

Teledermatology and COVID-19 in a resource-limited country such as Nepal

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ABSTRACT

Background: Teledermatology has become a popular alternative tool for providing dermatology services during the COVID-19 pandemic worldwide. Despite being a rising health care modality, it helped to deliver uninterrupted services. The study aimed to determine the implementation, utilization, and acceptance of teledermatology services during the pandemic. **Objectives:** The aim was to assess the satisfaction of patients utilizing teledermatology services and to obtain their clinical and epidemiological data. **Methods:** This was a retrospective, observational, single-center study on patients using teledermatology services. Demographic data was analyzed and a questionnaire survey was conducted through phone calls regarding their experience of the service. **Results:** The mean age of the patients was 33.48 ± 17.89 years. Out of 122 teleconsultations, 89 patients could be contacted again for feedback, among which 81 (91%) found the service easy to use, 75 (84.3%) were able to express their problems similarly to visits in person, 49 (55.05%) regarded teleconsultation as the same as an in-person visit, 80 (89.9%) were satisfied, and 85 (95.5%) agreed to use the service in the future. Superficial fungal infection was the most common diagnosis (24.6%). Newly registered patients were more satisfied in comparison to follow-up patients (96.36% of new cases vs. 79.41% of follow-up cases, $p = 0.01$). **Conclusion:** Teledermatology was well accepted by the patients in the current scenario. Telehealth services have a promising role in the future in fulfilling public health demands.

Key words: Teledermatology; COVID-19; Resource-limited countries; Nepal

INTRODUCTION

Telemedicine is the use of telecommunication technologies to deliver health care over long distances [1,2]. The history of telemedicine may be traced centuries back, yet in the twentieth century, the first report of the transmission of electrocardiographic data by telephone wires was published [3]. In the 1920s, teleconsultations were provided to sea crew via radio transmissions, following which, in the 1960s, commercial types of equipment for telemedicine were employed by military and space technology departments [4,5]. Since then, telehealth services have steadily increased globally and numerous countries have established proper telehealth programs.

The word *telemedicine* was introduced in 1970 [5]. According to the WHO, telemedicine is defined as

“the delivery of health care services, where distance is a critical factor, by all health care professionals using information and communication technologies for the exchange of valid information for the diagnosis, treatment, and prevention of disease and injuries, research and evaluation, and continuing education of health care providers, all in the interest of advancing the health of individuals and their communities” [6]. Teledermatology refers to a branch of telemedicine that provides dermatological care from a distance with electronic telecommunication tools [7]. It has been used in the diagnosis and treatment of skin diseases, in monitoring skin conditions, and for educational and research purposes [8].

Teledermatology services have become popular in recent years and have been integrated into various public health sectors in a number of countries [9].

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Although face-to-face consultations remain the gold standard for diagnosis, teleconsultations have been accepted as a viable tool that reduces the unnecessary time taken, increases cost-effectiveness, and reduces the number of in-person consultations by triaging [10].

Tele dermatology is delivered as synchronous or real-time, asynchronous or store-and-forward, and hybrid modalities. Synchronous tele dermatology is delivered through live video conferencing between the dermatologist and patient. In the asynchronous or store-and-forward technique, clinical images taken by the clinician or patient are digitally stored and forwarded to the attending dermatologist, while the mixed or hybrid tele dermatology modalities combine live video conferencing and the store and forward technique [11]. Novel modalities such as mobile tele dermatology and teledermoscopy employ social smartphone applications along with dermoscopic attachment to deliver images [1,12]. In addition, there are some new app-based dermatology services available that provide direct dermatology services [13].

The individual's access to quality health care remains a challenge in a country such as Nepal. Geographic complexity, shortage of healthcare manpower, unavailability of healthcare facilities, higher costs, and urban-rural disparity of medical professionals are some of the other challenges in the health sector of low-to-middle-income countries. The implementation of tele dermatology has helped to overcome these barriers and improve healthcare services [14].

