

# Patient perception and satisfaction with a smartphone-based tele dermatology service initiated during the COVID-19 pandemic at a tertiary care hospital in North India

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## Abstract

**Background:** Telemedicine is being increasingly used to provide healthcare to patients, particularly during the COVID-19 pandemic.

**Aims:** The study aimed to study patient perception and satisfaction with a smartphone-based hybrid tele dermatology service initiated during the COVID-19 pandemic.

**Methods:** This was a cross-sectional telephonic survey including patients  $\geq 18$  years of age who had received a tele dermatology consultation. After noting the demographic, clinical and teleconsultation details, patients were administered the Telemedicine Satisfaction Questionnaire and an additional 6-item questionnaire. Patients were also asked to give qualitative feedback and suggestions for improvement using a semi-structured interview guide.

**Results:** We interviewed 201 subjects. The most common diagnoses were pemphigus (27, 13.4%), superficial fungal infections (24, 11.8%), psoriasis (22, 10.9%) and dermatitis (21, 10.4%). The overall mean Telemedicine Satisfaction Questionnaire score was  $4.20 \pm 0.71$ . One hundred seventy-one (85.1%) patients responded that they would use tele dermatology services again, while 168 (83.6%) reported satisfaction with the quality of services. A majority of the patients were largely satisfied with the various components involved, though some concerns were raised about the care perceived as not at par with physical consultations, difficulty in procuring medicines, lack of confidence in photographic diagnoses and the lack of a personal touch. Patients with urticaria ( $P=0.020$ ), those who were advised a change in treatment ( $P=0.029$ ) and those with improvement in their skin disease ( $P=0.026$ ) were more likely to be satisfied.

**Limitations:** Our study was conducted during the COVID-19 pandemic when patient acceptability was likely to be higher. Only follow-up patients were included in the study.

**Conclusion:** Patient satisfaction levels were generally high with tele dermatology. Addressing lacunae that negatively impact patient perception and satisfaction will help in greater acceptance of tele dermatology services.

**Key words:** Patient satisfaction, smartphone, tele dermatology, telemedicine

## Plain Language Summary

Telemedicine is the use of a technology-based virtual platform for remote medical consultations and it can be particularly advantageous during disasters and public health emergencies in rendering medical services at remote locations. We conducted a telephonic survey to assess patient perception and satisfaction with our smartphone-based hybrid tele dermatology service initiated during the COVID-19 pandemic. Two hundred and one patients were asked to respond to the Telemedicine Satisfaction

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Questionnaire and an additional six-item questionnaire and were also asked to give qualitative feedback and suggestions. The overall mean Telemedicine Satisfaction Questionnaire score was  $4.20 \pm 0.71$ , indicating that the patients were generally satisfied with tele dermatology services. Some concerns that emerged in the qualitative feedback were about the care perceived as not being at par with physical consultations, difficulty in procuring medicines, lack of confidence on photographic diagnoses and the lack of a personal touch. Patients with urticaria (hives), those who were advised a change in treatment and those with improvement in their skin disease were more likely to be satisfied with tele dermatology services according to our survey.

## Introduction

Telemedicine is the use of a technology-based virtual platform to remotely deliver various aspects of health information, prevention, diagnosis and medical care. Telemedicine has been used by several medical specialties, and it can be particularly advantageous during disasters and public health emergencies in rendering medical services at remote locations.<sup>1</sup> During the current COVID-19 pandemic when social distancing is emphasized and lockdowns have further reduced access to healthcare professionals, telemedicine is being increasingly used to deliver health care to patients. The CDC reported a 154% increase in telehealth visits in the United States during the last week of March 2020, compared with the same period in 2019.<sup>2</sup>

Dermatology, being a visual specialty, is particularly well suited to telemedicine. Moreover, in India, where qualified dermatologists are concentrated in and around urban areas, and roughly one dermatologist caters to a population of 1.3 lacs,<sup>3</sup> tele dermatology can be an effective tool to meet patient needs, particularly for those in rural areas. With the rising number of smartphone users in India, smartphone-based tele dermatology can be a convenient way for patients to utilize tele dermatology services. As of December 2019, more than 50 crore (about 37% of the population) Indians were using smartphones, a 15% increase from 2018.<sup>4</sup> Smartphone use in rural India also rose from 9% in 2015 to 25% in 2018.<sup>5</sup>

## Study background

We started providing a hybrid tele dermatology service, combining elements from both store-and-forward and real-time conferencing, using a 4G android smartphone and the WhatsApp messenger application to patients during the COVID pandemic since early April 2020.<sup>6</sup> As per the institute policy, only follow-up patients were given tele consultations. Patients take an appointment for tele consultation through a dedicated institute helpline number or through the institute website. A team of resident doctors (MD trainees and post-MD senior residents) under the supervision of a faculty member contact the patients on the day of their scheduled appointment between 9 am and 2 pm through a voice call, discuss with them about their skin disease and ask them to send the pictures of their skin lesions along with previous medical records through the WhatsApp messenger. Patient condition is assessed, a note is made of their disease status and discussed with the faculty member as required. The patient is again contacted using voice call shortly thereafter and the treatment explained in detail. The prescription is

sent to the patient either through WhatsApp (as an image of the signed prescription) or SMS. In case of an earlier failed attempt, another attempt is made to contact the patient; once in the middle of the session (9am-2pm) and again before closing the session.

In this study, we aimed to study patient perception and satisfaction with this smartphone-based tele dermatology service, initiated during the COVID-19 pandemic.

