Original Article

Impact of telemedicine on antenatal care at a teaching institution in Eastern India: An insight into the future of better India

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Abstract

Objectives: Telemedicine (TM) emergence has been profound in using technology to address the problems of obstetrics in remote and rural places, especially in low-risk pregnancy. Through this study, we made an effort to assess the satisfaction level and concerns of antenatal and postnatal patients who availed the telemedicine facility during the study period. We also made an effort to facilitate improved access to antenatal and postnatal care, especially the low-risk pregnancies through telemedicine for patients from remote areas of eastern India that do not have the availability of specialists. **Materials and Methods:** Primary data were collected by means of a telephonic survey of all the antenatal patients who used telemedicine services of AIIMS, Kalyani, based on a preformed questionnaire. **Results:** A total of 80 antenatal patients gave consent to participate in the study. Most of the patients were from the upper lower class [43.75%] followed by the lower middle class [35%]. The average gestational age of respondents was 23.95 weeks. Seventy-one out of 80 patients felt that the appointment was made within a reasonable time. Only 12 patients [15.3%] had waiting time greater than 10 min. The average waiting time was 6.93 min. 56.3% of respondents felt that the person who attended their call was very cooperative. 86.3% of respondents strongly agreed that the consultant was able to understand their health issues completely. Eighty percent of the respondents said that they would like to continue using telemedicine in the future. There is a significant difference between those preferring to use telemedicine in the future and those who do not prefer telemedicine in the future. Poor internet facility and privacy were prominent reasons for not opting for telemedicine in the future by some respondents. **Conclusion:** From this study, it was concluded that TM certainly has great potential to make health care accessible to people residing in rural and far-off places.

Keywords: Antenatal, low-risk pregnancy, telemedicine

Introduction

Antenatal and postnatal care is indispensable for the timely identification of danger and management both before and after delivery. Adequate antenatal care is imperative for the delivery of a healthy baby to a healthy mother and to lessen maternal and neonatal morbidity and mortality.[1]

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Despite the use of teleconsultation from the early twentieth century, the application was initially limited for treating psychiatric patients which was later expanded to other medical fields. Telemedicine's emergence has been profound in using technology to address the problems of obstetrics in remote and rural places. It has special importance in low-risk pregnancy that does not require physical consultation every time.[2] A wide range of obstetrical services like a consultation with maternal and fetal medicine doctors, genetic consultation, surveillance of hypertension and diabetes mellitus, etc., are offered by several tertiary care hospitals through telemedicine.[3] In the

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postpartum period also, telemedicine has been used to enable postpartum follow-up visits and access to lactation consultations. Telemedicine becomes even more cardinal when the mother cannot afford physical consultation charges or is from far and remote places. It can potentially improve pregnancy outcomes by improved and affordable access to medical care and information.[4,5]

COVID-19 has triggered the implementation of information and communication technologies for the provision of telemedicine.[6] The pandemic has provided an extraordinary natural condition to explore how virtual obstetric care through telemedicine can be developed, maintained, and implemented.[7] During the lockdown, in fear of getting an infection, women would prefer to use telemedicine.[8] During the pandemic, telemedicine prenatal care has facilitated social distancing and decreased probable exposures for both the patients and the healthcare providers.[7]

Materials and Methods

Telemedicine is a new and emerging branch in India and has been more effective during the coronavirus pandemic. The pandemic has rushed the telemedicine use in remote societies that were to experience these developments utilization in future decades. Through this study, we made an effort to:

1. Assess the satisfaction level and concerns of antenatal patients who availed the telemedicine facility during the study period.
2. Facilitate improved access to antenatal care, especially the low-risk pregnancies through telemedicine for patients from remote areas of eastern India that do not have availability of specialists.

This was a cross-sectional exploratory research in which the study population included were the antenatal patients of Eastern India who availed the telemedicine services of AIIMS, Kalyani.

Primary data were collected by means of a telephonic survey of all the antenatal patients who used telemedicine services of AIIMS, Kalyani, during the study period. As the study period was small and telemedicine is not popular among the rural population, so all the antenatal cases availing the telemedicine facility within this period were included in the study. The study was conducted after receiving IEC approval. The sample collection was done for 45 days starting from August 1st to September15th. After data collection, statistical analysis was done using IBM SPSS 23 version.

Inclusion criteria

All antenatal patients who availed telemedicine services during the study period.

Exclusion criteria

Antenatal patients who did not give consent for participation in the study.

