

# Acceptability and Feasibility of Community Management of Ear Patients through Tele-otology Services in Outskirts of Kathmandu Valley, Nepal

Luna Mathema<sup>1</sup>, Rajan Shrestha<sup>2</sup>, Arun Adhikari<sup>1</sup>, Prasanta Poudyal<sup>1</sup>, Sanjib Kumar Upadhyay<sup>1</sup>, Bijay Khatri<sup>2</sup>

<sup>1</sup>Department of ENT-HNS, Hospital for Children, Eye, ENT, and Rehabilitation Services (CHEERS), Madhyapur Thimi, Lokanthali, Bhaktapur, Bagmati, Nepal.

<sup>2</sup>Academic and Research Department, Hospital for Children, Eye, ENT, and Rehabilitation Services (CHEERS), Madhyapur Thimi, Lokanthali, Bhaktapur, Bagmati, Nepal.

## ARTICLE INFO

### Article history:

Received: 13 January 2022

Revised: 16 March 2022

Accepted: 27 May 2022

### \*Correspondence:

Dr. Luna Mathema, MD,  
Department of ENT-HNS,  
Hospital for Children, Eye, ENT,  
and Rehabilitation Services  
(CHEERS), Madhyapur Thimi,  
Lokanthali, Bhaktapur, Nepal.

### E-mail:

lunashrestham@gmail.com

### Citation:

Mathema L, Shrestha R, Adhikari A, Poudyal P, Upadhyay SK, Khatri B. Acceptability and Feasibility of Community Management of Ear Patients through Tele-otology Services in Outskirts of Kathmandu Valley, Nepal. *MedS. J. Med. Sci.* 2022;2(3):12-17.

## ABSTRACT

**INTRODUCTION:** Tele-otology is one of the least explored areas of telehealth in Nepal. The objective image findings and live virtual specialist consultation using synchronous data exchange can address the different barriers to basic otological care in low-resource settings like Nepal. This study was conducted to explore the acceptability and feasibility of community management of ear patients through tele-otology. **MATERIALS AND METHODS:** It was a cross-sectional descriptive study conducted at a tertiary level ENT hospital in Bhaktapur and three outreach clinics of the hospital in the periphery of Kathmandu valley from 1st April to 31st May 2021. Trained community ear health workers (CEHWs) used mobile data in fields and communicated with ENT consultants at the base hospital with fiber-to-the-home internet connection for teleconsultation. The satisfaction was measured using a 5-point Likert scale. **RESULTS:** This study has shown satisfactory acceptance among beneficiaries and service providers. The sound quality rating was  $4.5 \pm 0.8$  at field-site and  $4.5 \pm 0.9$  at base hospital. The video quality ratings were  $4.4 \pm 0.8$  and  $4.0 \pm 1.1$  at field-site and base hospital, respectively; this difference was statistically significant ( $p=0.017$ ). **CONCLUSIONS:** With trained grassroots level workers and quality internet connections, tele-otology can play a significant role in the early identification and diagnosis of ear diseases, including middle ear pathologies, as well as bridging the ear care service gap in resource constraints settings like Nepal.

**Keywords:** Ear diseases, early diagnosis, outreach clinics, telehealth

## INTRODUCTION

The Telemedicine uses electronic platforms to communicate technology to provide and support healthcare when distance separates participants [1]. Its use has been well established in many fields of medicine, but its role in academic surgical subspecialties is yet to be fully explored [2]. Virtual platforms in developed countries are advanced to include remote robotic surgeries [3]. The coronavirus disease (COVID-19) pandemic has compelled developing countries like Nepal to seek or utilize virtual platforms like telemedicine for healthcare delivery. Telemedicine is widely

applicable in otolaryngology, as diagnoses are mainly based on objective image findings. It is useful to diagnose and treat tympanic membrane and middle ear disease[2]. Live virtual synchronous tele-otology consultation can address different barriers to basic otological care in low-resource settings like Nepal. This study was conducted to find the acceptability and feasibility of tele-otology consultation at a tertiary level, ENT hospital and three community-based clinics in Nepal.

## MATERIALS AND METHODS

### Study design and setting

A cross-sectional descriptive study was conducted from 1st April to 30th May 2021, during Nepal's second wave of COVID-19 pandemic. The tertiary level ENT facility, Hospital for Children, Eye, ENT, and Rehabilitation Services (CHEERS), was purposely selected as the base hospital for the availability of tele-otology setup, dedicated internet facility, and ENT consultants. Three out of five outreach clinics at the periphery of Kathmandu valley of the base hospital were selected randomly. The outreach services are conducted once a week in each outreach center.