## Methods

This was a cross-sectional telephonic survey conducted at the department of Dermatology and Venereology of the All India Institute of Medical Sciences, New Delhi that caters largely to the population of North India, after obtaining approval from The Institute Ethics Committee. Patients  $\geq 18$  years of age who had received a tele dermatology consult during December 2020 to April 2021 were included after they gave their verbal informed consent. They were interviewed telephonically within two weeks of their last tele dermatology consultation, by an investigator (DY) not affiliated with our department at the time of the study. Before the interview commenced, all the participants were informed that the interviewer is no longer affiliated with our institute, and that their responses would not affect their future care. After noting the demographic, clinical and teleconsultation details, patients were administered the Telemedicine Satisfaction Questionnaire and an additional 6-item questionnaire. They were also asked to give their feedback regarding their perception and satisfaction with our tele dermatology services and suggestions for improvement using a semi-structured interview guide. In cases where teleconsultation was provided to the primary caregiver instead of the patients themselves, the survey was administered to the primary caregiver. The telephonic interviews were recorded and transcribed verbatim.

## Patient satisfaction measures

The Telemedicine Satisfaction Questionnaire is a validated instrument developed for the evaluation of patient satisfaction with telemedicine.<sup>7</sup> It consists of 14 items, categorized into three domains: quality of care provided, similarity to face-to-face encounter and perception of interaction. Responses to all items are on a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree), with the total questionnaire score ranging from 14 to 70. We developed a Hindi translation of the Telemedicine Satisfaction Questionnaire using the standard forward-and-back translation process for the purpose of this study as follows: the English version of

the Telemedicine Satisfaction Questionnaire was translated into Hindi by two investigators proficient in the language independently (SB and DY), and a final version was mutually agreed on. This version was then translated back into English by another investigator (VG), which was then compared with the original English version of the Telemedicine Satisfaction Questionnaire to confirm that the meaning remained unchanged.

An additional set of six questions, developed specifically for this study, based on literature review and expert opinion, was also administered. These questions were particularly related to teledermatology and our method of providing teledermatology services, such as waiting to receive the call for teleconsult, taking and sending photographs of skin lesions, concerns about privacy of sharing photographs, preference for teleconsults or conventional hospital visits, and quality of teleconsultation and medical care. Responses to all these questions were on a 5-point Likert scale, as for the Telemedicine Satisfaction Questionnaire.

#### Statistical analysis

Continuous variables were reported as mean ( $\pm$  standard deviation, range), and categorical variables as frequency (%). Categorical variables were compared using Chi-square test or Fisher's exact test, as applicable. Patient and teleconsult variables associated with patient satisfaction were identified by univariable and stepwise multivariable logistic regression analysis using dichotomized Telemedicine Satisfaction Questionnaire scores  $<4$  and  $\geq 4$ . Variables found to be significant up to 25% level under crude analysis were considered for stepwise procedure (with a probability to enter and remove 0.10 and 0.15, respectively).  $P < 0.05$  was considered statistically significant. Statistical analysis was done using Stata version 14.2 (StataCorp, College Station, TX, U. S. A.).

## Results

We provided 1274 teledermatology consultations from December 2020 to April 2021. Three hundred and sixty-six patients, recruited through convenience sampling, were contacted for the telephonic survey. Of these, 122 could not be contacted for the interview, 18 did not consent to participate in the study and 25 were excluded because they were less than 18 years of age. Data for the remaining 201 subjects appears below.

#### Demographic, clinical and teleconsultation profile of the patients

Two hundred and one individuals were interviewed; 144 (71.6%) were patients themselves and 57 (28.4%) were primary caregivers. The mean age of patients was  $38.41 \pm 15.76$  (range 18–77) years. There were 109 (54.2%) males and 92 (45.8%) females. A majority (123, 61.2%) of the patients had completed graduation or received higher education. Eighty-four (41.8%) patients resided outside the national

capital territory of Delhi, and 118 (58.7%) patients reported needing  $>1$  hour to travel to our hospital from their place of residence. The most common diagnoses were pemphigus (27, 13.4%), superficial fungal infections (24, 11.8%), psoriasis (22, 10.9%), dermatitides (21, 10.4%), acne (17, 8.4%) and vitiligo (16, 7.9%). Nineteen (9.5%) patients had more than one skin disease. Table 1 summarizes the demographic, clinical and teleconsultation characteristics of the patients.

#### Satisfaction scores

The overall mean Telemedicine Satisfaction Questionnaire score was  $4.20 \pm 0.71$  indicating that patients were generally satisfied with the teledermatology services. The mean scores of the three domains "quality of care provided," "similarity to face-to-face encounter" and "perception of interaction" were  $4.13 \pm 0.75$ ,  $4.28 \pm 0.70$  and  $4.40 \pm 0.96$ , respectively. All except two items in the Telemedicine Satisfaction Questionnaire had a mean score  $\geq 4$  (agree or strongly agree): "as if met in person" ( $3.82 \pm 1.19$ ) and "healthcare is consistent" ( $3.99 \pm 1.07$ ). The highest score was for an item pertaining to saving time travelling to the hospital, with a mean score of  $4.70 \pm 0.58$ . An overall Telemedicine Satisfaction Questionnaire score  $\geq 4$  was recorded by 139 (69.2%) patients. One hundred and seventy one (85.1%) patients said that they would use telemedicine services again, while 168 (83.6%) patients reported being satisfied with the quality of telemedicine services.

Of the six additional questions, three had a mean score  $\geq 4$ . The items with a score of  $<4$  were related to "preference for telemedicine over going to hospital" ( $3.93 \pm 1.23$ ), "medical care being as good as going to hospital" ( $3.79 \pm 1.23$ ) and "not being able to see the doctor not reducing the quality of consultation" ( $3.83 \pm 1.20$ ). Figure 1 shows the mean scores and break-up of patient responses for all items of the Telemedicine Satisfaction Questionnaire and additional questions.