Data were collected by means of a telephonic survey based on a preformed questionnaire. This questionnaire is adopted from the Medical group management association[9] and has been modified according to the needs of our study. A total of 21 questions were included in the questionnaire and this included both close-ended and open-ended questions.

The questionnaire includes a total of 7 parts:

1. Information about the survey and its intent will be discussed with the patient before the questionnaire proper.
2. A verbal consent will be taken
3. Demography of the participant including age, parity, socioeconomic status, residence, and education level.
4. Ease of getting appointment on telemedicine
5. Behavior of the consultant and other staffs
6. Satisfaction about the medical consultation
7. Future use of telemedicine

The detailed questionnaire has been attached.

Informed verbal consent was taken before including the participant in the survey. As there was no face-to-face interaction and the survey was done through telephonic communication, only verbal informed consent was taken from the participant.

Statistical analysis

Profile of the participants and demographic variables like age, gravida, schooling, household income, and gestational age of pregnancy at the time of the survey were recorded. Data for satisfaction with the telemedicine consultation were collected with the use of Microsoft Excel version 2007 and analyzed using the IBM SPSS statistics (version 23). The categorical data were expressed in frequency and percentage, while the continuous data were presented by the measures of central tendency and dispersion. Statistical means of those intending to opt for telemedicine in the future or not were compared through *t* test. Determinants of future use of telemedicine were assessed through binary logistic regression.

Results and Observations

A total of 194 patients availed the telemedicine services of AIIMS, Kalyani, in Obstetrics and Gynecology department from August 1st to September 15th, 2022. Out of 194 patients, 92 patients were antenatal cases. Out of the 92 antenatal patients, 80 patients consented to participate in this study [Figure 1].

Table 1 represents the demographic details of the respondents taking into account their age, socioeconomic status, education, gravida, and gestational age at the time of study.

An average respondent was 27.57 years old, with an average gravida of 1.6. Most of the patients were from the upper lower class [43.75%] followed by the lower middle class [35%]. The average gestational age of respondents was 23.95 weeks. More than 47% of the respondents had attained education up to a higher secondary level.

Table 2 represents the data on the ease of getting appointment in terms of frequency and percentage. On assessing patient satisfaction using our questionnaire, we found that 71 out of 80 patients felt that the appointment was made within a reasonable time. 78.8% of respondents were able to get referrals when required. The smoothness of the check-in process was graded from 1–4 according to the rating given by the individual patient. Forty-one out of 80 patients rated the check-in process 3 out of 4.

Table 3 represents the waiting time of patients. Only 12 patients [15.3%] had waiting time greater than 10 min. The average waiting time was 6.93 min.

Table 4 depicts the satisfaction level of patients based on the behavior of the staff as well as on other aspects of telemedicine consultations. 56.3% of respondents felt that the person who attended their call was very cooperative.

86.3% of respondents strongly agreed that the consultant was able to understand their health issue completely and was not in a hurry to end the call. Eighty percent of the respondents said that they would like to continue using telemedicine the in future, while 8.8% said they would prefer a physical mode of consultation in the future and nearly 11.2% of respondents were not sure about telemedicine use in the future.

Nearly 80% of patients reported telemedicine to be as good as physical consultation.

We divided the participants into two categories. The first category was of the participants who were interested to use telemedicine in the future and the second category was of the participants who were not intending to use telemedicine in the future. Statistical means of those intending to opt for telemedicine in the future or not was compared through *t* test.

Table 5 shows the difference in the various dimensions of telemedicine use experience between the participants who prefer to use telemedicine in the future and those who did not want to use it in the future. There is a significant difference between those preferring to use telemedicine in the future and those not preferring telemedicine in the future for questions like "whether consultation was as good as physical medicine or not"; and "adequate attention was received or not." The rest of the questions had no significant mean difference.

