APAMI2020 General Oral Presentation Session | APAMI 2020 | General Oral Presentation Session

Telehealth and Telemedicine Systems

Sat. Nov 21, 2020 2:10 PM - 4:00 PM Room E-1 (Congress center 5F - Conference Room 52)

[AP1-E1-2-01] Telemedicine in India: Strengthening Health Services Delivery for Universal Health Coverage

Rahul Konapur[1], Nachiket Gudi[2], *Oommen John[3,4] (1. Ashoka University, India, 2. Department of Health Policy, Prasanna School of Public Health, Manipal Academy of Higher Education, India, 3. The George Institute for Global Health, India, 4. Prasanna School of Public Health, Manipal Academy of Higher Education, India）

Keywords: Telemedicine, Health Systems Strengthening, Telehealth Ecosystem

Background: The COVID-19 pandemic has the potential to bring telemedicine to the mainstream in India. In two decades of promising efforts by Indian Space Research Organization and other stakeholders, there are grey areas in the policy and regulatory sector being filled in only off late with Government of India issuing the Telemedicine Practice Guidelines in March 2020 to encourage wide adoption of Telemedicine by Registered Medical Practitioners.

Methods: We aim to narratively trace the history of telemedicine in India, enlist the current actions and prospects for Indian telemedicine journey. We use a case study to supplement the arguments made on the role of public and private stakeholders in deploying telemedicine to scale strengthening healthsystems to achieve Universal Health Coverage.

Results: Challenges of laws governing cross border consultations, lack of digital health standards, infrastructural limitations and reimbursement mechanisms are opined upon. We discuss avenues to explore during and in the post pandemic era such as telerehabilitation, implementing telemedicine for AYUSH system of medicine and scope for private enterprises in pivoting the initiatives for facilitating PPP model of service delivery.

Telemedicine in India: Strengthening Health Services Delivery for Universal Health Coverage

Rahul Konapur[a], Nachiket Gudi[b] and **Oommen John[c, d]**

[a] Ashoka University, India
[b] Department of Health Policy, Prasanna School of Public Health,
Manipal Academy of Higher Education, India
[c] The George Institute of Global Health, India
[d] Prasanna School of Public Health, Manipal Academy of Higher Education, India

Abstract

The COVID-19 pandemic has the potential to bring telemedicine to the mainstream in India. In two decades of promising efforts by Indian Space Research Organization and other stakeholders, there are grey areas in the policy and regulatory sector being filled in only off late with Government of India issuing the Telemedicine Practice Guidelines in March 2020 to encourage wide adoption of telemedicine by registered medical practitioners. We aim to narratively trace the history of telemedicine in India, enlist the current actions and prospects for Indian telemedicine journey. We use a case study to supplement the arguments made on the role of public and private stakeholders in deploying telemedicine to scale. Challenges of laws governing cross border consultations, lack of digital health standards, infrastructural limitations and reimbursement mechanisms are opined upon. We discuss avenues to explore during and in the post pandemic era such as telerehabilitation, implementing telemedicine for AYUSH system of medicine and scope for private enterprises in pivoting the initiatives for facilitating PPP model of service delivery. We focused on the impact of COVID-19 on India and how telemedicine was timely used to provide services and at the same time outline the road map for telemedicine in the post pandemic era.

Keywords:

Telemedicine, Health Systems Strengthening, Telehealth Ecosystem.

Introduction

The origin of telemedicine can be traced back to the 19th century when Thomas Bird coined the term. Earliest documented evidence of telemedicine dates to the early 20th century where electrocardiograph (ECG) data were transmitted via telephone wires. Modern form of telemedicine, which was largely driven by space and military technology sectors, started in the 1960s. Advancements in Information and Communication Technologies (ICT) over the last decade were one of the biggest drivers of telemedicine, which rapidly created new possibilities in healthcare delivery and service. The World Health Organization (WHO) defines telemedicine as "the delivery of health care services, where distance is a critical factor, by all healthcare professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation, and for the continuing education of health care providers, all in the interests of advancing the health of individuals and their communities" [1].

