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Original Research

Changes in fears and worries related to COVID-19 during the pandemic among current employees in Japan: a 5-month longitudinal study



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ABSTRACT

Objectives: This study investigates and describes the time course of fears and worries about COVID-19 among current employees during this outbreak.

Study design: This was a longitudinal study.

Methods: This study was a part of the Employee Cohort Study in Japan. The study comprised 4120 individuals from February 2019. A baseline survey in March 2020, a 2-month follow-up survey in May 2020, and a 5-month follow-up survey in August 2020 were conducted. Questions surveyed respondents' global fear and worry and six items related to COVID-19. A mixed model for repeated measures of an analysis of variance was used.

Results: A total of 1421 respondents completed the baseline survey. At 2- and 5-month follow-ups, 1032 and 1181 respondents completed surveys, respectively. Of those, 64 and 33 individuals who were temporarily laid off or on leave were recorded as missing values. Global fear and worry about COVID-19 significantly increased from March to August 2020. Fears of personal or family infection, limiting one's activities and national and local government policies also significantly increased with time. In contrast, fears of lack of knowledge and difficulty of obtaining hygiene products significantly decreased.

Conclusion: To conduct efficient risk communication during a pandemic, knowing the concerns of the populace, providing correct information and a sufficient supply of products, and setting clear guidelines are essential.

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Introduction

The novel coronavirus (COVID-19) has become a global health threat.¹ The first human infections were in Wuhan, China, at the end of 2019, and the virus quickly spread around the world.² This pandemic has exposed people's lives to a new danger due to the virus' rapid spread, high mortality rate, substantial monetary and human impact on health care systems, and calamitous economic impact.³

One feature of contagious diseases is the fear of infection. As people learned about COVID-19 and its high infection and mortality rates, it was natural to be fearful.⁴ Fear intensifies the damage from COVID-19 and makes people think less rationally about the disease.⁵ To date, fears of coming into contact with individuals who may be infected⁶ and the fear of facing an unknown disease⁷ have been reported. A literature review suggested six fears associated with COVID-19: the unknown, social isolation, hypochondriasis, disgust, information-driven fear, and compliance.⁴ Excessive perceptions of fear are associated with depression, anxiety, and vulnerability to the disease.⁵ It also can change daily behaviors (i.e. panic buying). Moreover, it has substantial unfavorable impacts on access to other medical services during a pandemic because people who have fears tend to avoid visiting doctors.⁸

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Meanwhile, fear does not have only a negative impact. One earlier study reported that the perceived fear of COVID-19 is associated with preventive actions, suggesting that fear can lead to encourage preventive behaviors.⁹ In addition, a survey of people's general perceptions and emotions during pandemics can provide useful information for health risk communication and to achieve changes in behavior.^{10,11} Furthermore, clarifying what people feel about fear enables decision-making on where to direct information about the disease. By looking at time course changes in people's fears, it is possible to tailor and communicate information accordingly. For example, at the beginning of a pandemic, fears of infection and of a shortage of hygiene products are likely to increase, but it may be possible to reduce fear and prevent panic by raising awareness of measures to prevent infection, warning people against hoarding and emphasizing that efforts are being made increase the availability of supplies. Therefore, investigating people's fears is essential in risk communication.

A previous longitudinal study in Europe conducted a daily survey for 22 days in March 2020 and concluded that the perceived global fear of COVID-19 significantly increased over time.¹² In September 2020, the Ministry of Health, Labour and Welfare in Japan retrospectively examined the 8-month time course of fears and worries related to COVID-19. The survey results showed the rate of perceptions in terms of global fear about the COVID-19 pandemic was highest from April to May, then decreased through September. The fear of becoming infected or having someone in the family become infected has remained the greatest fear, but the fear of a lack of necessities has decreased.¹³ However, to the best of our knowledge, there has been no prospective investigation of time course changes in global and specific types of fears of COVID-19 over periods of more than 1 month. The primary efforts against COVID-19 have focused on clinical treatments, such as infection control and development of or delivery of a vaccine.¹⁴ In contrast, the psychological aspects or trends in fear have yet to be widely considered, although the pandemic has a severe effect on the rates of depression and suicide.^{15,16} Depending on the status of the infection, messages and policies from governments or society about a 'new normal' lifestyle may shift as general fear related to COVID-19 changes over the course of the pandemic. Investigating time course changes in global fear and each type of fear pertaining to COVID-19 would allow public health leaders to conduct risk communication and determine the appropriate interventions for people dealing with groundless fears.