#### Qualitative feedback

A majority of the respondents broadly expressed satisfaction with the various components involved in our teledermatology services, particularly the convenience and time saved. The major areas of concern that emerged included the quality of medical care being perceived as lower than with physical consults, difficulty in procuring medicines due to either their unavailability nearby or the e-prescription not being considered valid by pharmacists, lack of a personal touch during the consultation, lack of confidence in the tele-assessments and perceived difficulty in conveying problems to the doctor. The qualitative feedback provided by patients and primary caregivers was largely similar. Table 2 summarizes the responses to the semi-structured interview guide.

#### Factors affecting satisfaction with teledermatology services

A diagnosis of urticaria (vs. other diagnoses,  $P=0.020$ ) and improvement in skin disease following the last

**Table 1: Demographic, clinical and teleconsultation characteristics of the patients (n=201)**

Variable	Result
Gender, n (%)	
Men	109 (54.2%)
Women	92 (45.8%)
Age (years), mean±SD	38.4 ± 15.7
Education, n (%)	
No formal education	33 (16.4%)
Till class 12	45 (22.4%)
Graduate or postgraduate	123 (61.2%)
Residence, n (%)	
National capital territory of Delhi	117 (58.2%)
Outside National capital territory of Delhi	84 (41.8%)
Usual time to reach hospital from residence, n (%) (h)	
≤1	83 (41.3%)
>1	118 (58.7%)
Diagnosis, n (%)*	
Acne and related disorders	
Acne vulgaris	17 (8.4%)
Folliculitis	2 (0.9%)
Rosacea	2 (0.9%)
Hair disorders	
Androgenetic alopecia	7 (3.4%)
Alopecia areata	7 (3.4%)
Hair fall	2 (0.9%)
Dermatitis	
Endogenous dermatitis/atopic dermatitis	11 (5.4%)
Parthenium dermatitis	1 (0.4%)
Seborrheic dermatitis	4 (1.9%)
Pruritus/prurigo	5 (2.4%)
Papulosquamous disorders	
Psoriasis	22 (10.9%)
Pityriasis rubra pilaris	3 (1.4%)
Lichen planus	10 (4.9%)
Urticaria	12 (5.9%)
Leprosy	8 (3.9%)
Lichen planus	11 (5.4%)
Melasma	8 (3.9%)
Immunobullous disorders	
Pemphigus	27 (13.4%)
Bullous pemphigoid	1 (0.4%)
Connective tissue diseases	
Lupus erythematosus	3 (1.4%)
Systemic sclerosis	2 (0.9%)
Small vessel vasculitis	1 (0.4%)

(Contd...)

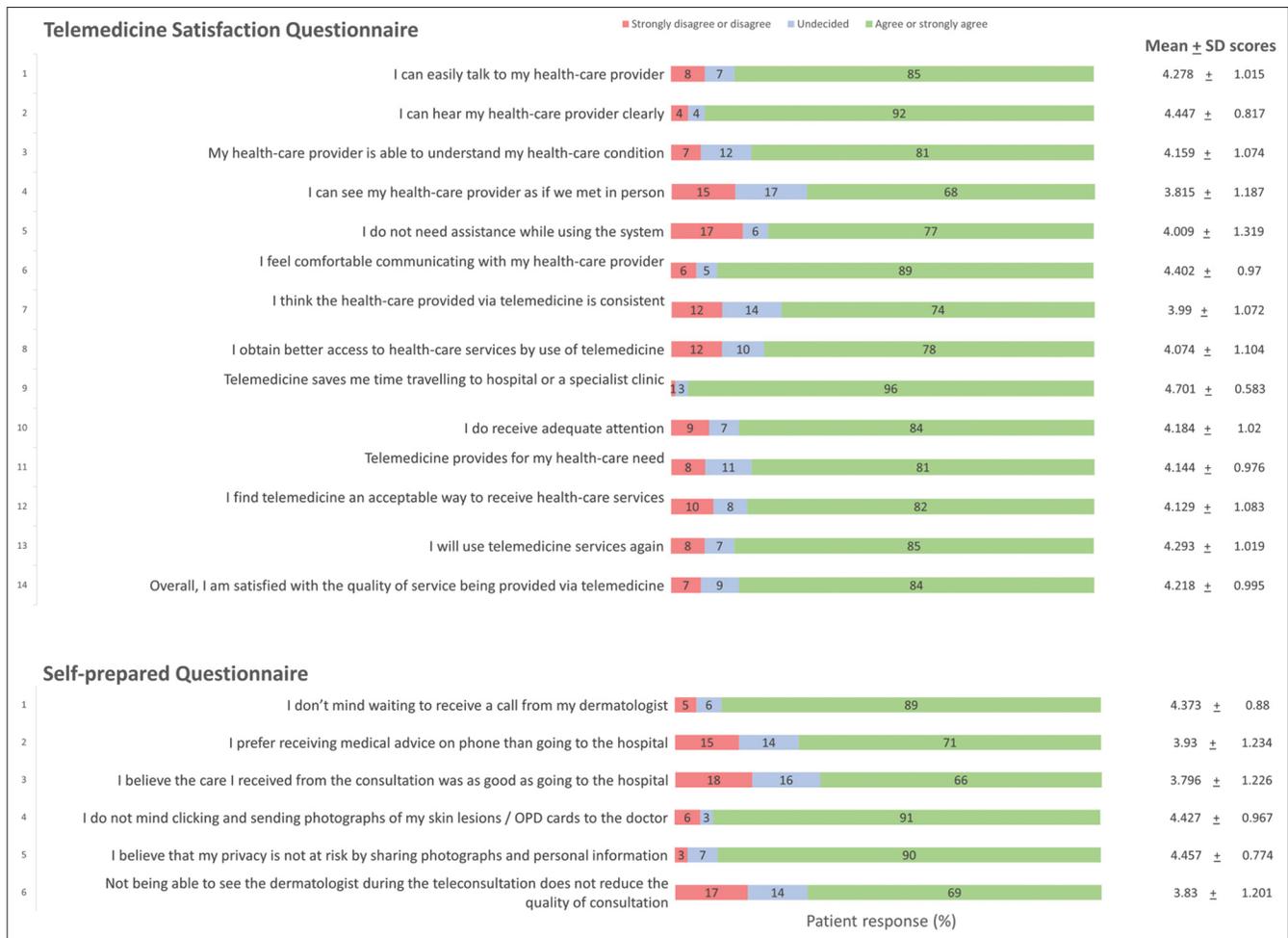
teleconsultation advice (vs. disease remained unchanged or worsened,  $P=0.013$ ) were significantly associated with patient satisfaction under crude analysis. Univariable logistic regression analysis showed patients whose skin disease improved (OR 2.19,  $P=0.014$ ) and who were advised a change in treatment (vs. treatment unchanged, OR 2.09,  $P=0.037$ )