This article aims to describe the status of telemedicine in India, outline the challenges to its scale up and highlights the potential opportunities to scale up models of telemedicine as health systems strengthening interventions for the post pandemic era. Telemedicine has been pilot tested in India for two decades. In 2001, the Department of Space (DoS) through Indian Space Research Organization (ISRO), initiated a nationwide telemedicine program and provided necessary infrastructure for 384 Hospitals with 60 specialty hospitals connected to 306 remote healthcare facilities [2]. Since then ISRO has been a key technology partner by initiating collaboration steps to connect healthcare along the length and breadth of the country. Besides, these national initiatives, international projects like the Pan-African eNetwork Project and the South Asian Association for Regional Cooperation (SAARC) Telemedicine Network Projects have also been taken up as an initiative of the External Affairs Ministry, placing Indian telemedicine in the global scenario [3]. However, evaluations of these pilots suggest that services rendered were of suboptimal quality primarily attributable to lack of a comprehensive and cohesive approach. The reports suggest that as the telemedicine infrastructure was not maintained, the services not cost effective and were underutilized. Current evidence highlights the scope for optimizing the resources, improve user experience and enhance the utilization to expand the reach of current healthcare services delivery beyond the physical infrastructure [4-6].

Materials and Methods

A non-systematic literature search was conducted in PubMed and Google Scholar to search for literature on telemedicine in India and studies that have used the Model for Assessment of Telemedicine (MAST) but paucity in literature exists, as there were no studies that reported the use of the framework. This warrants the need for utilizing a specific evaluation framework

during the evaluation of interventions delivered through telemedicine [7].

Past efforts of telemedicine in India

The Government of India (GOI) is implementing a project on National Medical College Network (NMCN) for interlinking the Medical Colleges across the country [8]. Under the NMCN scheme, 50 Govt. Medical Colleges are being inter-linked with the purpose of Tele-education, e-Learning and Online Medical Consultation by utilizing the connectivity provided by National Knowledge Network (NKN). A virtual layer of Specialty/ Super Specialty doctors from these Medical colleges would be created for providing "Online Medical Consultation" facility to citizens that will be akin to outpatient facility but in a virtual way through a web-portal. Under the National Telemedicine Network scheme, it is proposed to connect District Hospital with healthcare facilities at remote/rural locations in the ratio of 1:10. It aims to connect at least one medical college with a district hospital, which in turn is linked to 10 peripheral units in its respective state [9].

Currently, there are 8 Regional Resource Centers in the nation out of which one is National Resource Center cum Regional Resource Center. They have offered a total of 5406 telemedicine sessions. RRC central and RRC north have the recorded the highest rates of telemedicine sessions by conducting 1528 and 1045 sessions respectively.[8] Between September 2001 and August 2016, a total of 1661 tele consultations and follow-ups were carried out, with 3576 beneficiaries, and 148 CMEs conducted to benefit medical and allied health professionals. Telemedicine services have also been provided by private enterprises thereby playing a pivotal role in delivering care and realizing the vision of Universal Health Coverage [10]. Apollo Telehealth entered the telemedicine services by bringing in the world's first V-SAT enabled telemedicine center in 2001. They specialize in delivering primary health care to different parts of India and the world. Other major enterprises like Aravind eye care specializes in tele optometry, Sri Sathya Sai Tele-health Network provides services in neurosurgery and cardiology. Apart from this, there are other institutions like Narayana Hrudayalaya, Asian heart institute that are contributing to healthcare delivery. The government of Tripura initiated the Tripura Vision Centre Project in 2007, which has screened 92,600 patients [11]. The government of Kerala has also launched e-dhanawantari, which is a freely deployable web based telemedicine solution aiming to provide healthcare at affordable costs [12].

Impact of COVID-19

The World Health Organization declared COVID-19 as a Global Pandemic on 11 March 2020 [13]. Recent survey conducted by the WHO in 155 countries suggested that in 53% of them have partially or completely disrupted treatment for hypertension, 49%, 42% and 31% services have been disrupted in diabetes care, cancer treatment and cardiovascular emergencies respectively [14]. A study projected an increase in TB deaths of 149448 (range 85000–233602) in India between 2020-2024 and a total of 201595 (123523–301553) additional TB deaths in China, India and South Africa owing to service disruptions caused by the pandemic [15]. A sudden nationwide lockdown was imposed in India for 21 days with effect from the midnight of 24 March 2020 to reduce the

