Survey of attitudes of individuals who underwent remote prenatal check-ups and consultations in response to the COVID-19 pandemic

Kinuko Nakagawa¹, Takeshi Umazume¹, Michinori Mayama¹, Kentaro Chiba¹, Yoshihiro Saito¹, Kiwamu Noshiro¹, Mamoru Morikawa¹, Masanori Yoshino² and Hidemichi Watari¹

¹Department of Obstetrics and Gynecology, Hokkaido University Graduate School of Medicine, Sapporo, Japan
²Center for Intellectual Property and Innovation, Hokkaido University, Sapporo, Japan

Abstract

Aim: Perinatal telemedicine efforts have commenced worldwide in response to the COVID-19 pandemic. As there have been no prior studies on the acceptance of telemedicine by pregnant women, we conducted this survey to investigate the same.

Methods: We conducted an anonymous questionnaire survey of pregnant women who underwent telemedicine check-ups from March 4 to June 30, 2020, using a mobile fetal heart rate monitor and video call system through the Hokkaido University Hospital.

Results: Out of the 77 individuals who received prenatal telemedicine check-ups, 54 individuals (70%) had complications, and 64 individuals (83%) consented for the questionnaire survey. In the video call system, 18 individuals (28%) were found to be unwell and 17 individuals (27%) experienced difficulty using the mobile fetal heart rate monitoring device. Assuming scores for face-to-face consultations were five out of 10, the mean score for satisfaction was 4.2, but 19 (30%) women felt equal or greater satisfaction with face-to-face consultations. If not for the threat of COVID-19, only four individuals (6%) proactively expressed a desire for telemedicine, with a significantly less demand observed among primiparous women than multiparous women. The permissible additional financial burden enabling telemedicine was $10 or less for 80% of subjects.

Conclusion: In this small preliminary study, 30% of the pregnant women felt equal or greater satisfaction with telemedicine than face-to-face consultations. A stronger demand for telemedicine was exhibited by multiparous women than primiparous women. Thus, a system that would be advantages by limiting subjects and enabling low-cost examinations is required for making perinatal telemedicine more popular.

Key words: cardiotocography, COVID-19, pregnancy, telemedicine.

Introduction

With the COVID-19 pandemic, the first declaration of a State of Emergency in Japan was made on February 28, 2020 in Hokkaido. In order to prevent pregnant women from contracting COVID-19, avoiding unnecessary outings and minimizing their risk of exposure became necessary.¹ Thus, the COVID-19 pandemic triggered many efforts to implement perinatal telemedicine.²–⁵ While telemedicine can be expected to reduce the risk of infection of the medical institution,² a similar level of peace of mind obtained through face-to-face consultations cannot be expected.³ In Japan, each woman undergoes approximately 14 prenatal check-
ups per pregnancy, and it is recommended that ultrasound examination be performed during five or more check-ups according to the Japanese guidelines. However, many institutions perform ultrasound examination during every check-up as a routine practice, and Japanese pregnant women tend to consider ultrasound examination to be necessary at each prenatal check-up.

In the wake of the COVID-19 pandemic, medical professionals thought that perinatal telemedicine would be beneficial for medical professionals as well as pregnant women, and thus proceeded to put a system in place. We previously reported on the safety of telemedicine using a mobile fetal heart rate monitoring device (cardiotocography [CTG]). However, at our hospital, we found that some pregnant women became reluctant toward telemedicine check-ups once the society started to become habituated to the COVID-19 pandemic. Moreover, in face-to-face consultations, pregnant women are able to observe the fetus on ultrasound examination. If pregnant women experience any discomfort in the lower abdomen, the underlying cause is easier to understand based on the results of the examination results, thereby allaying any anxiety. With telemedicine, however, the doctor must treat the patient based on a medical interview and remote CTG findings. While these remote prenatal check-ups and consultations are provided with the best intentions of medical professionals involved, there are no reports of how pregnant women feel about such a method of care.

As the COVID-19 pandemic continues to cause havoc, there is a need to set a system in place to enable the provision of perinatal telemedicine; however, it should not be continued based on the medical professionals’ discretion alone. On the contrary, a system should be created that would take into account the feelings of pregnant women. We were wondering how pregnant women feel about remote prenatal check-ups and consultations. As we conducted perinatal telemedicine on a large scale for the first time in Japan, we executed a questionnaire survey of how pregnant women feel toward telemedicine, and planned research that would serve as a reference for future policies for the provision of telemedicine.

Methods

The study was conducted with the approval of the Institutional Review Board of Hokkaido University Hospital for remote prenatal check-ups and consultations. (No. 79 and No. 020-0007).

