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ARTICLE

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ACHIEVING SDG 3 IN RURAL INDIA: A SUSTAINABLE FRAMEWORK FOR VIRTUAL HEALTHCARE APPS

AYAN BANERJEE*

One of the main goals of Sustainable Development Goal 3 is to provide health care and a good lifestyle to all kinds of ages. Rural India is still struggling with the lack of healthcare services especially due to poorly developed infrastructure and fewer medical staff. This research has been done to find out the role of virtual health care in performing SDG 3 through the review of 47 research papers published from 2020 to 2025. Virtual healthcare applications make services more accessible, allow remote diagnostics, and are more affordable for rural areas. Nevertheless, obstacles are present such as poor digital infrastructure, low digital literacy, unwillingness to change, and lack of sufficiently trained personnel. The suggested model revolves around skills development, hybrid care models, infrastructure development, and community involvement. Therefore, the implementation of this plan going forward will depend on the collaboration between the stakeholders, policy support, and contextual modifications ruling out the chances of progress towards SDG 3 in rural India becoming transient.

Introduction

India is placed 99th in the 2025 SDG Index, thus entering the global top 100 for the very first time. Nevertheless, SDG 3 continues to be a major problem that is most pronounced in the countryside areas. It is a fact that 71 percent of India's population lives in rural areas but only 33 percent of doctors are practicing there, thus universal health coverage is facing very difficult access situations in these areas[1,2]. Virtual healthcare platforms are equipped to rectify such inequities through their ingenious layouts. eSanjeevani AB-HWC follows the telemedicine hub-and-spoke model, thus enabling the health officers of rural Health and Wellness Centres to get in touch with doctors of district hospitals by video calling and so, the delivery of the specialist care is ensured to the remote populations who are digitally illiterate or have limited digital skill[3]. With the integration of wearable biosensors, digital health applications have the ability to profoundly change chronic disease management. These technological tools facilitate monitoring and diagnosing of diabetes and hypertension outside the hospital through the transmission of real-time physiological data, thus allowing personalized treatment to be fine-tuned and better disease results to be achieved[4]. Unfortunately, there are a number of serious obstacles that limit the practical application of these measures. A lack of sufficient infrastructure, poor internet connection, risks to data safety, low digital literacy of rural communities, unwillingness of healthcare professionals to adopt new technologies and severe shortage of healthcare workers are some of the factors that hamper the implementation of telemedicine[5]. Even with these hindrances, a series of mHealth systematic reviews following PRISMA guidelines reveal that such interventions hold promise for improving maternal and child health in the BIMARU states of India. However, the shortage of healthcare providers and limited access to medicines continue to be barriers within the health system[6]. Sustainable e-health implementation needs to consider three interrelated factors at the same time: institutional (organizational environment and knowledge management), technical (infrastructure and technology

* Assistant Professor, Hospital Management Department, Brainware University, Kolkata, India

e-mail: ayanbanerjee764@gmail.com

transfer), and social (stakeholder engagement and donor involvement). Only the combined focus on these three dimensions creates the possibility of survival in the long run and the resulting health impact[7].

Objectives of the Study

1. To study how these virtual healthcare apps have penetrated rural India at present,
2. To find out what factors are hindering and facilitating the implementation,
3. To evaluate the extent of the use of virtual healthcare apps in achieving SDG 3 targets,
4. To design a viable model for the deployment of virtual healthcare apps in rural India.

Methodology

This study utilized a comprehensive literature review as its methodology. A comprehensive search of the literature was conducted for articles in PubMed, Scopus, Web of Science, and IEEE Xplore using the keywords: "virtual healthcare," "telemedicine," "mobile health apps," "rural India," "SDG 3," "healthcare access," and "digital health." Studies published between January 2020 and October 2025 were considered for inclusion. Inclusion criteria were peer-reviewed articles about virtual healthcare in the rural/underprivileged Indian populations, empirical studies on the adoption barriers/facilitators, and SDG 3-related outcomes. Exclusion criteria were non-English publications, publications with an unclear methodology, and non-empirical commentaries. The first search led to 132 articles being identified; 47 studies were finally chosen for qualitative synthesis and analysis after the duplicate removal and the application of the eligibility criteria.

Results and Discussion

The current research has recognized five areas that determine the use of digital health technologies: demographic and socioeconomic factors, health-related factors, an individual's general positive or negative attitude toward technology, barriers related to technology, and social influences[8]. Virtual healthcare applications have a great function to be promoted in the cities of tier II and III where there are few specialists and thus can be used for remote diagnostics, monitoring, and teleconsultations along with the reduction of both direct travel expenses and indirect costs such as lost productivity[1,5]. Through real-time visual, audio, and electronic resources, a Tele-ICU system links an off-site command center staffed with an intensivist and critical care nurse with the ICU of a hospital where the patients are in serious condition. Using the help of on-site personnel, the specialist can remotely treat the patient, who is in another geographic location[8]. The rollout of rural telemedicine has several major issues, such as poor or limited digital infrastructure and internet connectivity; low digital literacy, particularly among older adults; an inadequacy of training programs; and a general lack of awareness of the services available[5]. Approximately 75.9% of the rural population has no knowledge of telemedicine, and around 44.8% have only basic education, which affects the use of the platform. Moreover, 80% of healthcare workers are reluctant to change, and 60% of them are facing workload pressure due to a shortage of staff[9]. Concerns about data security and privacy are some of the factors that hinder trust[10]. Some of the main factors that facilitate digital health adoption are perceived usefulness, provider endorsement, hybrid care models, tailored training, user-friendly design, and social support[8]. The involvement of end-users, providers, and community stakeholders in co-design increases adoption[8]. Government programs such as eSanjeevani and national telemedicine guidelines offer policy support for digital health [8]. After institutional support, strong infrastructure, knowledge management, and coordinated attention to technical and social factors for a long-term resource commitment are required for sustainability. Telemedicine that is supported by the system leads to better sustainable results than projects that are not supported[7].

Recommendations

It is recommended, based on these findings, to upgrade the digital infrastructure by providing reliable Internet connection, power supply, and equipment to primary health centers and sub-centers, and at the same time, to set up telemedicine hubs at district hospitals to facilitate the rural health centers[5,11]. Capacity building necessitates organized training programs for medical personnel along with competency-based certification in digital health platforms. Public education programs should at the same time improve digital health literacy and inform about telemedicine services so that there is no digital divide and the adoption is effective[12]. Hybrid care models mix virtual consultations with in-person physical examinations to overcome the limitations of telemedicine. For their efficient execution, strong referral pathways and care coordination mechanisms are needed that would provide easy continuity between the virtual and physical care encounters[13]. Quality assurance needs management frameworks that maintain the quality of the service, the security of the data, and the clinical standards, which are supported by feedback systems for continuous

improvement. Multi-stakeholder partnerships involving government, healthcare providers, technology firms, and communities, utilizing local champions, thus allow for coordinated implementation and the sustainable mobilization of resources.

Conclusion

Health care apps powered by virtual technology provide major opportunities for SDG 3 in rural India through improved access, remote diagnostics, and cost reduction. However, achieving success requires addressing issues related to infrastructure, literacy, skill level, and user engagement. The suggested model emphasizes changes according to local conditions, cooperation, and development of capacity/resources at a system level in the long run. Supported by appropriate policies and well-devised plans, such applications are capable of making a radical change in rural healthcare and contributing to the achievement of universal health coverage. Subsequent studies should be focused on determining the effectiveness and sustainability of these interventions in different rural contexts by means of implementation. ❐

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