spread of virus [16]. This was preceded by a 'Janata Curfew' or 'self-lockdown' which was observed for period of 14 hours on 22 March 2020 [17]. The GOI also issued an advisory to postpone elective surgeries and preventive health checks, which led to significant decrease in the outpatient footfall number. One of the largest chains of hospitals in India reported that the overall patient volumes reduced by half thereby affecting the revenues [18-19]. A recent policy brief by National Health Authority stated that the overall claim volumes was 51% lower than the that of 12 weeks before the lockdown with claim values falling at 76% during the lockdown. On a Global front, Telemedicine has played a significant role in bridging the gap between patients and providers during COVID-19. Evidence from NYU Lagone Health states that the virtual urgent care visits have increased by 683% in the month of March and April signaling a long-term shift in healthcare delivery [20].

COVID-19 had a profound impact on the mental health of Indians where one in twenty people suffer from depression. Nearly 15% of Indian adults need active interventions for mental health issues and close to 10% of the population are affected by common mental disorders [21]. Due to closure of all the outpatient services in an attempt to contain the spread of virus, the mental health services were disrupted. Being the second most populated country in the world, India has only three psychiatrists per million population [22]. Telemedicine played a pivotal role in bridging this gap and making mental healthcare accessible beyond the hospital walls. National Institute of Mental Health and Neurosciences (NIMHANS) led the efforts from forefront by initiating mental health helpline number and scaling up its video-based telemedicine consultations [23-24]. Recent efforts are made considering telemedicine as an optimal system of care that enhances access and quality of care and contain costs, which include patient-borne costs as well [25].

The global adoption of telemedicine is possible when the laws are standardized. According to a study published by Nittari et al., different countries have different issues in adopting telemedicine [26]. North America, on one-hand deals with the issues related to interstate legalities while European works on the other hand report the European Directives, their application, and harmonization as the challenges. The National Telemedicine Guidelines by Singapore consider all the stakeholders i.e. Healthcare Providers, Patients and Caregivers. These guidelines ensure patient and provider safety and provide an all-round approach to deliver telemedicine services [27]. On the contrary, not having concrete telemedicine guidelines or systems in place had a very grave impact on Italy [28]. Strict privacy regulations and lack of adequate infrastructure hampered telemedicine implementation and thereby missing a unique opportunity to leverage its benefits during pandemic.

Telemedicine during COVID-19:

COVID-19 marked the beginning of a new era of healthcare delivery through telemedicine as it was catalyzed with travel restrictions and fear of infection during the transit, thereby facilitating the shift to virtual consultation. The GOI too responded, by easing the regulations and issuing guidelines promoting the adoption of telemedicine. The GOI issued the 'Telemedicine Practice Guidelines' as an amendment to the Indian Medical Council (Professional Conduct, Etiquette and Ethics) Regulations, 2002 to facilitate Registered Medical Practitioners in providing healthcare [29]. It brought

telemedicine into legal framework thereby clearing the clouds of uncertainty that the medical practitioners usually faced concerning the different modes of teleconsultation and the legality of medical advice given via virtual means. It emphasizes on consent and states that both the parties (provider and patient) need to identify and verify each other before the consultation. It also mandates the practitioners to maintain the health records of patient, which was not a necessity for in person consultations. It also put a cap on the medicines that can be prescribed based on the type and mode of teleconsultation. It mandates the completion of an online course for all the registered medical practitioners to provide online consultation. To ensure safe data transmission during telemedicine practices, the Ministry of Health and Family Welfare (MOHFW) had developed a set of Electronic Health Records (EHR) standards in 2013 and a revised version of the same in 2016.

While the facilitators such as ISRO's infrastructural support, EHR standards, and existing government/ private projects have been in place for fostering better adoption and scaling up, there are a few challenges that need attention. Firstly, telemedicine helps us connect to experts across the world, but also brings in the legal issues during cross border consultations. Electronic data exchange across borders have always posed issues with frameworks governing them as it needs attention on which country would be governing the use of the data. Secondly, India is yet to develop Digital Health Standards to govern and accredit the services that are being offered, although the National Accreditation Board for Hospitals and Healthcare (NABH) has been recently charged with the duty of drafting the guidelines [30]. These standards will not only enhance the uptake of telemedicine services but also enhance service delivery. The guidelines aim to identify and consider all related aspects of using patient interface technology around the spectrum of treatment applicable to ambulatory, hospitalized and remote patient monitoring. Thirdly, availability of uninterrupted network and power supply are key drivers for penetration telemedicine in the rural setting. Overall health literacy levels in general are low in Indian setting, which necessitates stakeholders to work on easing human-computer interaction and researchers to estimate digital health literacy levels. Fourthly, setting up a reimbursement mechanism for the care rendered through telemedicine would require all the stakeholders (patients, providers, third party payers and insurance companies) to be engaged, as it is an unexplored turf in the country.