Remote prenatal check-up and consultation methods

Among pregnant women who wished to undergo remote prenatal check-ups and consultation methods, we excluded those with twins, fetal growth restriction, mental illness, and fetal illness requiring frequent observation. Face-to-face consultations were conducted in all subjects at 24 and 36 weeks of pregnancy, while all other consultations were conducted by telemedicine combined with face-to-face consultations in accordance with the wishes of each pregnant woman concerned. A mobile fetal heart rate monitoring device that can be used at one’s home (iCTG: Melody International, Ltd.), and blood pressure (BP) monitor for use in telemedicine was mailed; this service was commissioned to the Hokkaido University Center of Innovation. Pregnant women who wished to undergo telemedicine provided written consent to the outpatient services. For pregnant women with symptoms of infection or anxiety about consulting the hospital due to the risk of exposure, the consent was obtained by telephone or video call. On the days of remote check-up, the women measured their BP, weight, and recorded the CTG in the morning. Doctors called the pregnant women and instructed them to contact using a video call system (Kizunaweb: Borderless vision Co. Ltd.) at the time of their appointment. The doctors made a video call using a laptop computer, and conducted the consultation to check the results of the CTG recorded on the tablet terminal, and if necessary, they sent medication by post that was prescribed by the hospital. After completion of the consultation, the pregnant women posted the CTG device back without delay at their own expense.

Questionnaire survey after completion of prenatal check-ups and consultations

After the completion of the remote prenatal check-ups and consultations, the pregnant women received an anonymous document and questionnaire survey via mail. The details of the questionnaire are as follows:

1. Was the video call system convenient?
2. The time required from the subject’s home to hospital.
3. Assuming that your satisfaction in terms of peace of mind in normal face-to-face consultations was
5, on a scale of 1–10, how was your peace of mind during telemedicine consultations?

4. Assuming that the effort required for normal hospital visitations was five, on a scale of 1–10, how much effort was required for online consultations?

5. Assuming that the level of satisfaction with normal face-to-face consultations was five, on a scale of 1–10, what was your overall level of satisfaction with online consultations?

6. If COVID-19 spreads again, would you request online consultations?

7. In a society without COVID-19, would you request online consultations?

8. Was it difficult to use the mobile CTG (iCTG)?

9. Was the cost of sending the device (approximately 26 dollars), which was covered by you, expensive?

10. How much additional money do you think is acceptable to pay for online consultations?

11. Employment status, educational history, and household yearly income.

12. What was your impression of online consultations?

Statistical analyses were performed using JMP Pro V.14 (SAS), with a chi-square test, and t-test for intergroup comparison.

Results

From March 4 to June 30, 2020, 77 pregnant Japanese women living in Hokkaido underwent 167 remote prenatal check-ups and consultations.

Characteristics of the 77 individuals who received telemedicine

The subject sample included 37 primiparous women (48%) with a mean age of 33 ± 5 years. Hokkaido University Hospital proactively accepts pregnant women with complications; therefore, the incidence of complications was high, such that there were 13 pregnant women (16.9%) with concurrent autoimmune disease and normal pregnant women accounted for only 30%. Remote prenatal consultations were primarily conducted after 26 weeks of pregnancy and were conducted after 26 weeks of pregnancy in 85% of subjects overall. The number of remote consultations was most commonly once per person, with two to four consultations in 49%, and a maximum of six consultations (Table 1).

| Table 1 Characteristics of the 77 individuals who received telemedicine |
|---------------------------------|-----------------|
| No. of women | 77 |
| Nulliparous women | 37 (48%) |
| Age (year) | 33 ± 5 (range, 19–43) |
| Body mass index (kg/m²) | 21.7 ± 4.3 (range, 16.0–42.5) |
| The underlying diseases of pregnant women |
| Autoimmune diseases | 13 (16.9%) |
| Thyroid diseases | 9 (11.7%) |
| Diabetes | 8 (10.4%) |
| Psychiatric diseases | 8 (10.4%) |
| Threatened premature labor |
| Hypertension | 6 (7.8%) |
| Hematological diseases | 5 (6.5%) |
| Cervical incompetence | 5 (6.5%) |
| Infectious diseases | 3 (3.9%) |
| Cardiovascular diseases | 2 (2.6%) |
| Fetal abnormalities | 2 (2.6%) |
| Kidney diseases | 1 (1.3%) |
| Placental location abnormality |
| Healthy Pregnant | 23 (29.9%) |
| Timing and frequency of telemedicine |
| Timing |
| ≤25 weeks | 25 (15.0%) |
| 26–35 weeks | 104 (62.3%) |
| 36 weeks ≤ | 38 (22.7%) |
| Frequency |
| 1 time/woman | 35 (45.5%) |
| 2 times/woman | 15 (19.5%) |
| 3 times/woman | 11 (14.3%) |
| 4 times/woman | 12 (15.6%) |
| 5 times/woman | 3 (3.9%) |
| 6 times/woman | 1 (1.3%) |

*Six patients used immunosuppressant. and †Including six gestational diabetes patients.

