target should move towards gram-negative infections rather than gram-positive ones is a question to be answered by further research.

Conflicts of interest: There are no conflicts of interest.

Navya Mathew[1], Shweta Ann Suresh[1], Lisha Pallivalappil[2], Kundoly Velayudhan Suseela[3]

Departments of [1]Pulmonary Medicine, [2]Pulmonary Medicine and Critical Care, [3]Microbiology, Amala Institute of Medical Sciences, Thrissur, Kerala, India

***Corresponding author:** Lisha Pallivalappil, Department of Pulmonary Medicine and Critical Care, Amala Institute of Medical Sciences, Thrissur, Kerala, India. E-mail: drlishapvranjith@gmail.com*

References

1. Turner NA, Sharma-Kuinkel BK, Maskarinec SA, Eichenberger EM, Shah PP, Carugati M, *et al*. Methicillin-resistant staphylococcus aureus: An overview of basic and clinical research. Nat Rev Microbiol 2019;17:203-18.
2. Dantes R, Mu Y, Belflower R, Aragon D, Dumyati G, Harrison LH, *et al*. National burden of invasive methicillin-resistant Staphylococcus aureus infections, United States, 2011. JAMA Intern Med 2013;173:1970-8.
3. CLSI. Performance standards for antimicrobial susceptibility testing, 30th ed. CLSI document M100. Clinical and Laboratory Standards Institute; 2023.
4. U.S. Centers for Disease Control and Prevention. The National Healthcare Safety Network (NHSN) Manual: NHSN [2022] Toolkit and Guidance for External Validation. Atlanta, GA: Division of Healthcare Quality Promotion, National Center for Emerging and Zoonotic Infectious Diseases. https://www.cdc.gov/nhsn/pdfs/validation/2022/2022-nhsn-ev-guidance-508.pdf
5. Bassetti M, Del Puente F, Magnasco L, Giacobbe DR. Innovative therapies for acute bacterial skin and skin-structure infections (ABSSSI) caused by methicillin-resistant Staphylococcus aureus: Advances in phase I and II trials. Expert Opin Investig Drugs 2020;29:495-506.
6. Wolde W, Mitiku H, Sarkar R, Shume T. Nasal carriage rate of staphylococcus aureus, Its associated factors, and antimicrobial susceptibility pattern among health care workers in Public Hospitals, Harar, Eastern Ethiopia. Infect Drug Resist 2023;16:3477-86.
7. Patil SS, Suresh KP, Shinduja R, Amachawadi RG, Chandrashekar S, Pradeep S, *et al*. Prevalence of methicillin-resistant Staphylococcus aureus in India: A systematic review and meta-analysis. Oman Med J 2022;37:e440.
8. Ghia CJ, Waghela S, Rambhad G. A systemic literature review and meta-analysis reporting the prevalence and impact of methicillin-resistant staphylococcus aureus infection in India. Infect Dis (Auckl) 2020;13:1178633720970569.
9. Jayadhar AT, Jitendranath A, Thomas AA, Sarika G S. Nasal carriage of meticillin-resistant Staphylococcus aureus amongst healthcare workers of intensive care unit of a tertiary care centre in South India: An observational cross-sectional study. J Patient Saf Infect Control 2020;8:64-7. Available from: https://www.jpsiconline.com/text.asp?2020/8/2/64/304219
10. Mehta Y, Hegde A, Pande R, Zirpe KG, Gupta V, Ahdal J, *et al*. Methicillin-resistant staphylococcus aureus in intensive care unit setting of India: A review of clinical burden, patterns of prevalence, preventive measures, and future strategies. Indian J Crit Care Med 2020;24:55-62.
11. AbuTaha SA, Al-Kharraz T, Belkebir S, Abu Taha A, Zyoud SH. Patterns of microbial resistance in bloodstream infections of hemodialysis patients: A cross-sectional study from Palestine. Sci Rep 2022;12:18003.

