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E-health services for rural areas of Uttarakhand: A systematic literature review

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Abstract

Background: When it comes to enhancing the standard of living and promoting societal growth, e-health services are indispensable. The major success of health services depends on technological interventions in health services. The key drivers of technology provide enhanced reliability, accessibility and quality of medical facilities to the patients. The interventions of technology in health services result in a reduction of costs, speedy remedial measures without any delay.

Purpose of the study: The review focused on examining applications of e-health in enhancing the quality of health services in rural areas of Uttarakhand.

Methodology Adopted: A systematic review study was implemented for the purpose of study. A total of databases were analyzed on the website Pubmed.gov.in, spanning literatures from January 1, 2000 to 1 January 2022.

Theoretical result: Over time, in rural parts of Uttarakhand, only a small number of researchers have examined the implementation and use of e-health services and health service usage.

Subject Classification: *H10, H51, O18, P25.*

Keywords: *E-health, Health services, Technology, Digital health, SLR.*

Introduction

In the modern era, use of computers, internet, technologies, and software is increasing rapidly in all the sectors. It has made people's lives easier, more convenient, and faster. A quality of good and prompt healthcare service is necessary for all human beings. As health and education are core parts of the holistic development of a nation's economy, there is a need to make innovations and modifications in healthcare as well as in educational services to develop healthy, educated, and energetic citizens in the country. Health is one of the most important elements for every purpose of life. Although the government is constantly focusing on investing in healthcare, it has realised that health is connected not only to the wellness of the citizens but also to the healthy economies. The traditional healthcare system is being transformed into an advanced electronic healthcare system, by applying information and communication technologies. e-health includes health care practices supported by electronic devices. It contains a range of systems and services that are related to healthcare or medicine such as educational, research, clinical, and administrative, both in the local and overseas regions. E-health services have been defined into four C's: commerce, content, care and connectivity [16]. It is anticipated that the introduction of the e-health system in a state like Uttarakhand, with the dispersed population in hilly areas, will

result in a paradigm shift in the conventional health care provision model used in rural areas. There are multiple uses of e-health which helps in reducing medical errors, boosting quantity with quality in healthcare services and e-health records. When people talk about "mobile medical apps," they're referring to the applications available for smartphones and other mobile devices [11]. Adoption of advanced technology will remove the barriers of patients [4] that is physically travelling from rural hilly areas to urban hospitals. It provides better care to elderly people. It is an economical and less time-consuming process [1]. Information and communication technology infrastructure includes internet adoption [8]. Patient acceptability of telemedicine health services is an important field of investigation in healthcare services [19] and e-health education in primary care [9]. Telemedicine guidelines for the medical practitioners of India and focused on adoption of healthcare technology innovation [4, 16]. The application of various technologies in healthcare services in Uttarakhand will not only provide important patient information but also help in coverage of better-quality services [12]. Feedback from the rural community towards incorporation of digital technologies is found to favourable in nature[17]. For successful implementation in rural healthcare [22], there is need to enhance education, training, dissemination of information and better management of digital health technology[21]. The use of digital health innovation, according to the report, will improve translational research and great clinical treatment in a remote area. An electronic health record can be a helpful tool for users to easily gather, save, organise, and exchange information [5]. It has been reported that the Medic Mobile m-health programme in rural regions has increased the longevity of mother and child, and that the involvement of community health workers in the m-health programme has resulted in improved obsteric care [15].

The research technique employed was qualitative in nature. It was done in Baglung using sixteen semi-structured interviews, field observation, and two focus groups. From a theoretical approach, this study used socio-technical theory and infrastructural theory to understand the influence of mobile health on obstetric care. The research found that the introduction of the Medic Mobile Program in rural Nepal has had a favourable effect on the health of women and newborns. On the same line, [2] reported that digital technology solutions [9, 20] had been operated effectively in rural area of Malawi. In remote areas of Malawi, the opportunities to accelerate research design and implementation, conduct quality control, and do so in a cost-effective manner were enormous. The investigation