### Participants and study procedure

Only the patients aged 18 years and above visiting the outreach clinics for ear care were included in the study. Patients coming to the outreach clinics without face masks were excluded from the study. The study tool was developed from literature review and finalized in consultation with a telemedicine technician, a public health expert, and an ENT consultant. Three Community Ear Health Workers (CEHWs) were trained on study tools and tele-otology techniques to minimize inter-observer bias. Pre-testing was conducted at Siddhi Memorial Hospital, Bhaktapur. CEHWs were trained to ensure uniform methods of approaching the potential participants, explaining the nature of information needed, taking written consent, and extracting the information through interviewing. They wore a protective gown, mask, cap, gloves, face shields, and sanitized their hands and ear tips of an otoscope before each ear examination and a face-to-face interview. Welch Allyn Digital Macroview™ Otoscope, serial number 23920, was used for teleconsultation in real-time for video conference with Zoom (Zoom Video Communications, Inc., California, USA) with the consultant at the base hospital. The still photos were also transferred when required. We used fiber-to-the-home internet from World Link (WorldLink Communications Ltd., Lalitpur, Nepal) with 50 megabits per second (Mbps) speed at the base hospital, and mobile data from Nepal Telecom (Nepal Doorsanchar Company Ltd., Kathmandu, Nepal) with 5 Mbps internet was used in the field.

### Data management and statistical analysis

The collected data were checked for completeness, legibility, and consistency on the same day of data collection. Data was entered in EpiData 3.1

(Released 2008. EpiData Association, Odense, Denmark) on the same day of data collection. Data were further cleaned and categorized using MS Excel 365 (Released 2020. Microsoft Corp., Redmond, Washington, United States). Analysis was done using IBM SPSS Statistics for Windows, Version 26.0 (Released 2019. IBM Corp., Armonk, New York, United States). Continuous variables are shown as the mean, standard deviation (SD), and categorical variables as frequency and percentage. Satisfaction level variables were measured on a 5-point Likert scale, 1 being the lowest score and 5 being the highest score, reported as mean and SD. Independent sample t-test was applied to check the differences between the means of the two groups. A p-value less than 0.05 was considered statistically significant.

### Ethical considerations

Participation in this study was voluntary. This study adhered to the Declaration of Helsinki guidelines. All procedures involving research participants were approved by the Ethical Review Board (ERB) of the Nepal Health Research Council (ERB Protocol Registration No. 134/2021 P). Written informed consent was obtained from each participant.

## RESULTS

All 80 patients approached agreed to participate in the study. The participants' mean (SD) age was 45.3 ( $\pm 16.5$ ) years. One in five patients was aged 60 years and above, and more than half of the participants were female (52.5%). Nearly two-thirds of the participants were indigenous Janajatis (Newars, Tamangs, etc.), as shown in Table 1.

**Table 1| Socio-demographic characteristics of patients at outreach clinics (n=80)**

Characteristics	Number (n)	Percent
<b>Age -Group</b>		
18 – 59 years	66	82.5
60 – 80 years	14	17.5
<b>Gender</b>		
Male	38	47.5
Female	42	52.5
<b>Ethnicity</b>		
Brahmin & Chhetris	27	33.7
Newars	42	52.5
Tamangs	8	10.0
Other disadvantaged Janajatis	3	3.8

**Table 2 | Availability of ear care services for patients coming to outreach clinics (n=80)**

Ear care services	Mean	SD	Range
Nearest primary ear care center			
Distance to nearest center (in Kilometers)	1.4	1.3	0.1 - 10.0
Walking distance to reach nearest center (in Minutes)	28.1	19.1	5.0 – 120.0
Local bus fare to reach nearest center (in Nepali Rupees)	18.6	7.6	15.0 – 60.0
Nearest ear care specialty center			
Distance to nearest center (in Kilometers)	13.9	2.1	12.0 – 18.0
Time to reach nearest center in Taxi (in Minutes)	45.5	12.9	35.0 - 75.0
Taxi fare to reach nearest center (in Nepali Rupees)	636.5	182.3	470.0 – 1010.0

**Table 3 | Ear diseases pattern among patients at outreach clinics (n=160)**

Disease	Number	Percent
No abnormality detected	102	63.8
Impacted wax	21	13.1
Tinnitus	11	6.9
Chronic suppurative otitis media	10	6.2
Acute otitis media	4	2.5
Eustachian tube dysfunction	4	2.5
Vertigo	4	2.5
Others (Otitis media with effusion, foreign body)	4	2.5