How to cite this article: Mathew N, Suresh SA, Pallivappil L, Suseela KV. Nasal Methicillin Resistant *Staphylococcus Aureus* Colonisation and the Incidence of Invasive Staphylococcal Infection in Patients Undergoing Hemodialysis. Indian J Nephrol. 2025;35:419-21. doi: 10.25259/IJN_418_2024

Received: 25-07-2024; **Accepted:** 07-01-2025; **Online First:** 20-02-2025; **Published:** 10-04-2025

DOI: 10.25259/IJN_418_2024

Usefulness of Telemedicine in Nephrology: The Role Beyond COVID-19

Dear Editor,

Most encouraging reports of the implementation of telemedicine in nephrology are from developed countries. There are few Indian studies on telemedicine in nephrology, especially on its impact after the COVID-19 pandemic. There is considerable variability between nephrology center policies and acceptability among patients in the context of telehealth.[1] We have published our experience of telemedicine[2,3] for kidney transplants during the pandemic. We report the feasibility, acceptability, and effectiveness of telemedicine in kidney care.

This was an observational, prospective, ethically approved study conducted between 1st June 2020 and 31st May 2024 at Fortis Vasant Kunj, Delhi. The procedure involved continually informing patients and relatives of the availability of telenephrology services for clinic visits. Our telenephrology technique was synchronous (both patient and doctor on the same platform) and comprised of an electronic medical record database called "Healthplix". It is a digital application for identifying patients' illnesses; writing prescriptions and treatments; scheduling and managing online consults; providing automated reminders to patients and doctors; customizing letterheads, prescriptions, investigations, and history all on one platform. This application is linked to WhatsApp and email. An online video or phone consultation was arranged as per time slot availability for every request. Patients without a smartphone (n=20) were assisted by a paramedical worker. A formatted message by Healthplix was delivered to patients/guardians via WhatsApp or Email as an output of the meeting. The results included current

problems, demographics, vital signs, current and previous investigations, current and changed prescriptions, and follow-up advice. At the end of the e-consult the patient rated their experience on a Likert scale from 0 to 10.

During the study period, 3200 e-consults were given to 850 patients (254 new and 596 follow-ups). There were 2850 Indian residents and 350 patients outside India. All patients spoke Hindi or English. Table 1 describes the patient details. Teleconsultation was done via WhatsApp audio/video calls (74%) or regular audio calls (26%). The prescription was sent by WhatsApp (79%) or E-mailed (21%) as per patient preference. Distribution of the diagnoses was as follows: kidney transplant (n = 304), idiopathic nephrotic syndrome (n = 246), chronic kidney disease (n = 184), IgA nephropathy (n = 54), urinary tract infection (n = 34), acute kidney injury (n = 14) and others (n = 12). The mean age of the patients was 38 years (range 2 months–92 years). Some patients (255) were advised to come to the hospital for review (including 185 new patients and 70 follow-up patients). These included those with stage III AKI (n = 43), need for native or allograft biopsy (n = 23), uremic symptoms (n = 14), suspicion of pyelonephritis (n = 3), urinary tract infections non-responsive to oral antibiotics (n = 6), severe pneumonia (n = 11), acute gastroenteritis with intractable symptoms/or danger signs (n = 31), and others (n = 10). Of these, 54 (21.1%) were advised admission, while the rest were advised to undergo follow-up. The mean (range) patient satisfaction score for e-consults was 8 (7-9). In a formal survey of 659 patients, 67% preferred telenephrology follow-ups to in-person visits.

Table 1: Patient characteristics in the telemedicine study

Variables	n = 850
Age, mean (range)	38 (0.17 to 92)
Age group	
<18	50 ± 5.88
18-30	134 ± 15.76
30-40	110 ± 12.94
40-50	236 ± 27.76
50-60	246 ± 28.94
>60	74 ± 8.71
Gender	
Male	689 ± 81.06
Female	161 ± 18.94
Education level	
Illiterate	78 ± 9.18
Higher secondary school	94 ± 11.06
Graduate	155 ± 18.24
Post-graduate	523 ± 61.53
Socio-economic group	
Upper class	213 ± 25.06
Upper-middle class	321 ± 37.76
Lower-middle class	143 ± 16.82
Lower class	173 ± 20.35
Insurance	
Out of pocket	326 ± 38.35
Government	123 ± 14.47
Private	401 ± 47.18
Duration of basic disease	
6 m	112 ± 13.18
1 yr	134 ± 15.76
1-2 yr	232 ± 27.29
2-5 yr	221 ± 26
> 5 yr	151 ± 17.76
Distance from the institute (km)	
50	54 ± 6.35
50-100	232 ± 27.29
100-250	221 ± 27.29
250-500	211 ± 24.82
500-750	83 ± 9.76
>750	49 ± 5.76