was conducted in the Malawian districts of Dowa and Ntchisi. It covered 27 health facilities with an estimated population of 6,40,000, encompassing a vast consideration for rural access to telehealth services by primary[10] medical healthcare service providers [6]. The study explained Australian Government's decision to reform the Medicare- subsidised telehealth services for better coverage in rural areas. The significance of information and communication technology solutions (telemedicine, m-health, e-education, etc.) in rural and urban healthcare facilities is a crucial factor. [24]. The study focused on perceived variables that influence the adoption and utilisation of ICT as e-health therapies in selected eastern healthcare facilities. Changes in the rural population's utilisation of telemedicine were studied [3]. It has also revealed patient features associated with the usage of telemedicine preceding to and during the COVID-19 epidemic [13]. The study collected cross-sectional data on monthly and quarterly rural telemedicine visits from January 2012 to June 2020. It had taken support from administrative data from Ontario, Canada. In this research a comparative study was conducted towards application of telemedicine among residents of urban and rural areas of Ontario (Canada) prior to and during the period of COVID-19[14,20].

The outcomes of the study demonstrated that the usage of telemedicine increased in rural areas during the COVID-19 outbreak [20,25]. But the results indicated that the application of telemedicine is more in urban population as compared to rural population. Future research, according to the report, should look into potential impediments to telemedicine use among rural patients, as well as the role of rural telemedicine in patients' health care applications. Telemedicine has the potential to provide facilities in delivering healthcare services to rural regions [19, 25]. In Australia and other countries, telemedicine applications include home telehealth, critical care telemedicine for newborn babies, health screening, telepediatrics, and teleradiology. Telemedicine is effective for delivering educational and training programmes as well as facilitating administrative meetings [19]. Telemedicine was shown to be successful when all sites involved had adequate equipment, employees, technical support and training, and telecommunications. Other essential variables for the development of telemedicine include telemedicine management, clinician empowerment, telemedicine assessment, user training, technology needs, site selection, and information exchange through publication. E-health interventions in chronic disease management have the potential to promote participation, effectiveness, and access to care in remote locations [23]. Considering India's vast paces in the scope of communication & technology [19],

telemedicine could prove an effective platform to add healthcare services to even the most remote corners across the country. Telemedicine as noticed from previous studies shall emerge out to be the cheapest, fastest mode to bridge the gap between the rural–urban health deliveries in Uttarakhand [7]. There have been several studies conducted on urban e-health services in Uttarakhand, but comparatively less on rural e-health services in the state. As a result, an effort has been made to review studies on e-health services over the last two decades, since the formation of Uttarakhand, to highlight the drastic attention of healthcare policymakers in filling this gap and improving the quality of health services in Uttarakhand's rural areas.

Purpose of the Study: The research reviews focussed to examine applications of e-health services in enhancing quality of health services in rural areas of Uttarakhand.

Methodology Adopted: A systematic literature review (SLR) methodology was executedusing guidelinesprojected by Kitchenham and Charters and Petersen et. al., [18]. Though it has been noted that PRISMA guidelines not applied in the present study, but the rules used followed phases like: (a) Number of research articles identified using search database engine; (b) Number of research articles screened as per selected criteria based on titles; (c) The appropriateness of research articles was assessed using predetermined criteria (quality evaluation); (d) Accepted research articles were comprised in the systematic literature review from period January 1,2000, to January 1, 2022. A total of 225 database were analysed on website using research source, Pubmed.gov.in. The search query ran on terms sufficient enough to review literatures available on terms used in the study. Table 1 displayed database depicting No. of research papers searched year wise. The articles reviewed with original data or result. Articles which did not meet the objective were excluded.

Research Questions Adopted in the Study:

The research questions used in the study included the PICOC (Population, Intervention, Comparison, Outcome, and Context) measures as proposed by Kitchenham and Charters [26].

- Population: Campaigns for rural health care.
- Intervention: Use of digital technology in determining health campaigns in rural areas.