This study explores and describes the time course changes in fears about COVID-19 among people currently employed from the outbreak to date. We used a global and specific fears and worries related to COVID-19 questions, such as fears of infection, lack of knowledge, and about government policies.

Methods

Study design and settings

This prospective cohort study was a part of the Employee Cohort Study of the COVID-19 pandemic in Japan (E-COCO-J),^{17,18} which comprises 4120 people preregistered with an Internet survey company since February 2019. A self-reported online questionnaire was sent to 4120 members invited from more than 500,000 preregistered members of an Internet survey company in Japan. We invited a larger sample of employees from respondents of the survey conducted in February 2019. However, the baseline survey of this current COVID-19 cohort study was conducted in March 2020, with a 2-month follow-up survey in May 2020 and a 5-month follow-up survey in August 2020. The research ethics committee of the Graduate School of Medicine and Faculty of Medicine, The University of Tokyo, Japan,

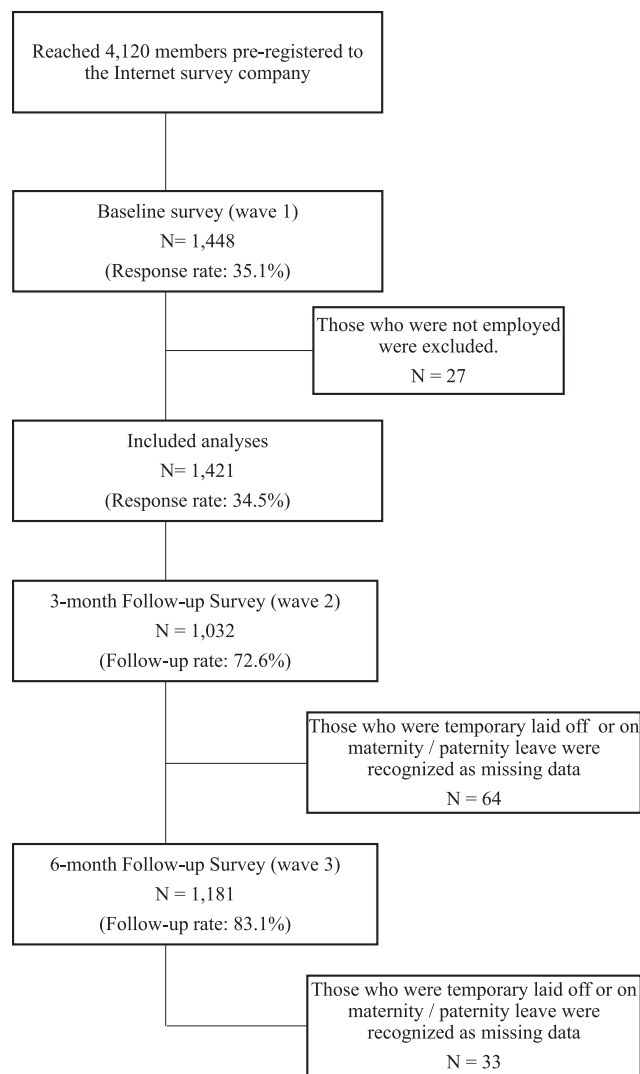


Fig. 1. Participant flowchart of this study.

approved the study protocol (No. 10856-(2) (3) (4)). We obtained informed consent from all participants via questionnaire instructions on the website. The instructions ensured the protection of personal information (e.g. name, phone number, or address) and explained that data would be anonymized. Any identifying information was removed on receipt of the data from the Internet survey company. Our study followed the Strengthening the Reporting of Observational studies in Epidemiology guidelines.¹⁹

Participants

Participants' recruitment was stratified by gender (males and females) and age (20–29, 30–39, 40–49, and 50–59 years). Participant inclusion criteria were as follows: (1) living in Japan, (2) full-time worker, and (3) aged 20–59 years. Participants of the survey in 2019 were again invited to the baseline survey (March 2020). Those who met the inclusion criteria completed the survey on a first-come, first-served basis. Those currently employed at the baseline were invited to the 3-month (May 2020) and the 5-month (August 2020) follow-up survey. The Internet survey company sent an invitation, and the participants accessed a website and completed the online questionnaire. Participants were awarded a token sum as a reward for answering each survey.