Currently, the role of telemedicine in nephrology is under-recognized.[4] The concept of telenephrology comes with an exciting opportunity to modify, enhance, or even substitute current practices.[5] In emerging nations like India, where tertiary centers are scarce and unevenly distributed, telemedicine plays a vital role for patients residing in remote places.[6]

The patients in our study were from all age groups and had an evenly distributed educational and economic status. The number of male participants was higher, as prevalent in various studies of nephrology from India.[7] The satisfaction scores were excellent indicating support for telenephrology. The virtual availability of specialist doctors was the most important factor. The satisfaction levels of patients have not been extensively studied before.[8] Schmid *et al.*,[9] tested the role of telemedicine in managing kidney transplants (n = 46), even within the first year of transplantation. With a significantly higher number of post-transplant cases (n = 306), our patient adherence and acceptability resonated with their study. Cumulatively, telenephrology can reduce the cost of travel but cause a loss of daily wage, significantly. Our study group had 38.35% patients who were paying from pockets who would have benefited the most. The patients paying from pocket (38.35%) and those above 40 years (>50%) would find telenephrology a comfortable and cost-effective alternative. A recent study also agrees with these findings.[10] Telenephrology would be preferred if the employment profile of some patients or relatives would not allow them for in-person visits. Importantly, patients with poor knowledge of technology could use telenephrology with assistance. Notably, patients with new diagnoses (13.18%) showed confidence in telemedicine as they are generally more reluctant than chronic patients. The study's limitation was the lack of granular data on cost-effectiveness. We used synchronous telehealth, as other modalities like asynchronous, remote patient monitoring, and mobile health require higher man-power, logistics, and new technology acceptance. We stress that the inability to complete a clinical examination will always exist. Still, the role of this emerging field is immense, and further studies are warranted.

Conflicts of interest: There are no conflicts of interest.

Hari Shankar Meshram[1], Sanjeev Gulati[2]

[1]Department of Nephrology, ILBS, Vasant Kunj, [2]Department of Nephrology, Fortis Group of Hospitals, New Delhi, Delhi, India

***Corresponding author:** Sanjeev Gulati, Department of Nephrology, Fortis Group of Hospitals, New Delhi, Delhi, India. E-mail: sgulati2002@gmail.com*

References

1. Raina R, Nair N, Sharma A, Chakraborty R, Rush S. Telemedicine for pediatric nephrology: Perspectives on COVID-19, future practices, and work flow changes. Kidney Med 2021;3:412-25.
2. Mazumder MA, Gulati S, Sengar A. Telemedicine in paediatric subspecialty: A low cost model for developing countries during the COVID-19 pandemic. J Indian Med Assoc. 2022;120:11-5. Available from: https://imsear.searo.who.int/server/api/core/bitstreams/063e989b-c56c-45f1-b405-76bf1fd9075a/content [Last accessed 2024 Nov 20].
3. Gulati S, Sengar A. Experience with telemedicine in paediatric nephrology during the COVID pandemic. Pediatr Nephrol 2021;36:2499-500.
4. Stauss M, Floyd L, Becker S, Ponnusamy A, Woywodt A. Opportunities in the cloud or pie in the sky? Current status and future perspectives of telemedicine in nephrology. Clin Kidney J 2020;14:492-506.
5. Campbell M, Akbari A, Amos S, Keyes C. Feasibility of providing nephrology services to remote communities with videoconferencing. J Telemed Telecare 2012;18:13-6.
6. Lea JP, Tannenbaum J. The role of telemedicine in providing nephrology care in rural hospitals. Kidney360 2020;1:553-6.
7. Han M, Wong G, Kute VB, Nakagawa Y, Wang HH, Arakama MH, *et al*. Gender disparity in asiAan-pacific countries: An analysis of the ASTREG-WIT-KT registry. Transplantation 2023;107:1-5.
8. Osman A, Lee SH, Noori M, Al-Jaishi M, Gallo K, Harwood L, *et al*. Patient perspectives of telemedicine in outpatient nephrology clinics during COVID-19: A qualitative study. Can J Kidney Health Dis 2024;11:20543581241293192.
9. Schmid A, Hils S, Kramer-Zucker A, Bogatyreva L, Hauschke D, De Geest S, *et al*. Telemedically supported case management of living-donor renal transplant recipients to optimize routine evidence-based aftercare: A single-center randomized controlled trial. Am J Transplant 2017;17:1594-605.
10. Dev V, Mittal A, Joshi V, Meena JK, Dhanesh Goel A, Didel S, *et al*. Cost analysis of telemedicine use in paediatric nephrology-the LMIC perspective. Pediatr Nephrol 2024;39:193-201.