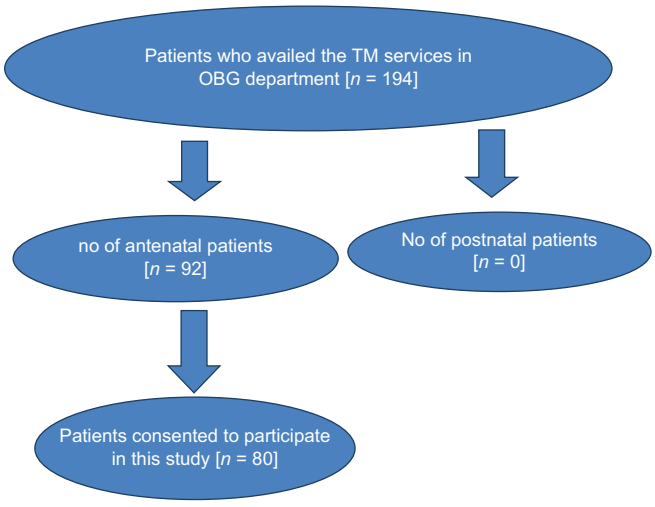

Figure 1: Flowchart depicting the final sample size

Table 1: Demographic detail of the respondents

Parameter	No of respondents [*n*=80]	%
Age [years]		
21–30	59	73.75
31–40	21	26.25
Socioeconomic status		
Lower	3	3.75
Lower middle	28	35
Upper lower	35	43.75
Upper middle	14	17.5
Education		
Higher secondary	38	47.5
Postgraduate	3	3.75
Primary	4	5
Secondary	12	15
Graduate	23	28.75
Gravida		
Primigravida	38	47.5
Multigravida	42	52.5
Gestational age		
5–20 weeks	21	26.25
20–40 weeks	59	73.75

Table 2: Appointment details

	Frequency	Percentage
Was it easy to get the appointment		
No	5	6.3
Yes	75	93.8
Was the appointment made within a reasonable time		
No	9	11.3
Yes	71	88.8
Was appointment available as soon as the patient wanted it		
No	15	18.8
Yes	65	81.3
Smoothness of check-in process		
1	8	10
2	10	12.5
3	41	51.3
4	21	26.3
Was it easy to get referrals when required		
No	17	21.3
Yes	63	78.8
Was the reason of appointment delays informed to the patient		
No	77	96.3
Yes	3	3.8

Figure 2 demonstrates the reasons given by participants for not opting telemedicine in the future. Out of 16 respondents, 10 were unhappy with not being able to download the prescriptions. Poor internet facility and privacy were also prominent reasons for not opting for telemedicine in the future.

Table 6 shows the result of binary logistic regression with variables depicting the intent to use telemedicine in the future (0 = NO, 1 = YES) and three independent variables, namely, ease of getting appointment, behavior of the staff, and patient satisfaction. Each of these variables is the user response for each of the above parameters in the Likert scale from 0 to 10.

A binomial logistic was performed to ascertain the effect of patient rating on parameters like ease of appointment, behavior of the staff, and patient satisfaction on the preference of use of telemedicine in the future. Linearly assumption was tested using model fit and pseudo-R^2 statistics. The logistic regression model was statistically significant with X^2 (3) =58.098, $P < .0005$. The model explained 81.6% (Nagelkerke R^2) of the variance in the preference for the use of telemedicine in the future and correctly classified 80% of cases.

All the three independent variables appear as statistically significant determinants for the participants who want to use telemedicine in the future. Every one-unit increase in the ease of getting appointment, behavior of the staff, and patient satisfaction increases the patient's likelihood of preferring to use telemedicine in the future by 1.98, 2.02, and 2.94 times, respectively.

Discussion

Telemedicine use is feasible and acceptable in antenatal care with a reduction in outpatient visits, thus reducing exposure to possible COVID infection. According to a study done in a tertiary care hospital in North India, a triage over teleconsultation may avoid a hospital visit in 20.4% of pregnant women without any maternal or fetal adverse outcomes.[10]

Table 3: Waiting time for telemedicine consultations

	Time [min]	Frequency	Percentage
Waiting time [min]	2	7	8.8
	3	6	7.5
	4	15	18.8
	5	7	8.8
	6	18	22.5
	7	7	8.8
	8	6	7.5
	9	2	2.5
	11	1	1.3
	14	1	1.3
	16	3	3.8
	17	2	2.5
	18	2	2.5
	19	1	1.3
	21	1	1.3
	22	1	1.3

Telemedicine's importance has been glorified during the corona pandemic, where remote patients with low and inefficient medical access were able to connect with a specialist. According to a review article by Odibo *et al.*, till September 2012 there were 68 publications on the topics related to utilization of telemedicine in obstetrics.[11]

A few studies have reported the use of telemedicine in antenatal diagnosis and counseling services. Telemedicine consultation has reduced OPD services of gestational diabetes with good pregnancy outcomes. Women also preferred the telehealth model of care for consultation regarding gestational hypertension. Text-based monitoring is more effective in managing blood pressure in the immediate post-discharge period in women with pregnancy-related hypertension than conventional hospital visits. A study done by Adi Hirshberg detected a 1.4-fold increase in single recorded blood pressure using telemedicine.[12]