Table 1
Baseline demographic characteristics of the participants (N = 1421).

Characteristic	n (%)	Mean (SD) [min–max]
Gender		
Male	716 (50.4)	
Female	705 (49.6)	
Age (years)		41.2 (10.5) [21–60]
20–29	269 (18.9)	
30–39	386 (27.2)	
40–49	369 (26.0)	
50–59	372 (26.2)	
≥60	25 (1.8)	
Marital status		
Single	695 (48.9)	
Married	726 (51.1)	
Child (ren)		
None	825 (58.1)	
One or more	596 (41.9)	
Occupational type		
Managers	126 (8.9)	
Non-manual	892 (62.8)	
Manual	403 (28.4)	

SD, standard deviation.

Variables and outcomes

Fear and worry about COVID-19

Global fear and worry over COVID-19 were measured by asking, ‘Do you feel anxiety due to COVID-19?’ Responses were scored along a 6-point Likert scale (ranging from 1 ‘not at all’ to 6 ‘feel strongly’). In addition, six statements related to COVID-19 were evaluated: I am worried that I might be infected; I am worried that my family might be infected; I am worried about the difficulty in obtaining medical supplies (e.g., surgical masks) and hygiene products (e.g., hand sanitizer); I am worried about the lack of correct information and knowledge; I am worried about how much to limit my own activities; and I am worried about the policies and responses of the national and local governments. Each item was rated on a 4-point Likert scale (ranging from 1 ‘strongly disagree’ to 4 ‘strongly agree’). Higher scores indicated greater fear and worry.

Demographic variables

Demographic variables included gender, age, marital status (currently married/single), number of children (none/one or more), and occupational types (managers/non-manual/manual). All variables were measured at the baseline except for occupational types (taken in the survey in 2019).

Analysis

A mixed model for repeated measures of an analysis of variance (ANOVA) was conducted to investigate the comparison of mean

Table 2
Means of fear and worry about COVID-19 variables at baseline, 2-month follow-up, and 5-month follow-up.

Fear and worry about COVID-19 infection (possible range)	Time 1 (N = 1421)	Time 2 (N = 968)	Time 3 (N = 1148)
	Mean (SD)	Mean (SD)	Mean (SD)
Global fear and worry about COVID-19 (1–6) ‘Do you feel anxiety due to COVID-19?’	4.31 (1.21)	4.54 (1.19)	4.65 (1.21)
Specific fears and worries about infection (1–4)			
‘I am worried that I might be infected.’	2.77 (0.80)	2.99 (0.77)	3.10 (0.78)
‘I am worried that my family might be infected.’	2.88 (0.82)	3.05 (0.78)	3.09 (0.81)
‘I am worried about the difficulty in obtaining medical supplies and hygiene products.’	3.18 (0.81)	2.87 (0.79)	2.80 (0.81)
‘I am worried about the lack of correct information and knowledge.’	3.01 (0.80)	2.86 (0.79)	2.98 (0.77)
‘I am worried about how much to limit my own behavior.’	2.81 (0.80)	2.82 (0.78)	2.92 (0.78)
‘I am worried about the policies and responses of the national and local governments.’	3.02 (0.83)	3.05 (0.81)	3.16 (0.84)

SD, standard deviation.

scores of each fear and worry item between baseline and 2-month or 5-month follow-up.²⁰ A mixed model with one within-subjects factor (point of measurement) was used; thus, there were no covariates adjusted in this analysis. The data from those who answered that they were temporarily laid off or on maternity/paternity leave at a 2-month or 5-month follow-up survey were recognized as missing values. Missing values were imputed applying the maximum likelihood estimation using the mixed method. Bonferroni’s multiple comparison test was also used to adjust the level of significance. Statistical significance was defined as a two-sided $P < 0.05$. SPSS 26.0. Japanese version (IBM Corp., Armonk, NY, USA) was used. We also conducted a similar mixed model for repeated measures of an ANOVA by excluding participants who were temporarily laid off or in maternity/paternity leave at a 2-month or 5-month follow-up survey for sensitivity analyses.