**Table 1: (Continued)**

Variable	Result
Superficial fungal infections	
Dermatophytosis	22 (10.9%)
Candidal infections	2 (0.9%)
Vitiligo	16 (7.9%)
Skin and soft tissue bacterial infections	3 (1.4%)
Scars (keloid/post-acne/post-traumatic)	6 (2.9%)
Others	
Pityriasis rosea	1 (0.4%)
Chronic arsenicosis	1 (0.4%)
Atypical mycobacterial infections	1 (0.4%)
Chilblains	1 (0.4%)
Drug rash with eosinophilia and systemic symptoms	2 (0.9%)
Fixed drug eruption	1 (0.4%)
Freckles	1 (0.4%)
Fingernail discolouration	1 (0.4%)
Herpetic infections	2 (0.9%)
Palmoplantar hyperhidrosis	2 (0.9%)
Port-wine stain	1 (0.4%)
Radiation dermatitis	1 (0.4%)
Subcorneal pustular dermatosis	1 (0.4%)
Zoon's balanitis	1 (0.4%)
Warts	1 (0.4%)
Lichen planus pigmentosus	1 (0.4%)
Skin disease per patient, n (%)	
1	182 (90.5%)
>1 (range 2–4)	19 (9.5%)
Reason for teleconsultation, n (%)	
Regular follow-up	156 (77.6%)
Disease flare	29 (14.4%)
New unrelated complaint	14 (6.9%)
Other reason	2 (0.9%)
Teleconsultation advice, n (%)	
Continue same treatment	104 (51.7%)
Treatment changed	72 (35.8%)
Asked to visit hospital	25 (12.4%)
Number of teleconsultations received, n (%)	
1	95 (47.3%)
>1 (range 2–15, median 3)	106 (52.7%)
Skin disease, n (%)	
Same	94 (46.7%)
Better	91 (45.2%)
Worse	16 (8%)

\*Some patients had &gt;1 diagnosis

were more likely to be satisfied with the tele dermatology services. Table 3 shows the results of crude analysis and univariable logistic regression analysis for factors associated with overall patient satisfaction with our tele dermatology services (Telemedicine Satisfaction Questionnaire  $\geq 4$ ).



**Figure 1:** The mean scores and break-up of patient responses for all items of the Telemedicine Satisfaction Questionnaire and our additional questionnaire

Diagnosis of urticaria was excluded from the regression model as the odds ratio could not be calculated. Multivariable analysis showed treatment change (OR 2.21, 95% CI 1.08–4.52,  $P=0.029$ ) and improvement in skin disease (OR 2.09, 95% CI 1.09–4.02,  $P=0.026$ ) to be associated with overall patient satisfaction, while receiving teleconsults more than once (OR 1.79, 95%; CI 0.95–3.33,  $P=0.069$ ) showed a trend toward an association but did not reach statistical significance.

**Discussion**

Telemedicine was virtually non-existent in India but the COVID-19 pandemic has thrust it to the forefront of the healthcare delivery system. Our telemedicine services were started during the lockdown due to the COVID-19 pandemic as an expediential measure to help patients access health services. We chose smartphone-based teledermatology using WhatsApp messenger because of its wide reach and feasibility. Smartphone-based teledermatology does not need dedicated infrastructure and therefore could be useful in resource-poor settings. Though patient satisfaction with conventional teledermatology has been shown to be generally high, not many studies have evaluated patient satisfaction with smartphone-based teledermatology in detail.<sup>8,9</sup>

Our results show a mean Telemedicine Satisfaction Questionnaire score of 4.20, suggesting that patients were largely satisfied with our teledermatology service. Earlier studies using a 5-point Likert scale have also reported comparable mean scores, ranging from 3.8 to 4.74. While some of these studies focused on patients in specific categories such as skin malignancies, cosmetic dermatology, acne or psoriasis, many included general dermatology patients like ours.<sup>10-15</sup> About 84% of the patients in our survey reported being satisfied overall with the quality of telemedicine services, while about 69% of patients recorded an overall Telemedicine Satisfaction Questionnaire score  $\geq 4$ . Around 85% patients said that they would use teledermatology again, a marker of its perceived usefulness. These results are consistent with those of previous studies, where satisfaction rates ranged from 77% to 90%.<sup>10,15-19</sup> Time saved in travelling to hospital emerged as the most appreciated aspect (mean Telemedicine Satisfaction Questionnaire score 4.70; 96% patients agreed or strongly agreed). This has been highlighted in earlier studies as well.<sup>20,21</sup>

Patients were generally happy with the ease and comfort of telecommunication and the clarity of their interactions with