The use of telemedicine in women with diabetes had resulted in reduced need for outpatient clinical visits with similar pregnancy outcomes.[13] Telemedicine has also been demonstrated to offer a timely intervention in women diagnosed with gestational hypertension and is also effective in optimizing blood pressure. The digital health solution provided by telemedicine has been popular with women. They appreciated the additional support and monitoring it provided as well as the perceived time and cost-savings of avoidable hospital appointments. A randomized controlled trial study done by Lucy Mackillop showed the efficacy of mobile phone-based blood glucose management in antenatal cases.[14]

Telehealth interventions were associated with good results in antenatal smoke cessation and breastfeeding. It also decreased the need for high-risk obstetric monitoring office visits without affecting the maternal and fetal outcomes. One study found reductions in diagnosed preeclampsia among women with gestational hypertension.[15]

Telemedicine caters to the antenatal and postnatal care needs of poor, culturally restricted, rural, and remote women. A study was

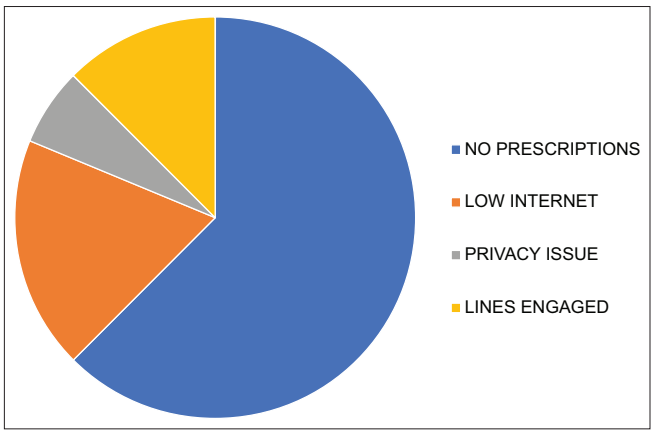

Figure 2: Reasons for not opting telemedicine in future

Table 4: Behavior of the staff and telemedicine consultancy

	Frequency	Percentage
Was the person who attended your call cooperative		
Less cooperative	3	3.8
Satisfactorily cooperative	32	40
Very cooperative	45	56.3
Concern and attitude of the medical assistants		
Concerned	31	38.8
Highly concerned	45	56.3
Not at all concerned	4	5
Helpfulness of the staffs in case of any problem in call		
Helpful	25	31.3
Helpful but arrogant	12	15
Not at all helpful	5	6.3
Very helpful	38	47.5
Was the patient comfortable in talking to the healthcare		
No	3	3.8
Yes	77	96.3
Was the patient able to hear the consultant clearly		
No	11	13.8
Yes	69	86.3
Was the consultant able to understand the patients' health issue	1	1.3
No	10	12.5
Yes	69	86.3
Was the consultation as good as physical consultation		
No	16	20
Yes	64	80
Are the consultations through Telemedicine consistent		
No	65	81.3
Yes	15	18.8
Did you receive adequate attention		
Maybe	3	3.8
No	2	2.5
Yes	75	93.8
Is the patient able to meet the consultant more frequently		
No	66	82.5
Yes	14	17.5
Was the patient able to get the prescription		
No	78	97.5
Yes	2	2.5
Would you prefer telemedicine in the future		
May be	9	11.3
No	7	8.8
Yes	64	80

done in Shifa International Hospital which reports the experience of telemedicine users. Appointment time, staff attitude, and internet quality were highlights of this study. Reports stated that the majority around 57% did not feel satisfied with telemedicine use. They still wanted physical visits. Eight percent lacked internet facilities, and 4% had privacy issues. Some 30% had a mix of reasons like payment difficulties, waiting time, and no emergency facilities.[16]

A study named PEACE study was done to identify factors related to satisfaction with virtual visits during pregnancy. The study relied on data obtained from 416 pregnant women who participated in perinatal experiences and COVID-19 effects from May 21 to November 21. They noted that 27.9% indicated being very or extremely satisfied with their virtual prenatal care experience, with a plurality of responses indicating being "moderately" satisfied. While examining the preference for in-person versus virtual prenatal care, 89.9% of the total women indicated a preference for in-person care, with only 10.1% indicating a preference for virtual care.[17]

A qualitative study was done to understand the perceptions of new mothers using virtual care via video conferencing. Fifteen patients were interviewed for 20–25 min. It was found that patients expressed high satisfaction with virtual care, emphasizing benefits related to comfort convenience, communication, socioeconomic