Results

Baseline participant characteristics

Fig. 1 shows the participant flowchart. Of the 4120 members invited, 1448 completed the baseline questionnaire (response rate = 35.1%). We used an Internet survey company and did not directly contact the members; thus, the reasons for no response (N = 2672) were unknown to us. Of 1448 completed surveys, 27 were excluded because of unemployment, so the final baseline sample consisted of 1421 participants. At the 2-month follow-up survey in May 2020, 1032 answered the questionnaire, yielding a follow-up rate of 72.6%. At the 5-month follow-up survey in August 2020, 1181 answered the questionnaire, yielding a follow-up rate of 83.1% (from baseline). Of those, 64 and 33 were recognized as data missing because they were temporarily laid off or on maternity/paternity leave at the time of the 2-month follow-up and 5-month follow-up, respectively.

Table 1 presents participant demographic characteristics. Among them, 716 were men (50.4%), and the average age was 41.2 years (standard deviation [SD]: 10.5). Almost half were single (48.9%), and approximately 40% had one or more children. In terms of occupational type, more than half were non-manual (62.8%), 28.4% were manual, and 8.9% were managers.

Means (SDs) of outcome variables at baseline, 2-month follow-up, and 5-month follow-up

Table 2 shows descriptive mean scores and SD of fears and worries about COVID-19 at baseline (Time 1: T1), 2-month follow-up (Time 2: T2), and 5-month follow-up (Time 3: T3) of participants who were full-time workers at each survey point. The mean score of global fear and worry about COVID-19 increase through T1 to T3 (4.31, 4.54, and 4.65, respectively). Regarding specific fear and worry

Table 3 Estimated means for fears and worries about COVID-19 variables at baseline, 2-month follow-up, and 5-month follow-up (N = 1421).

Fear and worry about COVID-19 infection (possible range)	Estimated means (SE)			Comparison between surveys ^a F for main effect of time	Estimated coefficient (SE) ^b			
	T1	T2	T3		T2-T1	P	T3-T1	P
	Global fear and worry about COVID-19 (1–6) 'Do you feel anxiety due to COVID-19?' Specific fears and worries about infection (1–4) 'I am worried that I might be infected.' 'I am worried that my family might be infected.' 'I am worried about the difficulty in obtaining medical supplies and hygiene products.' 'I am worried about the lack of correct information and knowledge.' 'I am worried about how much to limit my own behavior.' 'I am worried about the policies and responses of the national and local governments.'	4.31 (0.03) 2.77 (0.02) 2.89 (0.02) 3.18 (0.02) 3.01 (0.02) 2.81 (0.02) 3.02 (0.02)	4.52 (0.03) 2.99 (0.02) 3.05 (0.02) 2.88 (0.02) 2.87 (0.02) 2.82 (0.02) 3.05 (0.03)		4.64 (0.03) 3.09 (0.02) 3.10 (0.02) 2.81 (0.02) 2.99 (0.02) 2.92 (0.02) 3.17 (0.02)	F(2, 1303.06) = 53.06 F(2, 1310.86) = 111.01 F(2, 1346.19) = 49.49 F(2, 1431.83) = 121.05 F(2, 1458.02) = 16.52 F(2, 1424.45) = 13.89 F(2, 1371.51) = 18.03	0.21 (0.03) 0.22 (0.02) 0.16 (0.02) −0.30 (0.03) −0.14 (0.03) 0.01 (0.03) 0.03 (0.03)	<0.01 <0.01 <0.01 <0.01 0.03 1.00 0.75

SE, standard error; T1, Time 1; T2, Time 2; T3, Time 3.

Bold font indicates statistical significance.

^a A mixed model for repeated measures analysis for variance model analyses was conducted.

^b Compared Time 1 and Time 2 (T2-T1), and Time 1 and Time 3 (T3-T1).

about COVID-19, the mean score of 'I am worried about the difficulty in obtaining medical supplies and hygiene products' decreased from T1 to T3 (3.18, 2.87, and 2.80, respectively). The mean score of 'I am worried about the lack of correct information and knowledge' decreased from T1 to T2 but increased from T2 to T3 (3.01, 2.86, and 2.98, respectively). The mean scores of 'I am worried that I might be infected' (2.77, 2.99, and 3.10, respectively), 'I am worried that my family might be infected' (2.88, 3.05, and 3.09, respectively), and 'I am worried about how much to limit my own activities' (2.81, 2.82, and 2.92, respectively) increased through the measurement times. Also, the mean score of 'I am worried about the policies and responses of the national and local governments' (3.02, 3.05, and 3.16, respectively) increased through T1 to T3.