Information of the 64 individuals who cooperated in the questionnaire survey

Among the 77 individuals who participated in the study, 64 individuals (83%) cooperated with the questionnaire survey. Regarding education history, university, and technical school graduates accounted for 29 individuals (45%). The household yearly income was 10 001–40 000 dollars for 35 individuals (55%) (Table 2).

Time to hospital, convenience of the video call system, and impression of iCTG usage

The time required to visit hospital was less than 60 min in approximately 90% of the subjects; however, two pregnant women required 121 min or more.
We found that the video call system was inconvenient for 18 individuals (28%). There were 17 individuals (27%) who experienced difficulty using the mobile CTG device (Figure 1).

**Mindsets of pregnant women regarding remote prenatal check-ups**

Assuming scores for face-to-face consultations were five out of ten, the mean score for peace of mind in remote prenatal check-ups was 3.7, and the score for the effort required was 2.7. While the effort required for consultations was less in telemedicine, as expected, peace of mind was also lower. The overall level of satisfaction was lower than that of face-to-face consultations at 4.2. Nineteen (30%) women felt equal or greater satisfaction with face-to-face consultations. If the coronavirus were to spread again, 26 pregnant women (41%) positively hoped for remote prenatal check-ups, while 31 pregnant women (48%) expressed the desire for remote consultations if they were occasional; however, if in society without COVID-19, only 4 individuals (6%) expressed a positive desire, and 32 individuals (50%) expressed no desire. In the question item requesting subjects to write free descriptions of their impressions of remote prenatal check-ups, of the 48 items with descriptions, in 22 items (46%) the subjects noted that honestly, they would prefer to undergo an actual ultrasound examination (Figures 2, and 3).

### Table 2 Information of the 64 individuals who cooperated in the questionnaire survey

| No. of women | 64 |
|--------------|----|
| Nulliparous | 29 (51%)a |
| Age (year)a | 34 ± 5 (range, 19–43)a |
| Education | |
| Primary school or less | 9 (14%) |
| High school | 24 (38%) |
| University and technical school | 29 (45%) |
| Graduate | 1 (2%) |
| N/A | 1 (2%) |
| Annual household income | |
| ≤$10 000 | 9 (14%) |
| 10 001–40 000 | 35 (55%) |
| 40 001–100 000 | 6 (9%) |
| 100 001– | 13 (20%) |
| N/A | 1 (2%) |
| Occupation | |
| Does not work | 25 (39%) |
| Full-time worker | 8 (12%) |
| Part-time worker | 5 (8%) |
| N/A | 26 (41%) |

aData on seven women were missing; NA, not available.
Additional costs permissible by pregnant women for prenatal check-ups
The cost incurred to send the required equipment for each consultation was approximately 26 dollars. This cost was covered by the pregnant women themselves, and 34 individuals (53%) felt this to be expensive. An acceptable additional cost for remote prenatal check-ups was zero dollars for 23 individuals (36%) and one to 10 dollars for 28 individuals (44%) (Figure 4).

The difference in the mindset of primiparous and multiparous women regarding remote prenatal check-ups
Among 57 pregnant women from whom information was obtained with regard to delivery history, 29 individuals (51%) were primiparous. While there was no difference regarding peace of mind, effort, and level of satisfaction in remote prenatal check-ups according to delivery history, the proportion of women who wished to receive remote prenatal check-ups if there was no threat of COVID-19 was significantly higher in multiparous women than in primiparous women ($p < 0.01$) (Table 3).

Discussion
We found the following three points with regard to the mindset of Japanese women residing in Hokkaido regarding remote prenatal check-ups: (1) Thirty percent of the pregnant women felt equal or greater satisfaction with telemedicine when compared with face-to-face consultations, (2) pregnant women could not accept the increased cost of telemedicine compared to normal consultations (an additional cost of up to 10 dollars was considered acceptable), and (3) if there was no threat of COVID-19, there was less demand for remote prenatal check-ups, and the demand from primiparous women was lower than that of multiparous women.

First, we found that in remote prenatal check-ups when compared to face-to-face consultations, 30% of the pregnant women felt equal or greater satisfaction with telemedicine when compared with face-to-face consultations, (2) pregnant women could not accept the increased cost of telemedicine compared to normal consultations (an additional cost of up to 10 dollars was considered acceptable), and (3) if there was no threat of COVID-19, there was less demand for remote prenatal check-ups, and the demand from primiparous women was lower than that of multiparous women.