**Table 2: Summary of responses to the semi-structured interview guide**

Themes covered in the semi-structured interview guide	Sub-themes	Patient quotes
Receiving doctor's call	At inconvenient times: 4/201 (19.9%)	"Got a call during office hours" "Call interrupted my online class"
	No specific time of call: 43/201 (21.4%)	"Kept on waiting for the call" "There should be a fixed time for call" "Doctor's call can come anytime..." "A message could be sent that the doctor will call around 10 am." "... I can be better prepared with my records"
Conveying problems to doctor	Not enough time spent: 21/201 (10.4%)	"Doctor seemed to be in a hurry" "... should ask more questions" "... should give more time to tell our problems" "Sometimes I am not able to convey all my problems"
	Inability to convey problems: 10/201 (4.9%)	"I could not explain properly on the phone" "I remembered something later..."
	Lack of personal touch: 32/201 (15.9%)	"Video-call option should be there for those who want it" "Video-call will give a personal touch" "It can make it more like a physical consult" "Seeing the doctor's face will give me more satisfaction"
	Better attention: 2/201 (0.9%)	"I felt that the doctor was giving attention to only me, unlike in the OPD"
Understanding doctor's advice Doctor being able to understand patient's problem	Easier to understand: 4/201 (1.9%)	"I can record the conversation and listen to it later, if I have any doubt"
	Unsure if doctor understood the problem: 11/201 (5.4%)	"Doctors don't understand completely..." "Assessment on photographs is not as good as on physical examination" "I could not clearly point out new vitiligo lesions on the photograph"
	Lack of confidence in photographic assessments: 29/201 (14.4%)	"I don't know how much the doctor understands by looking at photographs" "Skin diseases require touch..." "I don't know how clearly skin lesions are seen on photos"
Clicking and sending photographs to doctor	Privacy concerns: 14/201 (6.9%)	"I don't want to send my photograph as I am a girl" "I feel embarrassed in sending photographs of the genital area"
	Difficulty in clicking photos: 5/201 (2.5%)	"I cannot click photos of my back" "Someone else clicks photos for me" "I need help in clicking photos" "I cannot send photos of my entire body"
Taking an appointment for telemedicine	Difficulty in taking an appointment telephonically: 34/201 (16.9%)	"The phone is always busy" "I had to try daily for 5-6 days" "No one answers the phone"
	Difficulty in taking an online appointment: 27/201 (13.4%)	"I don't know how to take an appointment" "Website hangs a lot" "It has so many steps, complex process. Needs OTP (one-time password)." "It should be modernized and made more user-friendly" "... easier if doctors themselves can give the next appointment"
	Avoids prescription errors (1.5%)	"...now the chemist does not have to deal with the doctor's hand-writing"
Buying medicines through a SMS or WhatsApp prescription	Difficulty in getting medicines through SMS prescription: 23/201 (11.4%)	"Prescription was not accepted by my local chemist and many online pharmacies" "SMS prescription does not look authentic" "Prescription should have the doctor's name" "I had to show an old prescription to get my refill" "Difficult to get the bill reimbursed"
	Complex process: 24/201 (11.9%)	"My mother cannot do it by herself as she is old" "It is easier for people who know computers..." "I need help with teleconsultation"
Overall process of the telemedicine process	Lack of continuity: 37/201 (18.4%)	"A different doctor calls at every appointment" "I have to start from scratch every time..." "Previous clinical records should be saved to make it less cumbersome" "I wanted to speak to my senior doctor" "I don't know if my case was discussed with my previous doctor"

(Contd...)

Table 2: (Continued)

Themes covered in the semi-structured interview guide	Sub-themes	Patient quotes
Convenience, time taken, expense	Cost-effective and more convenient: 28/201 (13.9%)	"I don't have to take leave from work" "Earlier, I used to miss physical appointments due to lack of time or money" "... avoids waiting in crowded outpatient departments" "Doctors call back at a more convenient time if we request them"
	Difficult to procure medicines without hospital visit: 27/201 (13.4%)	"Medicines are costly, which were earlier available for free from the hospital pharmacy" "Medicines are costlier than my travel to hospital..." "Prescribed medicines were not available in my hometown" "Hospital should do free home delivery of medicines" "I am not sure of the quality of medicines available here (in my hometown)" "Brand names of medicines should be written in the prescription"
Others	Quality of care not at par with physical consults: 57/201 (28.3%)	"... not as good as physical visits for severe skin disease" "Teleconsultation is fine as long as disease is improving; urgent appointment for an outpatient visit should be given if worsening" "I cannot get phototherapy for my vitiligo" "Appointment for a physical visit should be given after a few tele-appointments" "I prefer teleconsultation only during COVID times" "Less expensive, but at the cost of quality"
	Cannot initiate the contact with the doctor: 13/201 (6.5%)	"... in case of emergency" "...if I have to clear any doubt" "I cannot call back if I missed the call earlier"

the doctor in our study. However, patients did miss seeing their doctor during the teleconsultations, as we contacted the patients using a voice call; the items pertaining to this aspect had the lowest scores. Having an option of video-call was suggested by some patients to enhance the quality of the teleconsultation. An earlier study by Williams *et al.* also reported patients expressing lower satisfaction with the absence of face-to-face contact with doctor.<sup>22</sup>

Another important concern was regarding the quality of healthcare provided through teledermatology, as suggested by the low scores on the relevant items. Some of the reasons for this perception included not enough time spent on teleconsultation by the doctor, and perceived inability to convey all problems properly to the doctor and/or doubts if the doctor understood them. Still, about 70% ( $n=142/201$ ) of our study patients preferred teleconsultations over hospital visits, and 66% ( $n=133/201$ ) of them felt that medical care through teleconsultations was as good as going to the hospital, rates that were comparable to those in other studies.<sup>20,22</sup>

Patients also lacked confidence in the photographic diagnoses and assessments made without physical examination and had concerns regarding the clarity of skin lesions on photographs. Similar concerns regarding accuracy were expressed by about half of the patients in a study ( $n=123$ ) from Australia by Chee *et al.*<sup>23</sup> However, a recent study from Brazil reported high diagnostic accuracy (78% complete agreement with in-person examination, 8% partial agreement and 14% no agreement) for inflammatory dermatoses with store-

and-forward teledermatology,<sup>24</sup> while a systematic review suggests that smartphone-based teledermatology may have a similar or better diagnostic concordance than that of store-and-forward method.<sup>25</sup>