How to cite this article: Meshram HS, Gulati S. Usefulness of Telemedicine in Nephrology: The Role Beyond COVID-19. Indian J Nephrol. 2025;35:421-3. doi: 10.25259/IJN_745_2024

Received: 29-11-2024; **Accepted:** 06-01-2025; **Online First:** 25-02-2025; **Published:** 10-04-2025

DOI: 10.25259/IJN_745_2024

Clinical Application of Genetic Testing in Nephrology

Dear Editor,

Chronic kidney disease (CKD) is an increasingly prevalent global health problem. It can be identified by well-established clinical biomarkers, such as serum creatinine, cystatin C, estimated glomerular filtration rate, proteinuria estimation, etc. The etiological diagnosis is often obscure without a biopsy and is relevant for prognosis and transplantation planning. Presently, ~625 genes have been identified for CKD development. Genetic evaluation is an essential component of precision medicine and can reduce the clinical uncertainty of CKD.[1] This retrospective study was conducted to identify the prevalence of genetic abnormalities in renal diseases at the VPS Lakeshore Hospital, Kochi [Supplementary Material]. Data were collected from the hospital database. Eighty participants were included, of whom 60 had CKD, 18 were renal transplant recipients, and 2 had childhood nephrotic syndrome. Whole exome sequencing (WES) showed gene mutations in 18.8% (n=15). This is comparable with published literature, which reports gene mutations in 19% of all screened patients.[2] The prevalance of identified gene mutations, cause of renal function impairement, and indications for genetic testing has been given in Supplementary Tables 1-3. Next-generation sequencing (NGS) can detect 39 genes, including those involved in steroid-resistant nephrotic syndrome (SRNS), collagen type IV mutations, Alport's syndrome, thin basement membrane nephropathy, and collagen gene mutations.[3] Genetic studies are warranted in patients with a family history of CKD, extra-renal manifestations, young age of onset, unusual disease course, unclear etiology, and for guiding therapeutic decisions.[2] WES, with the ability to identify 13 genetic disorders, found 24% of patients with one or more abnormalities.[4] WES can identify mutations in diseases like nephronophthisis, medullary cystic kidney disease and tubulointerstitial fibrosis.[5] Another NGS modality used to detect rare genetic disorders is whole genome sequencing (WGS).[6] Chronic glomerulonephritis (CGN) is the reported leading cause of CKD in developing countries, followed by diabetes mellitus and systemic hypertension.[S1] Among participants with CGN, 33.3% (n=6) had clinically and therapeutically significant mutations and four (22.2%) with CKD had Alport's syndrome. Alport's syndrome has been recognized as one of the most common causes of CKD. It is responsible for end stage renal disease (ESRD) in 0.2-3% patients, varying significantly by age, ethnicity, and the presence of co-morbidities all of which are etiological factors for CKD too.[S2-S6] *COL4A4* & 5 (Alport's gene) are X chromosomal genes that form collagen chains of the glomerular basement membrane.[S7] Mutations of this