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located, is a large city with a population of 1.97 million people. While it has convenient transportation facilities, the condition of the roads in winter are poor due to snowfall. Thus, in March, when telemedicine commenced, it was not easy to travel to hospital. In addition, anxiety about COVID-19 led to a degree of satisfaction equal to or higher than that of face-to-face consultation. On the other hand, 70% of women felt that remote prenatal check-ups were less satisfactory than face-to-face consultations. In terms of the conceivable advantages by the medical professionals, that is, enabling individuals to relax at home until the time of the appointment, the results suggested that this did not make up for the peace of mind that could be obtained through face-to-face consultations. In the question asking the pregnant women to freely describe their impressions of remote prenatal check-ups, 46% noted that honestly they would have preferred to undergo ultrasound examination, indicating again a strong demand to undergo actual ultrasound examination, which is performed regularly during each check-up at several institutions. With regard to peace of mind with telemedicine, it has been reported that in the telemedicine system of the UK military in 1998, peace of mind was additionally obtained by 13% of patients. Thus, despite subsequent developments in communications equipment, it appears that it is not easy to obtain the peace of mind in telemedicine similar to that of face-to-face consultations.

Second, pregnant women could not accept telemedicine being more expensive than normal medicine. We found that an additional cost of up to 10 dollars was considered acceptable. The level of satisfaction was lower for telemedicine than face-to-face consultations, which was a predictable result. If telemedicine was able to cut overall costs, then it would be possible that the cost would be covered by public funding. However, only some types of telemedicine systems are thought to lower overall costs. With the present telemedicine system, iCTG devices were distributed

Table 3 The difference in the mindset of primiparous and multiparous women regarding remote prenatal check-ups

|                              | Nullipara  | Multipara  | p-value |
|------------------------------|------------|------------|---------|
| No. of women                 | 29 (51%)   | 28 (49%)   |         |
| Age (year)                   | 32 ± 1     | 36 ± 1     | 0.01    |
| Score of peace of mind       | 3.9 ± 0.4  | 3.6 ± 0.4  | 0.53    |
| Score of effort required      | 2.9 ± 0.4  | 2.5 ± 0.4  | 0.43    |
| Score of satisfaction        | 4.1 ± 0.4  | 4.3 ± 0.4  | 0.72    |
| Desire for telemedicine       | Yes, occasional, no | Yes, occasional, no |         |
| With COVID-19 pandemic       | 8          | 17         | 0.05    |
| With no threat of COVID-19   | 0          | 9          | <0.01   |

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by post. This meant that only two individuals per week could undergo check-ups, resulting in poor cost performance and making this method unsustainable. Considering that the level of satisfaction was lower when with face-to-face consultations despite the COVID-19 pandemic, to increase the generalized popularity of perinatal telemedicine in Japan, a low-cost perinatal telemedicine system needs to be developed.

Third, in society without COVID-19, we found that there was little demand for remote prenatal check-ups, with less demand from primiparous women as compared to that from multiparous. It was inferred that this was attributed to the fact that primiparous women due to their first pregnancy experienced anxiety feelings, making them seek face-to-face care from medical professionals. In contrast, multiparous women who have already experienced pregnancy previously, felt seeing the doctor was a burden because they also had to care for their elder child. Pregnancy check-ups are also an opportunity for pregnant women to reassure themselves that the pregnancy is going well, and the importance of this opportunity, especially in primiparous women, is one of the reasons why remote prenatal check-ups have not been accepted.

This study had several limitations. First, the data obtained was of 64 Japanese women, thus the sample size was small. Second, 70% of the pregnant women had complications. In the future, a survey of the attitude of a larger and more generalized population needs to be implemented to encourage the establishment of a system for providing perinatal telemedicine.

In the present survey, we found that the peace of mind was lower for perinatal telemedicine as compared to face-to-face consultations. If medical care resulting in less peace of mind is to be offered, then, it needs to be offered at a lower cost to be advantageous to patients. Furthermore, we found that as compared to primiparous women, multiparous women exhibited stronger demand for telemedicine. The perinatal telemedicine in society without COVID-19 may find its value in the medical care that does not require medical devices which can overcome the demerit of time and distance without anxiety of the pregnant woman, for example, telemedicine consultation during pregnancy and lactation. It is considered that the real-time ultrasonic consultation of doctor to doctor is also good for telemedicine. Even though, perinatal telemedicine may not provide sufficient security; however, it may provide an opportunity for the pregnant woman herself to start her own management to make up for it, and both the medical institution and the pregnant woman herself may reform their awareness of safe pregnancy. At present, there is no medical device other than CTG that is capable of determining the status of the fetus at home. In future, a new device for fetal monitoring at a low cost needs to be developed if perinatal telemedicine is to be provided at home.

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Conflict of Interest
The authors declare no conflicts of interest.

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