Time course changes of fears and worries about COVID-19

Table 3 presents the estimated effects of time on each fear and worry variable based on the mixed model analyses. The score of global fear and worry about COVID-19 significantly increased at T2 and T3 compared with the baseline (P < 0.01). For specific fears and worries about COVID-19, the score of 'I am worried about the difficulty in obtaining medical supplies and hygiene products' significantly decreased at T2 and T3 compared with the baseline (P < 0.01). Although the score of 'I am worried about the lack of correct information and knowledge' significantly decreased at T2 compared with the baseline (P = 0.03), the change did not stay significant at T3. The score of 'I am worried about the policies and responses of the national and local governments' showed a significant increase at T3 compared with the baseline (P < 0.01), with no significant difference at T2. The scores of 'I am worried that I might be infected' and 'I am worried that my family might be infected' were significantly increased at T2 and T3 compared with T1 (P < 0.01). The score of 'I am worried about how much to limit my own activities' showed a significant increase at T3 (P < 0.01), but not at T2 compared with the baseline. The total of 1346 participants were extracted from all included from the main analyses. The results from the sensitivity analyses are shown in Supplementary Table 1. The transitions of the scores from each item were very similar to the main results.

Discussion

This study explored the time course changes in fears and worries about COVID-19 among people currently employed in Japan. We found that global fear and worries about COVID-19 significantly increased from March to August 2020. The strength of this study is that it surveys in the middle of the COVID-19 pandemic. The participants' data were corrected at three time points, enabling analysis of the fear variables and time trends. In terms of specific fears and worries, fear of the possibility of individual or family infection, limiting one's activities, and national and local government policies also significantly increased as time passed. In contrast, fear of lack of knowledge and difficulty in obtaining hygiene products significantly decreased. This study suggests that the estimated mean of global and specific fears and worries (possibility of infection, one's own limited behaviors, and toward policies and governments) have scored higher regardless of the time course, the transition of infected patients, or lifestyle changes. Moreover, the study findings suggest that although the situation around a lack of hygiene products or correct knowledge about the infection has improved, global fear and other specific fears and worries have stayed high in the middle of the pandemic.

A previous 1-month longitudinal study reported a significant increase in global fear of COVID-19,¹² and the current result also

showed a significant increase from March to August. In comparison, the Japanese national retrospective survey¹³ conducted in September 2020 reported the highest global and specific fears (personal or family infection) from April to May, followed by a gradual decline until September. The difference may be because of the way the data were collected. Japan was under a state of emergency from April to May, so the result might be recall biased.

The increase in the fear of infecting themselves or their family may have been caused by the increasing number of cases of COVID-19 infection. In August 2020, the number of infected cases in Japan remarkably increased because of a second wave.²¹ There have also been reports of stigmatization and discrimination against people infected with COVID-19.²² In addition, a previous study conducted during the H1N1 pandemic mentioned that decreasing trends in perceived severity and anxiety were led by information that influenza's clinical picture turned out to be mild.²³ However, COVID-19 had not been reported as clinically mild or as treatable. In contrast, as of this writing, the number of deaths is increasing around the world. As such, global fear or the fear of infection by COVID-19 may have remained high.

The decreased fear and worry of lack of knowledge and of hygiene products may be explained by people becoming accustomed to the 'new normal' lifestyle and constant influx of information from experts. A previous study mentioned that with the inclining phase of the severe acute respiratory syndrome (SARS) outbreak in 2003, the prevalence of masking and the adoption of better hand hygiene increased dramatically when the number of people with SARS increased.²⁴ Moreover, it has been reported that perceived anxiety during a pandemic is positively associated with carrying out recommended prevention measures.^{24–26} Therefore, it might be considered that the increased fear and worry of infection might promote preventive actions, which is a 'new normal' lifestyle. From the beginning of this pandemic, the Japanese government has been warning to avoid the three Cs: closed spaces, crowded places, and close contact.²⁷ This constant advisory from experts may help provide people with correct information. In the course of prevention actions and repeated receiving of information from the government, people might have accumulated enough knowledge about COVID-19. At the start of the pandemic, it was difficult to obtain hygiene products worldwide, but the situation has improved, so it is easier to comply with prevention measures.