Lockdowns and social distancing due to COVID-19 have hampered dermatological services. Recently, due to the ongoing worldwide pandemic of COVID-19, tele dermatology has emerged as an alternative to overcome the crisis of disrupted dermatological services [15]. Dermatologists have been increasingly using tele dermatology services to reduce face-to-face contact, limit the spread of coronavirus infection, and overcome the current barriers to providing dermatology services to patients. Due to frequent lockdowns, it is not only in the rural areas yet also in the urban areas that tele dermatology has been providing healthcare services around the world [16].

As our center is a pioneering institute providing telehealth services for both rural and urban areas of Nepal, we conducted this study to explore the use of tele dermatology services and how they are received by patients in a low-income country such as Nepal [17].

MATERIALS AND METHODS

An observational, single-center study was conducted at a skin health center in Nepal. A retrospective data review of tele dermatology services from May 2020 to July 2021 was conducted. Patients included in the study were those who had received tele dermatology services from our center in the country. The tele dermatology model service was based on real-time videoconferencing and a hybrid model. The initial registration of the patients was performed through phone calls to the registration department by the phone number provided on the official website of the institute. The patients were instructed to be ready with previous prescriptions, medicines, or any reports. Then, real-time videoconferencing was done via Skype on an Android smartphone or a computer with a 4G Internet connection. The tele dermatology service was provided by the doctor as specified by the patients. A detailed history was obtained from the patients and examination was done on live videoconferencing. Informed consent was taken from the patients to obtain photos and videos. Patients below eighteen years of age were consulted in the presence of their guardian. Images, recordings, and investigations were sent by the patients with the application. A provisional diagnosis was reached and treatment was provided. Follow-up was advised to the patients as required. An in-person visit to the center was advised to the patients requiring a skin biopsy or any emergencies. Details about the patient's history, examination, diagnosis, treatment, and follow-up were recorded in a patient's datasheet.

The patient's details, including age, sex, address, new case/follow-up case, chief complaints, duration of the disease, provisional/definitive diagnosis, and management, were noted from the patient's datasheet. An approximate distance from the patient's address to the location of the institute and the total time required for travel were measured with Google Maps and noted. The patients were contacted and asked to share their experience of using tele dermatology services. The patient's questionnaire was taken from the telehealth usability questionnaire (TUQ) with modifications [18,19]. Five questionnaires representing ease-of-use, interaction quality, reliability, satisfaction, and future use were selected and asked to the patients (Table 1). Responses from the patients in the form of yes-or-no answers were noted.

Statistical analysis was performed using SPSS Statistics, version 20. Qualitative data was described as

frequencies and proportions. $p < 0.05$ was considered significant. The Pearson's chi-square test was used to compare categorical variables. Missing data was excluded from the study.

Ethics Statement

Ethical clearance was obtained from the institute's review committee.

RESULTS

A total of 134 patients were provided with teledermatology services during the study period. Out of 134 teleconsultations, 122 were done in the country, while 12 were done outside of it. There was a peak in the number of patients using teledermatology services during lockdowns (May to August 2020 and May to July 2021) in the country (Fig. 1).

Patient Demographics

The mean age of the patients using teledermatology services was 33.48 ± 17.89 years (from 6 months to 87 years). Among the 122 patients, 49 (40.2%) were males and 73 (59.8%) were females. The majority of the patients (64.8%; $n = 79$) were from outside the city where the institute was located, and 35.2% of the patients ($n = 43$) were from the city. The average

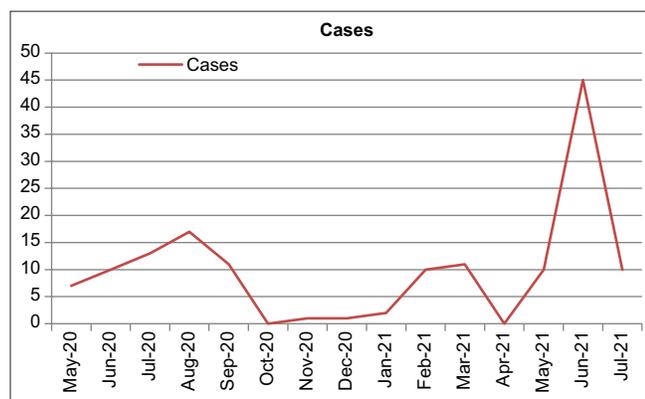


Figure 1: Trend of teledermatology consultation.