Unlike other medical specialties, photography of skin lesions is a unique and an integral part of teledermatology. Most of our patients did not express concerns regarding taking and sending the photographs (91%,  $n=183/201$ ) or regarding privacy (90%,  $n=181/201$ ). Williams *et al.* also reported that 85% of their 122 patients did not mind being photographed.<sup>22</sup> On the other hand, 14% of patients refused photography citing social or religious reasons in a Saudi Arabian study ( $n=166$ ) by Kaliyadan *et al.*<sup>9</sup> while about 25% patients expressed concerns regarding privacy in the Australian study ( $n=123$ ) by Chee *et al.*<sup>23</sup>

Qualitative feedback gave us insights into a few more issues that troubled our patients. Though seen as convenient and saving both time and money, some patients found telemedicine to be more expensive as they had to purchase medicines that were earlier available free of cost at our hospital. There is only limited literature formally evaluating the cost-effectiveness of teledermatology, but most studies suggest that it may be more economical, especially when indirect costs (such as lost productivity) are factored in. It may be particularly cost-effective for certain patient populations, such as those who live in remote areas with poor access to healthcare.<sup>26,27</sup> Another problem patients faced was finding the prescribed medications in their locality/hometown; it

**Table 3: Crude analysis and univariable logistic regression analysis showing factors associated with overall patient satisfaction with our tele dermatology services (Telemedicine Satisfaction Questionnaire score  $\geq 4$ )**

Variable	No. of patients with Telemedicine Satisfaction Questionnaire score <4 (n=62)	No. of patients with Telemedicine Satisfaction Questionnaire score $\geq 4$ (n=139)	P-value <sup>#</sup>	OR (95% CI)	P-value <sup>^</sup>
Age, years			0.658		
<30	23 (37.1%)	54 (38.6%)		1	
30–60	30 (48.4%)	71 (51.1%)		1.008 (0.527–1.927)	0.981
>60	9 (14.5%)	14 (10.1%)		0.6625 (0.251–1.746)	0.405
Gender			0.849		
Male	33 (53.2%)	76 (54.8%)		1	
Female	29 (46.7%)	63 (45.3%)		0.943 (0.518–1.719)	0.849
Education			0.294		
No formal education	7 (11.3%)	26 (18.7%)		1	
$\leq$ Class 12	17 (27.4%)	28 (20.1%)		0.443 (0.158–1.241)	0.122
Graduate/Post-graduate	38 (61.3%)	85 (61.2%)		0.602 (0.240–1.508)	0.279
Residence			0.978		
Delhi/NCR	36 (58.1%)	81 (58.3%)		1	
Outside Delhi/NCR	26 (41.9%)	58 (41.7%)		0.991 (0.540–1.818)	0.978
Usual time to reach hospital from residence (h)			0.902		
<1	26 (41.9%)	57 (41%)		1	
>1	36 (58.1%)	82 (59%)		1.038 (0.566–1.907)	0.902
Diagnosis (vs. others)					
Acne and related disorders	6 (9.7%)	15 (10.8%)	0.812	1.129 (0.416–3.062)	0.812
Eczema/papulosquamous disorders	17 (27.4%)	39 (28.1%)	0.926	1.032 (0.528–2.016)	0.926
Urticaria	0 (0%)	12 (8.6%)	0.020*	-	-
Superficial fungal infections	5 (8.1%)	19 (13.7%)	0.348	1.805 (0.641–5.077)	0.263
Immunobullous diseases	10 (16.1%)	18 (12.9%)	0.548	0.773 (0.334–1.789)	0.548
Vitiligo	6 (9.7%)	10 (7.2%)	0.548	0.723 (0.251–2.087)	0.549
Hair disorders	4 (6.5%)	11 (7.9%)	>0.99	1.246 (0.381–4.078)	0.716
No. of skin diseases per patient			0.797		
1	57 (91.9%)	125 (89.9%)		1	
>1	5 (8.1%)	14 (10.1%)		1.276 (0.438–3.715)	0.654
Teleconsultation received by			0.887		
Patient	44 (71%)	100 (71.9%)		1	
Primary caregiver	18 (29%)	39 (28.1%)		0.953 (0.492–1.847)	0.887
No. of teleconsultations received			0.081		
1	35 (56.5%)	60 (43.2%)		1	
>1	27 (43.5%)	79 (56.8%)		1.706 (0.933–3.122)	0.083
Reason for teleconsultation			0.437		
Disease flare/new complaint	16 (25.8%)	29 (20.9%)		1	
Regular follow-up	46 (74.2%)	110 (79.1%)		1.319 (0.654–2.659)	0.438
Teleconsultation advice			0.065		
Continue same treatment	37 (59.7%)	67 (48.2%)		1	
Treatment changed	15 (24.2%)	57 (41%)		2.098 (1.046–4.209)	0.037*
Advised to visit hospital	10 (16.1%)	15 (10.8%)		0.828 (0.338–2.027)	0.680
Skin disease response after teleconsultation advice			0.013*		
Same/worse	42 (67.7%)	68 (48.9%)		1	
Better	20 (32.3%)	71 (51.1%)		2.192 (1.170–4.107)	0.014*