**Table 4 | Satisfaction score regarding tele-otology service perceived by patients at outreach clinics (n=80)**

Statements	Mean	SD
I felt like reaching hospital with consultant service after utilizing tele-otology service	4.4	0.8
I trust in the technology used	4.5	0.8
I felt comfortable talking with consultant	4.5	0.8
I would have visited consultants if I didn't have got this service here	1.2	0.4
<i>1= lowest score, 5= highest score</i>		

**Table 5 | Perceived satisfaction by field-level staff and consultants at the base hospital (n=160)**

Statements	Perceived satisfaction score among:				p-value*
	Field level staff (n= 80)		ENT consultant at base hospital		
	Mean	SD	Mean	SD	
Easiness of examination using tele-otology	4.6	0.7	-	-	
Easiness to consult with ENT consultant	4.6	0.7	-	-	
Satisfaction with sound quality	4.5	0.8	4.5	0.9	0.595
Satisfaction with video/photo quality	4.4	0.8	4.0	1.1	0.017
Satisfaction with internet quality	4.4	0.8	4.3	1.1	0.306
Satisfaction with overall technology	4.6	0.7	4.4	1.0	0.120
<i>1= lowest score, 5=highest score; CEHW: Community Ear Health Worker, ENT: Ear, Nose, and Throat, *=Independent sample t-test</i>					

Among the 80 participants, 45.0%, 30.0%, and 25.0% were service seekers from Bajrabarahi Chapagaun Hospital, Bode Maternal Child Health Clinic, and Changunarayan Municipality Hospital, respectively. The patients had to travel as far as 10 kilometers to reach the nearest health facility with primary ear care services, which usually takes a 120-minute walk, and local bus fares could be as high as one American dollar (US\$), equivalent to Nepali Rupees (NRs.) 120.00. The service was available only once a week at these centers. If the same patients had to travel for consultant specialist otolaryngologist service, one had to travel as far as 18 kilometers, which sometimes takes 75 minutes in a taxi, and the taxi fare could be as high as US\$ 8.4 (NRs. 1,010.00) as shown in Table 2.

Among 160 ears examined, 13.1% had impacted wax and 6.2% had chronic suppurative otitis media, as presented in Table 3.

Besides 29 out of 102 ears with normal findings had complaints of hearing loss and were referred for hearing evaluation. Regarding the patient's satisfaction, the average score showed that they strongly liked the technology, trusted it, and even felt like reaching the hospital with consultant services after utilizing tele-otology services, as shown in Table 4.

They also expressed that they would not have visited higher-level health facilities with consultant services even if they had not had the tele-otology service in their nearest primary ear treatment center. The CEHWs at field-based outreach clinics were strongly satisfied with tele-otology and the easiness of teleconsultation with ENT consultants. The CEHWs at outreach clinics were relatively more satisfied with sound quality, video quality, internet quality, and overall technology than the consultants at the base hospital but the difference is only significant for video quality satisfaction score ( $p=0.017$ ), as depicted in Table 5.

## DISCUSSION

This study was conducted to explore the community acceptance and feasibility of real-time consultation of tele-otology services at primary ear treatment centers on the outskirts of Kathmandu valley. Every patient coming for ear care was approached for tele-otology consultation, and all agreed to participate in the study. They were strongly satisfied with the availability of

consultation services at their doorsteps through the technology. The ear health workers at the field-based primary ear care center were relatively more satisfied with the technology than the ENT consultants at the base hospital. All patients approached to participate in this study agreed to utilize the tele-otology consultation services and took part in the study. This could be due to the attraction to new technology for the patients and the availability of consultant services at their doorsteps; who else would have to travel longer with higher taxi fares, as shown by this study to visit a consultant to the nearest specialty service provider, and even would have a long waiting time for consultation in times of pandemic.

Nonetheless, our study shows very good patient satisfaction as most of them were strongly satisfied after visiting the clinic itself with a score of 4.4 out of 5, which is similar to other studies by Layfield et al. in Pennsylvania, where the satisfaction score was 6.01 out of 7 [4]. In a study in Ohio by Siem et al., there was 86% satisfaction [5]. Other study by Varkey et al. at Mayo clinic also showed good satisfaction among patients with telemedicine, with all patients strongly agreeing that they will use telemedicine again [6]. Patient satisfaction could be higher due to patients needing to rely on such technology due to movement restrictions or fear of traveling long distances during the COVID-19 pandemic. Besides, the teleconsultation with the specialist in our study was free of cost, and direct visualization of their tympanic membrane by the patients themselves must also have influenced the satisfaction rate.