Table 1: Survey questionnaire for the patients

1. Was it convenient for you to use the system? Yes/no. (ease of use)
2. Were you able to express yourself as effectively as during an in-person visit? Yes/no. (interaction quality)
3. Was the visit provided by the teledermatology service similar to an in-person visit? Yes/no. (reliability)
4. Were you satisfied with the teledermatology service? Yes/no. (satisfaction)
5. Will you use the teledermatology service in the future? Yes/no. (use in future)

distance from the institute to the patient's residence was 144.84 ± 157.20 km (2–721 km). The mean travel time was estimated at 385.31 ± 889.52 minutes (10–8600 minutes). Out of the 122 patients, 74 (60.7%) were new cases, while 48 (39.3%) were follow-up patients (Table 2).

Disease Characteristics

The average duration of illness was 7.53 ± 19.51 months, ranging from 4 days to 144 months. A definitive diagnosis was reached in 112 cases (91.8%), while in ten cases, in which a skin biopsy was required for confirmation, only a probable diagnosis was given. Fungal infection was the most common diagnosis ($n = 30$; 24.6%), followed by pigmentary disorders ($n = 26$; 21.3%), urticarial disorders ($n = 19$; 15.6%), eczematous or dermatitic disorders ($n = 17$; 13.9%), acne vulgaris ($n = 10$; 8.2%), hair and nail disorders ($n = 7$; 5.7%), acne vulgaris and pigmentary disorders ($n = 4$; 3.3%), papulosquamous disorders ($n = 3$; 2.5%), other diseases ($n = 3$; 2.5%), bacterial and viral infection ($n = 1$; 0.8%), immunobullous disorder ($n = 1$; 0.8%), sexually transmitted disease ($n = 1$; 0.8%) (Table 3).

Patient's Experience

Eighty-nine patients could be contacted again and asked to share their experience regarding the teledermatology service. Among the 89 patients, 81 (91%) regarded the service as simple to use, while 8 (9%) as inconvenient. Regarding the ability to express themselves, seventy-five patients ($n = 75$; 84.3%) were able to express their problems similarly to direct visits, while fourteen patients ($n = 14$; 15.7%) were unable to do so. Forty-nine patients ($n = 49$; 55.05%) thought teleconsultation was the same as in-person visits, and forty patients ($n = 40$; 44.95%) did not find it similar. The majority of the patients ($n = 80$;

Table 2: Demographic data of the patients

Total number of patients (n)	122
new cases	74 (60.7%)
follow-up cases	48 (39.3%)
Mean age	33.48 ± 17.89 yrs.
Sex	
male	49 (40.2%)
female	73 (59.8%)
Mean disease duration	7.53 ± 19.51 months (4 days to 144 months)
Average distance (from the institute to the patient's residence)	144.84 ± 157.20 km
Average travel time	385.31 ± 889.52 minutes
Definitive diagnosis	112 (91.8%)
Probable diagnosis	10 (8.2%)

89.9%) were satisfied, while only nine ($n = 9$; 10.1%) were unsatisfied with the service. Finally, 85 patients (95.5%) agreed to use teledermatology services in the future, while four (4.5%) did not agree (Table 4).

Overall satisfaction was independent of age ($p = 0.81$), sex ($p = 0.64$), definitive/probable diagnosis ($p = 0.81$), the patient's residence ($p = 0.48$), and the disease diagnosed ($p = 5.42$). Yet, the difference in satisfaction between newly registered cases (53/55; 96.36%) and follow-up cases (27/34; 79.41%) was statistically significant ($p = 0.01$) (Table 5).

