, the results of this study highlight that even postpartum women who were capable of gaining social resources in ordinal times need to be taken care of during the COVID-19 pandemic.

Despite its contribution, this study had several limitations. First, causation is not clear due to the cross-sectional nature of the study, and trust may have been affected by the COVID-19 pandemic. Second, the low response rate of the survey makes it difficult to generalise our results. As mentioned in the text, our results have a lower representation of the population with lower education levels with no full-time work. Third, we could not conduct sensitivity analysis due to the fact that we had limited data. Considering the complexity and multidimensionality of trust, multiple sensitivity analyses using different exposure variables would have increased the robustness of our study results, and these should be conducted in future research with more nationally representative data.

Authors' statement

Conceptualization; MM.
Data curation; TT.
Formal analysis; MM.

Ethical approval

All procedures were conducted following the ethical standards of the Helsinki Declaration of 1975, as revised in 2013. Ethical approval number 20084 was given on 19 June 2020 by the Research Ethics Committee of the Osaka International Cancer Institute that reviewed the study protocol.

Declaration of competing interest

There is no COI to be declared.

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