This study showed that the likelihood of our patients visiting a specialty center if tele-otology service was not available was very low. In the study in the United Kingdom (UK) by Seim et al., 62% of participants responded that they would have visited a specialist if the tele-otology was unavailable [5]. This difference might be due to the different scenarios of the study; where our study was conducted amid the COVID-19 pandemic, where the government had enforced restrictions on movement to curb the spread of the diseases. In addition, the UK is one of the developed countries, with better education and awareness level than Nepal as well as higher purchasing power to consult the specialty services. Our study used grass-root level health care providers for the field (community clinics) with little training, which was



in concordance with other studies by Varkey et al. and Gupta et al. where they also had trained non-ENT specialists [6, 7]. Studies by Siem et al. and Mandavia et al. have used otolaryngologists both at the base hospital and field, and their diagnosis has been compared and has yielded good results [5, 8]. In a study by Biagio et al., video-otoscopic images acquired by an otolaryngologist and a trained hearing telehealth clinic facilitator were found to be equally effective for asynchronous diagnosis by an otolaryngologist compared with conventional face-to-face otoscopy [9]. In a developing country like Nepal with scarce specialized health care facilitators, tele-otology can cover a wider population with the help of minimally trained human resources and limited mobility. Our study has shown a very good acceptance of the sound and video quality both at the field site and at the base hospital, with a video rating of 4.5 and 4.4 out of 5, whereas sound quality ratings of 4.5 and 4.0 out of 5 in the community field and base hospital, respectively. The satisfaction with overall technology was 4.6 and 4.4 out of 5 in the community field and base hospital, respectively. In a study by Biagio et al., otolaryngologists rated the image quality as acceptable or better in 87% of cases [9]. Similarly, Lundberg et al. stated that the overall image quality was good, with 82.3% acceptable or excellent quality [10]. Other studies by Biagio et al. and Mbaio et al. also have stated good image adequacy for remote diagnosis [9, 11]. In a systematic review article by Ning et al., the provider satisfaction result varied from 92 % to 100%, whereas in another scoring system, they showed variation from 5.6/10 to 8.7 /10 whereas, in the first one, an asynchronous model was used [12]. Similar satisfaction has been demonstrated by studies by Layfield et al., Seim et al., and Hentati et al., and was generally satisfied with the interface

quality [4, 5, 13]. Although 50 Mbps internet was used in the base hospital compared to 5 Mbps in the field, the internet service at the hospital was a shared one. This might be the reason for lower satisfaction among consultants in our study, suggesting that a dedicated internet line should be preferred for telehealth services. Our study was conducted during the second wave of the COVID-19 pandemic in Nepal, where there was a restriction in movements, and we just had 80 participants. Furthermore, the context of the COVID-19 pandemic also affects patients' perception of telemedicine. This study was limited to the feasibility study and did not account for the financial aspects of tele-otology setup or service fees for teleconsultation.

## CONCLUSIONS

Integrating tele-otology services in existing health facilities seems to be well accepted by the community. They seemed to be satisfied with getting live teleconsultation with an ENT consultant near their doorsteps. With trained community ear health workers, the teleconsultation from the base hospital also seems feasible for consultants with high satisfaction levels regarding the visuals and sound quality. In the current pandemic scenario, where travel is restricted in countries like Nepal with difficult terrain and limited human resources, tele-otology might significantly bridge the service gap in ear care. Moreover, tele-otology may have a significant role in the early identification and diagnosis of middle ear disease and in preventing or timely management of deafness and life-threatening pathology in developing countries like Nepal. However, further long-term studies are recommended to determine the acceptance and cost-effectiveness of tele-otology.

## ADDITIONAL INFORMATION AND DECLARATIONS

**Acknowledgements:** Authors wish to thank all the study participants, Community Ear Health Workers and Consultant Doctors for their support during this study. Authors would also like to thank CHEERS family for their support with tele-otology set-up, equipment and internet services during the study.

**Competing Interests:** The authors declare no competing interests.

**Funding:** This work was partially supported by Nepal Health Research Council under Provincial Health Research Grant [2021, 2077/78].

**Author Contributions:** Concept and design: LM, RS, and PP; Literature review: LM; Statistical analysis: RS and BK; Writing the manuscript: LM, RS, and BK; Revision and editing: LM, RS, AA, PP, SKU, and BK. All authors have read and agreed with the contents of the final manuscript for publication..