Road Map for Telemedicine in Post Pandemic Era:

To account for future prospects of telemedicine; virtual care and tele rehabilitation are services around which scalable business models will enter mainstream [31]. Although recent evidence from a Cochrane systematic review warrants for more mixed methods studies to be conducted to evaluate efficacy, tele rehabilitation would carve its way to thrive in the current pandemic and post pandemic era [32]. Large scale telemedicine deployments would also digitalize health information which would otherwise have taken years to achieve. Use of telemedicine can also be extended to the alternative system of medicine and this has been highlighted by the Central Council of Indian Medicine's notification [33]. Penetration of telemedicine will not only boost contactless service delivery but also pave ways for carrying out technology assessments on digital health applications in India.

A telehealth ecosystem in India should be based on continuum of care model and patient centric in approach (Figure 1). Once the patient decides to present to the doctor then the choice of visiting a public or a private healthcare facility is made, following which a diagnosis is facilitated through laboratory results. Treatment can be planned through monitoring and the episode of care is reimbursed through insurance firms through the involvement of Third-Party Administrators (TPA). The various stakeholders identified are patient, providers (public, private), Government and reimbursement services. To support this mechanism of remote patient care, there should be technical support partners to ensure better patient experience, telemedicine practice guidelines for assisting both patient and provider, followed by a team to monitor and evaluate the practice to foster the delivery of quality care [34].
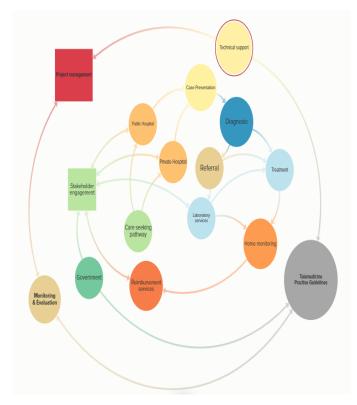

Figure 1- Telehealth Ecosystem in India

Futuristic Telehealth for India

According to the World Bank data, not only are there 87 cellular phone users per 100 people and a total of 1.001 billion mobile cellular subscriptions in India but also 34.45% of Indian population has access to internet [35]. According to a report published by Telecom Regulatory Authority of India, overall tele density in India has reached 87.66% in 2020 [36]. India also has seen the growth in individuals using internet with percentages increasing from 7.5% in 2010 to 34.45% in 2017 [37]. With global average data cost being $8.53/GB, India has the lowest data average price of $0.26/GB, which is a boon for telemedicine penetration [38]. A recent survey concluded that data traffic per smart phone in India is highest among the Asian countries at 8.5 GB/month [39]. Although there is an increasing access to services over the last decade with increasing number of cellular phone and internet users, a large proportion of them have functional literacy, thus highlighting the need for voice based and video based interventions to improve the lives of the masses. Notable evidence includes a tailored voice message improving infant care practices in Mumbai and participatory video enabled

agricultural extension platform in Odisha [40-41]. Employing chat bots, Voice interface systems such as Amazon Alexa, Google voice and Apple Siri, Biosensors and wearable devices are considered as the future of telehealth as they are being extensively used in prevention, detection, monitoring and coordinating the delivery of healthcare thereby hinting at the shift to patient centered care [42]. Artificial Intelligence assisted symptom checkers in diagnosis has showed encouraging results as well [43].

Conclusion

Telemedicine has been catering to healthcare needs since the last 20 years in India, however the current pandemic has helped recognize its usefulness and potential, highlighting the factors to be considered such as infrastructural, regulatory and policy support, engaging stakeholders within the telehealth ecosystem thereby ensuring a patient centric delivery model to increase the uptake of services. Thus, considering the existing health system's constraints and developing novel pathways and innovations to overcome these through the deployment of telehealth projects, a robust data governance framework along with monitoring and evaluation framework needs to be in place to sustain gains that have been achieved during the COVID-19 pandemic.