Table 5: Mean difference for various parameters of telemedicine consultancy with respect to willingness of using telemedicine in the future

	Would you prefer telemedicine in the future		
	Yes (64) *n* (%)	**No (16) *n* (%)**	***P***
A 1) was it easy to get the appointment			
Yes	59 (92)	16 (100)	0.58
No	5 (8)	0 (0)	
2) was the appointment made within a reasonable time			
Yes	56 (87.5)	15 (94)	0.68
No	8 (12.5)	1 (6)	
3) was appointment available as soon as the patient wanted it			
Yes	52 (81)	13 (81)	0.72
No	12 (19)	3 (19)	
4) smoothness of check-in process			
1	7 (11)	1 (6)	0.38
2	7 (11)	3 (19)	
3	31 (48)	10 (63)	
4	19 (30)	2 (12)	
MEDIAN	3	3	
IQR	1	1	
5) how much was the waiting time (in minutes)			
Mean±SD	7.02±5.04	6.63±3.4	0.77
6) was the reason of appointment delays informed to the patient			
Yes	2 (3)	1 (6)	0.49
No	62 (97)	15 (94)	
7) was it easy to get referrals when required			
Yes	51 (80)	12 (75)	0.73
No	13 (20)	4 (25)	
B 1) was the person who attended your call cooperative			
1. Less cooperative	2 (3)	1 (6)	0.20
2. Satisfactorily cooperative	23 (36)	9 (56)	
3. Very cooperative	39 (61)	6 (38)	
2) concern and attitude of the medical assistants			
1. Concerned	23 (36)	8 (50)	0.11
2. Highly concerned	39 (61)	6 (38)	
3. Not at all concerned	2 (3)	2 (12)	
3) helpfulness of the staffs in case of any problem in the call			
1. Very helpful	34 (53)	4 (25)	0.01
2. Helpful	21 (33)	4 (25)	
3. Helpful but arrogant	7 (11)	5 (31)	
4. Not at all helpful	2 (3)	3 (19)	
C. 1) was the patient comfortable in talking to the health care provider			
Yes	63 (98)	14 (88)	0.10
No	1 (2)	2 (12)	
2) was the patient able to hear the consultant clearly			
Yes	58 (91)	11 (69)	0.04
No	6 (9)	5 (31)	
3) was the consultant able to understand the patients' health issues			
Yes	56 (87.5)	14 (88)	1.0
No	8 (12.5)	2 (12)	
4) was the consultation as good as physical consultation			
Yes	59 (92)	5 (31)	0.01
No	5 (8)	11 (69)	
5) are the consultations through Telemedicine consistent			
Yes	14 (22)	1 (6)	0.28
No	50 (78)	15 (94)	
6) did you receive adequate attention			
1. Yes	64 (100)	11 (69)	0.01
2. No	0 (0)	2 (12)	
3. Not satisfactory	0 (0)	3 (19)	

Contd...

Table 5: Contd...

	Would you prefer telemedicine in the future		
	Yes (64) *n* (%)	No (16) *n* (%)	*P*
7) is the patient able to meet the consultant more frequently through the telemedicine			
Yes	13 (20)	1 (6)	0.28
No	51 (80)	15 (94)	
8) was the patient able to get the prescription			
Yes	62 (97)	16 (100)	1.0
No	2 (3)	0 (0)	

Table 6: Analysis of willingness to use of telemedicine in the future using binary logistic regression

Variable	Odds ratio	95% confidence interval		*P*
		Lower	Upper	
Ease of getting appointment	1.981	0.809	4.852	0.135
Behavior of the staff	2.025	0.618	6.639	0.244
Patient satisfaction	2.942	1.026	8.435	0.045

factors, and the ease of technology use. Participants also told that they were able to make trust and connection with consultants despite being physically away from them.[18]

Telemedicine antenatal visits are good for low pregnancy. During TM consultations, women can be assessed for their weight, blood pressure, fetal heart rate, and fundal height (measured by a nearby physician). Problems related to the start of labour pain, eclampsia, etc., can also be enquired. A review article reported that about 40% of women do not attend any postpartum visits physically, but statistics improved with the use of telemedicine.[19]

Patient satisfaction is high with telemedicine services and it has revolutionary potential which can be incorporated into routine patient care, especially in low-resource countries. A study was done at AIIMS, Gorakhpur, which reported that 62.8% of respondents were willing to continue using telemedicine even after the start of physical OPD, while only 25.6% of respondents felt that they need physical visits with the doctors.[20]

The present study was conducted through the mode of telephonic survey for obstetric patients who attended telemedicine services at AIIMS, Kalyani, during the month of August and September 2022. A total of 80 patients agreed to participate in the study. The low number of telemedicine consultations in our study signifies the reluctance of the patients to shift to a virtual mode of health care, even when the care was given by the same set of doctors. Despite the low statistics, telemedicine has a vital role in improving access to tertiary care facilities and specialists.