**Data Availability:** Data will be available upon request to corresponding authors after valid reason.

## REFERENCES

1. Dasgupta A, Deb S. Telemedicine: A new horizon in public health in India. *Indian Journal of Community Medicine*. 2008;33(1):3-8. [\[Article\]](#)
2. Garritano FG, Goldenberg D. Successful telemedicine programs in otolaryngology. *Otolaryngologic clinics of North America*. 2011;44(6):1259-74, vii. [\[Article\]](#)
3. Anvari M, McKinley C, Stein H. Establishment of the world's first telerobotic remote surgical service: for provision of advanced laparoscopic surgery in a rural community. *Ann Surg*. 2005;241(3):460-4. [\[Article\]](#)
4. Layfield E, Triantafillou V, Prasad A, Deng J, Shanti RM, Newman JG, et al. Telemedicine for head and neck ambulatory visits during COVID-19: *Evaluating usability and patient satisfaction*. *Head Neck*. 2020;42(7):1681-9. [\[Article\]](#)
5. Seim NB, Philips RHW, Matrka LA, Locklear B, Inman M, Moberly AC, et al. Developing a synchronous otolaryngology telemedicine Clinic: Prospective study to assess fidelity and diagnostic concordance. *The Laryngoscope*. 2018;128(5):1068-74. [\[Article\]](#)
6. Varkey P, Schumacher K, Swanton C, Timm B, Hagen PT. Telemedicine in the work site: a study of feasibility, and patient and provider satisfaction. *Journal of telemedicine and telecare*. 2008;14(6):322-5. [\[Article\]](#)
7. Gupta N, Baghotia KS, Rabha M, Sachdeva S, Sahai G, Bhatnagar K, et al. Comprehensive Community Screening of Otolological Patients by Trained Technicians Using a Telemedicine Device: An Efficient and Cost-Effective Way to Triage Patients With Ear Diseases. *Ear, nose, & throat journal*. 2021;100(3\_suppl):263s-8s. [\[Article\]](#)
8. Mandavia R, Lapa T, Smith M, Bhutta MF. A cross-sectional evaluation of the validity of a smartphone otoscopy device in screening for ear disease in Nepal. *Clinical otolaryngology : official journal of ENT-UK ; official journal of Netherlands Society for Oto-Rhino-Laryngology & Cervico-Facial Surgery*. 2018;43(1):31-8. [\[Article\]](#)
9. Biagio L, Swanepoel DW, Laurent C, Lundberg T. Video-otoscopy recordings for diagnosis of childhood ear disease using telehealth at primary health care level. *Journal of telemedicine and telecare*. 2014;20(6):300-6. [\[Article\]](#)
10. Lundberg T, Westman G, Hellstrom S, Sandstrom H. Digital imaging and telemedicine as a tool for studying inflammatory conditions in the middle ear--evaluation of image quality and agreement between examiners. *Int J Pediatr Otorhinolaryngol*. 2008;72(1):73-9. [\[Article\]](#)
11. Mbaio MN, Eikelboom RH, Atlas MD, Gallop MA. Evaluation of video-otoscopes suitable for tele-otology. *Telemedicine journal and e-health : the official journal of the American Telemedicine Association*. 2003;9(4):325-30. [\[Article\]](#)
12. Ning AY, Cabrera CI, D'Anza B. Telemedicine in Otolaryngology: A Systematic Review of Image Quality, Diagnostic Concordance, and Patient and Provider Satisfaction. *The Annals of otology, rhinology, and laryngology*. 2021;130(2):195-204. [\[Article\]](#)
13. Hentati F, Cabrera CI, D'Anza B, Rodriguez K. Patient satisfaction with telemedicine in rhinology during the COVID-19 pandemic. *Am J Otolaryngol*. 2021;42(3):102921. [\[Article\]](#)

## Publisher's Note

MJMMS remains neutral with regard to jurisdictional claims in published materials and institutional affiliations.

CCREACH will help you at every step for the manuscript submitted to MJMMS.

- We accept pre-submission inquiries.
- We provide round the clock customer support
- Convenient online submission
- Plagiarism check
- Rigorous peer review
- Indexed in NepJOL and other indexing services
- Maximum visibility for your research
- Open access

Submit your manuscript at:  
Website: [www.medspirit.org](http://www.medspirit.org)  
e-mail:  
[editormjmms@gmail.com](mailto:editormjmms@gmail.com)