References

[1] Organization WH. Telemedicine: opportunities and developments in member states. Report on the second global survey on eHealth: World Health Organization 2010.

[2] Ministry of Health and Family Welfare GoI. e-Health & Telemedicine [2020 July 24]. Available from: *https://main.mohfw.gov.in/Organisation/departments-health-and-family-welfare/e-Health-Telemedicine*

[3] ISRO. Enabling Specialty Healthcare to the Rural and Remote Population of India. Telemedicine Healing Touch Through Space. Bangalore.

[4] Bali S, Gupta A, Khan A, *et al.* Evaluation of telemedicine centres in Madhya Pradesh, Central India. *Journal of Telemedicine and Telecare.* 2016; 22(3):183-8.

[5] Holla B, Viswanath B, Neelaveni S, *et al.* Karnataka state telemedicine project: Utilization pattern, current, and future challenges. *Indian journal of psychological medicine.* 2013; 35(3):278.

[6] Moirangthem S, Rao S, Kumar CN, *et al.* Telepsychiatry as an economically better model for reaching the unreached: A retrospective report from South India. *Indian Journal of Psychological Medicine.* 2017; 39(3):271.

[7] Kidholm K, Ekeland AG, Jensen LK, *et al.* A model for assessment of telemedicine applications: mast. *International journal of technology assessment in health care.* 2012; 28(1):44-51.

[8] TELEMEDICINE DIVISION Ministry of Health & Family Welfare GoI. NATIONAL TELEMEDICINE PORTAL; 2017 [updated 2019 June 13]. Available from: *https://nmcn.in/allrrc.php*

[9] Ministry of Health and Family Welfare GoI. CONCEPT NOTE on NATIONAL TELEMEDICINE NETWORK (NTN).

[10] TELEMEDICINE DIVISION MOHFW, GOVERNMENT OF INDIA. NATIONAL TELEMEDICINE PORTAL; [updated 2020 July 24]. Available from: *https://nmcn.in/internaldashborad.php*

[11] Health and Family Welfare Department GoT. Teleophthalmology; 2007 [updated 2020 July 24]. Available from: *https://health.tripura.gov.in/?q=3006201701*

[12] India Go. e-Dhanwanthari: CDAC; Available from: *http://edhanwanthari.kerala.gov.in/thejaswini/features.html*

[13] Organization WH. Timeline of WHO's response to COVID-19 2020. [updated 2020 June 30]. Available from: *https://www.who.int/news-room/detail/29-06-2020-covidtimeline*

[14] Organization WH. COVID-19 significantly impacts health services for noncommunicable diseases; 2020. Available from: *https://www.who.int/news-room/detail/01-06-2020-covid-19-significantly-impacts-health-services-for-noncommunicable-diseases*

[15] McQuaid CF, McCreesh N, Read JM, *et al.* The potential impact of COVID-19-related disruption on tuberculosis burden. *European Respiratory Journal.* 2020.

[16] Bureau PI. PM calls for complete lockdown of entire nation for 21 days. 2020.

[17] Bureau PI. Text of Prime Minister's address to the nation on combating COVID-19. 2020.

[18] Owen SPN, Pulkit KS, Sheena C. PM-JAY Under Lockdown: Evidence on Utilization Trends. 2020.

[19] Insider B. COVID-19 had material impact on healthcare services business operations: Apollo Hospitals; 2020. Available from: *https://www.businessinsider.in/business/news/covid-19-had-material-impact-on-healthcare-services-business-operations-apollo-hospitals/articleshow/76285763.cms*

[20] Mann DM, Chen J, Chunara R, *et al.* COVID-19 transforms health care through telemedicine: evidence from the field. *Journal of the American Medical Informatics Association.* 2020.

[21] Murthy RS. National mental health survey of India 2015–2016. *Indian journal of psychiatry.* 2017; 59(1):21.

[22] Gautham MS, Gururaj G, Varghese M, *et al.* The National Mental Health Survey of India (2016): Prevalence, socio-demographic correlates and treatment gap of mental morbidity. *International Journal of Social Psychiatry.* 2020; 0020764020907941.

[23] Selvaraj S, Reddy PV, Muralidharan K, *et al.* Impact of COVID-19 on mental health: A watershed moment in tertiary care service provision in India? *Asian Journal of Psychiatry.* 2020.