The interviews were conducted by a questionnaire that was adopted from medical group management.[9] About 73.75% of respondents were from younger age group (21–30), whereas 26.25% were between 30 and 40 years of age. This points toward the use of the internet and smartphone more by the younger population for health-seeking benefits. Similar results were obtained by Priyadarshani *et al.*[20] The older population in rural areas still does not have smartphones or they do have not enough information about using technology for health care. The study population of our study was from rural background. Respondent's socioeconomic status or education did not seem to be the deciding factor for their use of telemedicine. The average waiting time for the telemedicine consultation in our study was 6.93 min. Only 15.3% of patients had a waiting time of more than 10 min. Waiting time was a big factor for availing telemedicine. Most of the patients found that waiting time was much shorter in comparison to the physical mode of consultation. The results coincide with some studies which reported waiting time to be the deciding factor for opting telemedicine.[21,22] Sixty-four out of 80 patients felt that they got adequate attention during telemedicine consultations and this was the reason for their intent to use telemedicine in the future also. High satisfaction can also be ascertained by a very significant *P* value in the case of comparison of physical consultation with virtual care. This was a new finding in our study which was an important deciding factor for opting telemedicine in the future. Getting an easy referral seemed to be a reason for higher satisfaction in telemedicine consultations. 78.8% of participants could get an easy referral in our study. About 86.3% of patients felt that consultants understood their health issues easily on the virtual platform also.

Patients were not able to download their prescriptions, which was one of the reasons for their dissatisfaction in our study. The reason for this may be poor network issues in the rural area.

When asked about the benefits of telemedicine, most of them ascertained that hospital-acquired infection can be prevented with telemedicine consultations. The mindset of patients, and of the general public at large, may be affected by a large number of COVID cases that India has witnessed in the past. Some patients told that that "we don't have to travel far from their house to the hospital for follow-up or for general advice for minor problems in pregnancy." A woman told "I don't have to sit long in the waiting longue during telemedicine calls."

When asked about disadvantages, a woman told that "call is often busy." Some patients complained that they do not understand what medications are being told since they were not able to download the prescription. Internet connectivity was also a problem in rural areas. A woman with term pregnancy asked "where should I go during labour pain."

About 80% of women in our study rated their experience with telemedicine to be as good as physical consultation. Eighty percent of patients also intended to use TM in the future. Our findings are in line with a previous study in the USA, where 95% of respondents rated telehealth as better than or just as good as a traditional visit while only 1% rated it worst.[23]

From this perspective, TM certainly has great potential to make health care accessible to people residing in rural and far-off places. There may be benefits of revolutionary models that use video communication and laboratory reports.[24]

Limitations of the study

As telemedicine is an emerging branch in the eastern part of India, power analysis of sample size calculation was not done; instead, all the antenatal patients who availed telemedicine facilities during the study period were included in the study. The questionnaire used in our study is adopted from the Medical group management association[9] and has been modified according to the needs of our study. But this modified questionnaire was not pilot tested as the study period provided by ICMR was very short. Larger studies in the future may provide a better understanding of the antenatal patient perceptions toward telemedicine.

Conclusion

High satisfaction of the patient with the TM means that it can be adopted and incorporated into routine patient care especially in low-resource countries like India. COVID-19 has a major impact on patients' opinions. TM will certainly meet the healthcare needs of deprived and rural population who do not have tertiary care hospitals nearby. Various areas need to be improved to increase the usage of telemedicine. Internet connectivity, education about advances in technology, and awareness about telemedicine would encourage the adoption of TM in a greater manner in our country. These technologies can be particularly useful in addressing rural-urban health discrepancies by improving access to specialists. It can be used to provide services to pregnant women without exposing them to infections. TM also breaks the geographic constraints of any hospital. Healthcare providers should be trained in updates and advances in technology. A successful telemedicine program for obstetric care would optimize convenience and ease for patients to get appointment and universal access to every individual.

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Conflicts of interest

There are no conflicts of interest.

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