Based on our results, although almost 6 months had passed since the first COVID-19 case was diagnosed in Japan, fear and worry about this disease remained high among workers. In particular, the fear of national and local government policies scored the highest. The significant increase in worry about limiting one's activities and national and local government policies at T3 compared with T1 may be explained by the Japanese government's attitude. In August 2020, when the wave three surveys were conducted, Japan was experiencing a second wave of the pandemic. People must have believed that the government could not control the pandemic, which may have caused the apprehension toward the national or local government. This fear, which we scaled in this study, may also be linked to people getting frustrated with public health measures over time and struggling to comply. The resulting frustration may also increase anxiety about the governments.

In addition, from the end of July, the Japanese government started promoting domestic travels (this campaign was canceled in December 2020 considering the pandemic situation). This campaign was initiated, except in Tokyo, where many COVID-19 cases had been reported. Although some prefectures had an increasing number of infected people, this campaign was launched without clear guidelines for limiting activities or preventive measures, such as ramping up testing capacity or implementing locally managed, non-pharmaceutical interventions.²⁸ Trust in the

government is an important component in controlling a pandemic,²⁹ thus the government should implement more measures to reassure the public.

Limitations

This study has the following limitations. First, the participants were not from a random sample of workers but were registered as monitors for an Internet-based survey company. Therefore, we cannot generalize our findings to all Japanese workers. Second, the baseline survey response rate was relatively low (35.1%); thus, this might cause selection bias. Third, all the measurements were self-reported and may have caused information bias and measurement errors. Fourth, the questionnaire's reliability and validity were not tested, and thus, perceptions were not stable over time. Fifth, we did not ask the participants about what specific fears and worries they had in terms of national and local government policies and responses, so this question lacked specificity. In addition, this question related to national and local government policies and responses may measure not only fear and worry but also complaints toward the governments. Sixth, this study focused on the working population. The results may be different from those among the essential and emergency workers. Finally, a statistical analysis of the associations between the measures taken by governments or local prevalence rate and the fears and worries related to COVID-19 could not be done because of the limited number of time points of the surveys. Future studies should investigate the effects of the measures and the severity of the epidemic on the concerns associated with COVID-19.

Conclusion

Global fear and worries about COVID-19 significantly increased from March to August 2020. The fear of the possibility of individual and family infection, limiting one's activities, and national and local government policies significantly increased. In comparison, fear of lack of knowledge and fear of difficulty in obtaining hygiene products significantly decreased. To conduct efficient risk communication during a pandemic, it is essential to know what people are concerned about, provide accurate information and sufficient quantities of products, and set clear guidelines. The government should assume a leadership role in working on public health measures and policies to control infection at an early stage and convey a consistent message on infection control.

Author statements

Ethical approval

The research ethics committee of the Graduate School of Medicine and Faculty of Medicine, The University of Tokyo, Japan approved the study protocol (No. 10856-(2)(3)(4)).

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Competing interests

N.K. is currently receiving grants from Fujitsu LTD., Fujitsu Software Technologies LTD, SB At Work Corp., personal fees from Occupational Health Foundation, Japan Dental Association, Sekisui Chemicals, Junpukai Health Care Center, Osaka Chamber of

Commerce and Industry, and non-financial support from Japan Productivity Center as relevant financial activities outside the submitted work. For the remaining authors none were declared.

Consent to participate

The authors have obtained informed consent via the Internet survey from all the participants.

Consent for publication

This article is not currently being considered by another publication, is not in press in any other format, and has not been published previously. The authors will comply with all the copyright and proprietary regulations as stipulated by Public Health.

Data availability

These data are not open available.

Authors' contributions

Y.H., N.S., K.I., K.T., R.K., and N.K. have made substantial contributions to conception, design of the work, and the acquisition, analysis, and interpretation of the data. The authors have drafted and revised the work and approved the version to be published. The authors also agree to be accountable for all aspects of the work.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.puhe.2021.06.017>.

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