DISCUSSION

In a developing, low-income country such as Nepal, the health system is unable to meet the demand of the rural and marginalized population due to limited resources and facilities. The higher cost and time required to access health services have worsened the situation even more [14]. A large number of

dermatologists are concentrated in urban areas in comparison to rural areas, creating a disparity [20]. Teledermatology may bridge the gap between the demand and supply of dermatological healthcare facilities by allowing specialists to evaluate, diagnose, manage, and provide follow-ups to underserved populations [17]. Patient care in remote areas reduces the expenses related to distance traveled and referrals; hence, teledermatology overall improves the healthcare system of the country. Several studies have highlighted the importance of telemedicine in resource-limited settings to overcome barriers and improve health services [21,22]. However, geographic difficulties, weather conditions, poor communication systems, lack of healthcare facilities in rural areas, and the economic burden of accessing health facilities are the issues that have limited the expansion of teledermatology services in the country [14].

Teledermatology has emerged as a viable healthcare service amid the pandemic [23]. It has proven to become an effective way of providing essential health services along with a reduced risk of transmission of infection in the community [24]. Apart from this, teledermatology has also demonstrated its advantage of being cost-effective and time-saving during the pandemic in comparison to direct consultations in

Table 3: Prevalence of the skin diseases

Diseases	Number of Patients	Percentage
Acne vulgaris	10	8.2%
Pigmentary disorders	26	21.3%
Acne vulgaris and pigmentary disorders	4	3.3%
Eczematous/dermatitic disorders	17	13.9%
Fungal infections	30	24.6%
Papulosquamous disorders	3	2.5%
Bacterial and viral infections	1	0.8%
Urticarial disorders	19	15.6%
Hair and nail disorders	7	5.7%
Sexually transmitted diseases	1	0.8%
Immunobullous disorders	1	0.8%
Other diseases	3	2.5%
Total	$n = 122$	100%

Table 4: Responses to the survey

Parameter	Responses ($n = 89$)	Percentage
Convenience/ease of use		
yes	81	91%
no	8	9%
Able to express oneself		
yes	75	84.3%
no	14	15.7%
Same as an in-person visit		
yes	49	55.05%
no	40	44.95%
Satisfied		
yes	80	89.9%
no	9	10.1%
Will use in the future		
yes	85	95.5%
no	4	4.5%

Table 5: The patients' satisfaction

Variable	Overall Satisfaction ($n=89$)		p Value
	yes	no	
Age	—	—	0.81
Sex			
Male	33	3	0.64
Female	47	6	
Registration			
New	53	2	0.01*
Follow-up	27	7	
Diagnosis			
Definitive	73	8	0.81
Probable	7	1	
Patient's residence			
Inside the city (institute's location)	27	2	0.48
Outside the city (institute's location)	53	7	
Disease diagnosis			
Acne vulgaris	7	1	5.42
Pigmentary disorders	16	3	
Acne vulgaris and pigmentary disorders	3	0	
Eczematous/dermatitic disorders	10	3	
Superficial fungal infections	19	1	
Papulosquamous disorders	1	0	
Bacterial and viral infections	1	0	
Urticarial disorders	15	1	
Hair and nail disorders	4	0	
Sexually transmitted diseases	1	0	
Immunobullous disorders	1	0	
Other diseases	2	0	

* P value significant.

different studies [25,26]. There has been an increased demand for teledermatology services not only in rural areas, yet also in urban [27]. Also, there has been higher patient satisfaction with teledermatology services during COVID-19. In a study by Ruggiero et al., 92.3% of acne patients were satisfied with the dermatologist after a teleconsultation [28]. However, the inability to receive clinical procedures, the uncertainty of reimbursement to the treating physician, missing diagnoses, poor visual resolutions for reaching a diagnosis, a lack of infrastructure, and mental distress among the dermatologists are some of the challenges faced during the pandemic [29].