<sup>#</sup>Chi-square test or Fisher's exact test, as applicable. <sup>^</sup>Univariable logistic regression analysis. \*Variables statistically significantly associated with patient satisfaction (Telemedicine Satisfaction Questionnaire score  $\geq 4$ )

was easier to buy them from a medical store near the hospital when they came for a physical consultation. Further, SMS or WhatsApp prescriptions were not accepted by all chemists and online pharmacies, and there were difficulties in getting reimbursements for medications purchased using such prescriptions. Patient suggestions around these problems included having a physical consultation after every few teleconsultations, free home-delivery of medicines from the hospital pharmacy, and modifying e-prescriptions to make them look more authentic. These issues need the attention of healthcare policy makers for easier implementation of telemedicine services. Several countries have formulated regulations and have adopted e-prescription systems in community pharmacies at a national level.<sup>28</sup>

There are a few studies that have looked at factors associated with patient satisfaction with teledermatology. Williams *et al.* found that patients with a high burden of disease did not prefer teleconsultations.<sup>22</sup> Hsueh *et al.* reported short waiting times before teleconsultation, perception of skin disease being properly treated and receiving adequate follow-up as factors associated with patient satisfaction.<sup>15</sup> A recent Indian study by Handa *et al.* reported higher satisfaction levels among patients with dermatophytoses, infestations and bacterial infections,<sup>29</sup> while dermatologists perceived superficial skin infections, acne, eczemas and pigmentary disorders to be particularly suited for telemedicine.<sup>30,31</sup> We found that patients with urticaria were more likely to be satisfied with teledermatology than those with other diagnoses, probably because the disease is seen as non-serious, assessment is largely based on patient history, and it is amenable to easy treatment titrations on teleconsultations. As expected, patients whose skin disease improved after the teleconsultations were more satisfied than those whose disease remained unchanged or worsened, while patients who were advised a change in treatment were also more satisfied. In general, patients who are advised a change in treatment plan may feel that their problems have been better attended, though this may not always be true. Similarly, in another study, patients who were only reassured were less satisfied than those who were advised a skin biopsy or a face-to-face evaluation.<sup>32</sup> We noted a trend for better satisfaction in patients who had received more than one teleconsult, presumably because of increased familiarity with the process. We expected patients from outside the state and those with long travelling hours to the hospital to be more satisfied with teledermatology, but this was not the case in our results. Patient satisfaction was found to be independent of distance from hospital in the study by Handa *et al.* as well.<sup>29</sup> Younger and more educated patients are more likely to be at ease with new technology, and therefore more receptive of telemedicine, but we did not find any association of patient satisfaction with age or education status.

Most of the earlier studies on patient satisfaction with telemedicine used non-validated instruments. We used the Telemedicine Satisfaction Questionnaire, a validated

instrument developed for this purpose.<sup>7</sup> As this was a general telemedicine instrument, we supplemented it with a few of our own questions particularly relevant to teledermatology. In addition, patient's qualitative feedback and their suggestions were also collected.

#### Limitations

Our study was conducted during the COVID-19 pandemic, when the acceptability of telemedicine services is likely to be higher. Statistically significantly higher mean satisfaction scores were recorded for the patients receiving teledermatology consultation for the first time during the COVID-19 pandemic compared to those who had received it before the pandemic as well (4.7 vs. 4.4,  $P=0.03$ ) in a study by Hamad *et al.*<sup>33</sup> As we were providing teleconsultations only to patients who had previously been seen in person, patients seeking a consultation for the first time were not included in the study. Some aspects of patient experience, such as reduced waiting times for an appointment with teledermatology vis-à-vis physical visits, were not studied. We recruited the participants through convenience sampling; though this sampling method is used commonly in qualitative research, it puts the results at a risk of potential bias.

#### Conclusion

Our results suggest that patients find telemedicine a convenient, time-saving and cost-effective alternative to physical hospital visits. Satisfaction levels were generally high with our smartphone-based teledermatology service. Our study identified certain lacunae that negatively impact patient perception and satisfaction; addressing them might help in greater acceptance of teledermatology services.

#### Declaration of patient consent

Institutional Review Board (IRB) permission obtained for the study.

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#### Conflicts of interest

There are no conflicts of interest.

#### References

1. Pasquali P, Sonthalia S, Moreno-Ramirez D, Sharma P, Agrawal M, Gupta S, *et al.* Teledermatology and its current perspective. *Indian Dermatol Online J* 2020;11:12-20.
2. Koonin LM, Hoots B, Tsang CA, Leroy Z, Farris K, Jolly B, *et al.* Trends in the use of telehealth during the emergence of the COVID-19 pandemic-United States, January-March 2020. *MMWR Morb Mortal Wkly Rep* 2020;69:1595-9.
3. Ashique KT, Kaliyadan F. Teledermatology in the wake of COVID-19 scenario: An Indian perspective. *Indian Dermatol Online J* 2020;11:301-6.
4. India's Smartphone Users Grew by 15% in 2019, With Total 50 Crore Users of Which 77% Are Online, *India Times*; 2019. Available from: <https://www.indiatimes.com/technology/news/india-loves-smartphones-over-50-crore-indians-use-smartphones-77-use-internet-reveals-report-505413.html> [Last accessed on 2021 Jun 14].