- Comparison: Description of measures deployedin evaluation of e-health care services in rural areas.
- Outcomes: Classification of the result output, techniques and other areas.
- Context: Technology addressing patient's prevention/diagnosis.

The research questions were analysed to find where and when research studies/articles were published ? What were the topic areas, place and year of publication? What aspects of e-health services influence health-care quality in Uttarakhand? What tools were explored in analysis?

Table 1

Search Query: E health Services in Uttarakhand

Year	Count
2021	49
2020	56
2019	22
2018	17
2017	11
2016	12
2015	10
2014	12
2013	10
2012	10
2011	6
2010	4
2009	4
2008	1
2007	1

Source: https://pubmed.ncbi.nlm.nih.gov

The following graph (Figure 1) depicted the number of studies engaged in identifying the interventions of digital technologies in health services.

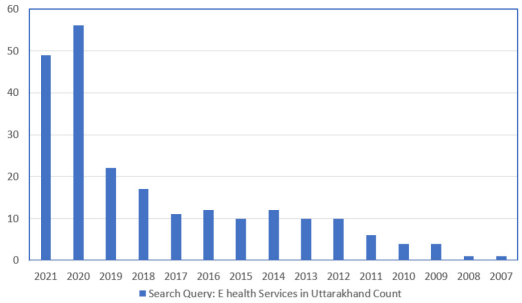


Figure 1

Graphical representation of research papers depicting e-health services in Uttarakhand.

Theoretical Research: It has been observed that research articles utilized in the study described usage of manifolde-health services in Uttarakhand which increased from year 2000 to 2022. At the same time, it was discovered that e-health services were rare when it came to rural health care in Uttarakhand and shown a need for more exploration and improvement. The literature study discovered 225 articles from the PubMed database, of which 06 were measured and included in the review after analysis and screening (Figure 2).

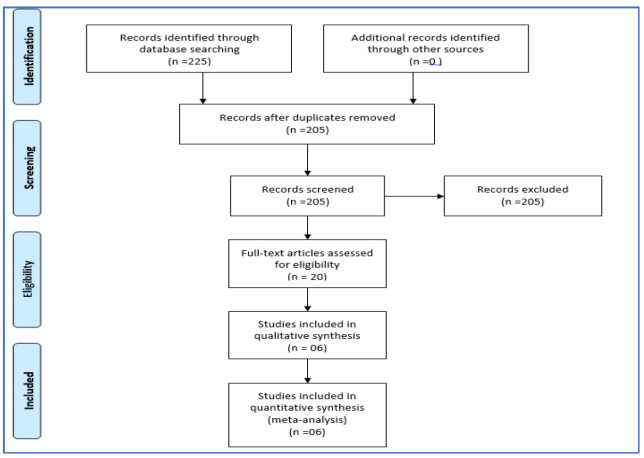


Figure 2

Systematic Literature Review Stages designed by Kitchenham and Charters (2007).

Only six of the 225 papers chosen addressed the application of digital technologies for patient prevention/diagnosis, telemedicine, and patient digital registration in Uttarakhand's rural areas. Hence the study highlighted the drastic need to focus on e-health services in Uttarakhand at the same time-healthcare has appeared to play a crucial player in health system particularlyduring the COVID pandemic scenario in underserved rural areas. Though the Uttarakhand government initiated many digitalized services [9,17] but still the awareness on usage of telemedicine and technology needs to be created among rural population [24], especially in hilly and remote areas of Uttarakhand which can offer to be both cost-effective as well as efficient quality care. E-health care services when concluded, was found to be easy and user-friendly but suffers from challenges like it require a huge investment in setting up computer systems/softwares and sometimes technical hitches including low bandwidth.

Managerial Implications: The SLR can be used in better provision of e-health services in both traditional and modern medicine/medicare including both rural and urban areas of Uttarakhand and other terrain states of India. The SLR concludes extensive utilization of technology in application of health services for effective management in health care sector. This Research study emphasised an intensive analysis of rural healthcare services and its applicability to the geographical location of the area. Hence this study will encourage future researchers to identify other variables could not be covered through this study.

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