This retrospective review was conducted to determine the implementations, advantages, drawbacks, and future possibilities of teledermatology services in our center. In this study, we observed a peak in the use of teledermatology services in August 2020 with seventeen cases per month and, then, in June 2021 with forty-five cases per month, which was the time of a strict, nationwide lockdown. This indicates an increased demand for teledermatology services at times of difficulty in accessing health services. However, in comparison to direct consultations at the outpatient department, the number of cases seen was lower.

The sex distribution among those seeking teledermatology services was similar in our study. Most of the patients were outside the city in which our center was located, which highlights the improved access to health services to underserved populations at the time of the pandemic. The distance of care provided was as far as approx. 721 km, which included the rural areas of the country. In studies by Coustasse et al. and Maddukuri et al., similar uses of teleservices in rural areas were found [30,31].

A definitive diagnosis was reached in 91.8% of the cases in our study. In a study by Oliveira et al., teledermatology services showed a high level of diagnostic agreement and accuracy [32]. However, diagnostic accuracy could not be assessed in our study due to the inability of the patient to visit the center to confirm the diagnosis during COVID-19.

Regarding the patients' experiences with teledermatology services, a majority found the service easy to use and were able to express their problems properly. Similarly, most of the patients were satisfied with the service and agreed to use it again in the future. These findings were similar to results observed in previous studies [19,33,34].

In contrast to a review by Hadelier et al., the number of individuals who preferred teleconsultations and face-to-face consultations was almost equal [34]. Newly registered cases were more satisfied in comparison to follow-up cases with a statistical significance, probably due to prior in-person visits by a large number of follow-up patients. Patients with superficial fungal infection had the highest level of satisfaction, which was around 95%, similarly to results achieved by Handa et al. [33].

Decreased travel costs and time, shorter waiting lists, and the avoidance of unnecessary face-to-face contact are some of the reasons for the acceptance of teledermatology by the general population. Teledermatology has been well accepted not only by patients but also by dermatologists [35]. Unfortunately, we were not able to assess the acceptance of teledermatology by dermatologists in our study.

Teledermatology has its challenges and limitations in a country such as Nepal. An expensive setup and equipment, a lack of a legal framework, medical practitioners lacking skills on telemedicine, and poor integration of telemedicine in the healthcare system are some of the shortcomings. One non-government organization, Community Health Education Services by Telehealth (CHEST), has provided telemedicine services to remote areas of Nepal without access to healthcare, even during the pandemic [17]. Recently, telemedicine guidelines were also provided by the Nepal Medical Council under the Nepal Medical Council Act of 1964 to strengthen teleservices in the country [36].

Although most patients are satisfied, there are many who still prefer in-person consultation over teleconsultation. Also, numerous skin diseases require diagnosis and management under the direct care of a treating doctor, which is a drawback for the dermatologist. Thus, we should understand that both face-to-face consultation and telemedicine have their benefits and limitations. Teledermatology, however, has emerged to provide skin healthcare during the difficult times of the COVID-19 pandemic, the importance of which cannot be underestimated.

CONCLUSION

This study provided insight into patient acceptance of teledermatology in Nepal. Although teledermatology is

a rising subspeciality in Nepal, it has established itself as a powerful tool for providing health services with a high degree of acceptance among people. Still, a poor Internet connection in parts of the country, inability to access Internet services due to socioeconomic reasons, and illiteracy are some of the hurdles in the implementation of teledermatology services in Nepal. The limitations of the study were the small number of patients, the single-center location of the study, and the retrospective design. Further studies are required to understand the role of teledermatology, its implementation and integration in health services, and its establishment as a viable alternative health service during times of crisis.

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Statement of Human and Animal Rights

All the procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the 2008 revision of the Declaration of Helsinki of 1975.

Statement of Informed Consent

Informed consent for participation in this study was obtained from all patients.

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