5. Indian to Have 820 Million Smartphone Users by 2022-The Economic Times; 2021. Available from: [https://www.economictimes.indiatimes.com/industry/telecom/telecom-news/indian-to-have-820-million-smartphone-users-by-2022/articleshow/76876369.cms?utm\\_source=contentofinterest&utm\\_medium=text&utm\\_campaign=cppst](https://www.economictimes.indiatimes.com/industry/telecom/telecom-news/indian-to-have-820-million-smartphone-users-by-2022/articleshow/76876369.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst) [Last accessed on 2021 Jun 14].
6. Taneja N, Gupta V. COVID-19 pandemic ushering in the era of teledermatology. *Indian J Dermatol Venereol Leprol* 2021;87:436-7.
7. Yip MP, Chang AM, Chan J, MacKenzie AE. Development of the telemedicine satisfaction questionnaire to evaluate patient satisfaction with telemedicine: A preliminary study. *J Telemed Telecare* 2003;9:46-50.
8. Kanthraj GR. Newer insights in teledermatology practice. *Indian J Dermatol Venereol Leprol* 2011;77:276-87.
9. Kaliyadan F, Amin TT, Kuruvilla J, Ali WH. Mobile teledermatology-patient satisfaction, diagnostic and management concordance, and factors affecting patient refusal to participate in Saudi Arabia. *J Telemed Telecare* 2013;19:315-9.
10. Haderler E, Gitlow H, Nouri K. Definitions, survey methods, and findings of patient satisfaction studies in teledermatology: A systematic review. *Arch Dermatol Res* 2021;313:205-15.
11. Rajda J, Seraly MP, Fernandes J, Niejadlik K, Wei H, Fox K, *et al.* Impact of direct to consumer store-and-forward teledermatology on access to care, satisfaction, utilization, and costs in a commercial health plan population. *Telemed J E Health* 2018;24:166-9.
12. Marchell R, Locatis C, Burgess G, Maisiak R, Liu WL, Ackerman M. Patient and provider satisfaction with teledermatology. *Telemed J E Health* 2017;23:684-90.
13. Wang YC, Ganzorig B, Wu CC, Iqbal U, Khan HA, Hsieh WS, *et al.* Patient satisfaction with dermatology teleconsultation by using MedX. *Comput Methods Programs Biomed* 2018;167:37-42.
14. Eminović N, de Keizer NF, Wyatt JC, ter Riet G, Peek N, van Weert HC, Bruijnzeel-Koomen CA, *et al.* Teledermatologic consultation and reduction in referrals to dermatologists: A cluster randomized controlled trial. *Arch Dermatol* 2009;145:558-64.
15. Hsueh MT, Eastman K, McFarland LV, Raugi GJ, Reiber GE. Teledermatology patient satisfaction in the Pacific Northwest. *Telemed J E Health* 2012;18:377-81.
16. Bosanac SS, Nguyen V, Bui D, Eisen DB, Sivamani RK. Randomized and controlled pilot study of the pragmatic use of mobile phone based follow up of actinic keratoses treated with topical 5-fluorouracil. *Dermatol Online J* 2018;24:19.
17. Ford JA, Pereira A. Does teledermatology reduce secondary care referrals and is it acceptable to patients and doctors?: A service evaluation. *J Eval Clin Pract* 2015;21:710-6.
18. Thind CK, Brooker I, Ormerod AD. Teledermatology: A tool for remote supervision of a general practitioner with special interest in dermatology. *Clin Exp Dermatol* 2011;36:489-94.
19. Fiks AG, Fleisher L, Berrigan L, Sykes E, Mayne SL, Gruver R, *et al.* Usability, acceptability, and impact of a pediatric teledermatology mobile health application. *Telemed J E Health* 2018;24:236-45.
20. Nicholson P, Macedo C, Fuller C, Thomas L. Patient satisfaction with a new skin cancer teledermatology service. *Clin Exp Dermatol* 2020;45:691-8.
21. Al Quran HA, Khader YS, Ellauzi ZM, Shdaifat A. Effect of real-time teledermatology on diagnosis, treatment and clinical improvement. *J Telemed Telecare* 2015;21:93-9.
22. Williams TL, Esmail A, May CR, Griffiths CE, Shaw NT, Fitzgerald D, *et al.* Patient satisfaction with teledermatology is related to perceived quality of life. *Br J Dermatol* 2001;145:911-7.
23. Chee SN, Lowe P, Lim A. Smartphone patient monitoring post-laser resurfacing. *Australas J Dermatol* 2017;58:e216-22.
24. Giavina-Bianchi M, Sousa R, Cordioli E. Part I: Accuracy of teledermatology in inflammatory dermatoses. *Front Med (Lausanne)* 2020;7:585792.
25. Clark AK, Bosanac S, Ho B, Sivamani RK. Systematic review of mobile phone-based teledermatology. *Arch Dermatol Res* 2018;310:675-89.
26. Snoswell C, Finnane A, Janda M, Soyer HP, Whitty JA. Cost-effectiveness of store-and-forward teledermatology: A systematic review. *JAMA Dermatol* 2016;152:702-8.
27. Wang RH, Barbieri JS, Nguyen HP, Stavert R, Forman HP, Bologna JL, *et al.* Clinical effectiveness and cost-effectiveness of teledermatology: Where are we now, and what are the barriers to adoption? *J Am Acad Dermatol* 2020;83:299-307.
28. Aldughayfiq B, Sampalli S. Digital health in physicians' and pharmacists' office: A comparative study of e-prescription systems' architecture and digital security in eight countries. *OMICS* 2021;25:102-2.
29. Handa S, Mehta H, Bishnoi A, Vinay K, Mahajan R, Narang T, *et al.* Teledermatology during the COVID-19 pandemic: Experience at a tertiary care centre in North India. *Dermatol Ther* 2021;34:e15022.
30. Bianchi MG, Santos A, Cordioli E. Dermatologists' perceptions on the utility and limitations of teledermatology after examining 55, 000 lesions. *J Telemed Telecare* 2021;27:166-73.
31. Kaliyadan F, Venkitakrishnan S. Teledermatology: Clinical case profiles and practical issues. *Indian J Dermatol Venereol Leprol* 2009;75:32-5.
32. Baranowski MLH, Balakrishnan V, Chen SC. Patient satisfaction with the veteran's administration teledermatology service. *J Am Acad Dermatol* 2019;S0190-9622(19)30143-4. Doi: 10.1016/j.jaad.2019.01.036. Epub ahead of print.
33. Hamad J, Fox A, Kammire MS, Hollis AN, Khairat S. Evaluating the experiences of new and existing teledermatology patients during the COVID-19 pandemic: Cross-sectional survey study. *JMIR Dermatol* 2021;4:e25999.