[24] Division e-H. ELECTRONIC HEALTH RECORD (EHR) STANDARDS FOR INDIA, 2016.

[25] Bashshur R, Doarn CR, Frenk JM, *et al.* Telemedicine and the COVID-19 Pandemic, Lessons for the Future. Mary Ann Liebert, Inc.; 2020.

[26] Nittari G, Khuman R, Baldoni S, *et al.* Telemedicine practice: review of the current ethical and legal challenges. *Telemedicine and e-Health.* 2020.

[27] Ministry of Health S. National Telemedicine Guidelines, 2015.

[28] Omboni S. Telemedicine during the COVID-19 in Italy: a missed opportunity? *Telemedicine and e-Health.* 2020.

[29] Aayog N. Telemedicine Practice Guidelines Enabling Registered Medical Practitioners to Provide Healthcare Using Telemedicine. 2020.

[30] HealthWorld E. NABH to set Digital Health Standards; Telemedicine Accreditation in focus too, 2020. Available from: *https://health.economictimes.indiatimes.com/news/health-it/nabh-to-set-digital-health-standards-telemedicine-accreditation-in-focus-too/75500238#:~:text=for%20digital%20health.-,The%20NABH%20Digital%20Health%20Standards%20aims%20to%20consider%20all%20relevant,the%20faster%20adoption%20of%20technology*

[31] John O, Jha V. Remote patient management in peritoneal dialysis: an answer to an unmet clinical need. Remote Patient Management in Peritoneal Dialysis. Karger Publishers; 2019; 99-112.

[32] Laver KE, Adey-Wakeling Z, Crotty M, *et al.* Telerehabilitation services for stroke. *Cochrane Database of Systematic Reviews.* 2020; (1).

[33] MEDICINE CCOI. TELEMEDICINE PRACTICE GUIDELINES for Ayurveda, Siddha and Unani Practitioners. Delhi: 2020.

[34] John O. Maintaining and sustaining a telehealth-based ecosystem. Fundamentals of Telemedicine and Telehealth. Elsevier: 2020; 127-43.

[35] Bank TW. Mobile cellular subscriptions (per 100 people); 2018. Available from: *https://data.worldbank.org/indicator/IT.CEL.SETS.P2*

[36] INDIA TRAO. Highlights of Telecom Subscription Data as on 29th February, 2020. 2020.

[37] Bank TW. Individuals using the Internet (% of population) – India; 2017. Available from: *https://data.worldbank.org/indicator/IT.NET.USER.ZS?locations=IN*

[38] Standard B. India's mobile internet rate per GB remains lowest in the world: Prasad; 2019. Available from: *https://www.business-standard.com/article/pti-stories/india-mobile-internet-rates-remain-lowest-in-world-prasad-119120201245_1.html#:~:text=The%20average%20price%20of%20%24%200.26,is%20%24%208.53%20for%201%20GB*

[39] Ericsson. Data usage per smartphone is the highest in India – Ericsson; 2019 [2019 June 19]. Available from: *https://www.ericsson.com/en/press-releases/2/2019/6/data-usage-per-smartphone-is-the-highest-in-india--ericsson*

[40] Murthy N, Chandrasekharan S, Prakash MP, *et al.* The Impact of an mHealth Voice Message Service (mMitra) on Infant Care Knowledge, and Practices Among Low-Income Women in India: Findings from a Pseudo-Randomized Controlled Trial. *Maternal and child health journal.* 2019; 23(12):1658-69.

[41] Kadiyala S, Morgan EH, Cyriac S, *et al.* Adapting agriculture platforms for nutrition: a case study of a participatory, video-based agricultural extension platform in India. *PloS one.* 2016; 11(10):e0164002.

[42] Keesara S, Jonas A, Schulman K. Covid-19 and health care's digital revolution. *New England Journal of Medicine.* 2020; 382(23):e82.

[43] Meyer AN, Giardina TD, Spitzmueller C, *et al.* Patient Perspectives on the Usefulness of an Artificial Intelligence–Assisted Symptom Checker: Cross-Sectional Survey Study. *Journal of medical Internet research.* 2020; 22(1):e14679.

Address for correspondence

Oommen John
Senior Research Fellow, The George Institute of Global Health, India
Prasanna School of Public Health, Manipal Academy of Higher Education, India
E-mail: susheel.john@gmail.com