Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/7bvgfq15

"ROLE OF UTILIZATION OF TELERADIOLOGY SERVICES IN RURAL INDIA: A CROSS-SECTIONAL STUDY"

Dr. Ghanshyam Turkar[1*] Dr. Prashant Bagdey[2]

[1]Department of Radiology, Assistant Professor, Government Medical College Gondia ,Gondia , Maharashtra, India
[2*]Department of Community Medicine, Professor, Government Medical College Nagpur, Nagpur, Maharashtra, India

***Corresponding Author: Dr. Ghanshyam Turkar,** Department of Radiology, Assistant Professor, Government Medical College Gondia ,mail id :sonoviewgondia083@gmail.com, Address :Sonoview , Civil Line Gondia

ABSTRACT

Background:
Access to radiology services in rural India remains limited due to shortage of radiologists and inadequate infrastructure, leading to delays in diagnosis and unnecessary referrals. Teleradiology has emerged as a promising solution by enabling electronic transmission of images for expert interpretation, improving accessibility and timeliness of care. However, evidence on its utilization and impact in rural Indian settings is limited.

Aim:
To assess the role of teleradiology services in rural community health centres (CHCs) of Gondia district in terms of accessibility, turnaround time, clinical utility, and patient satisfaction.

Methods:
A cross-sectional study was conducted from November 2019 to March 2020 across three rural hospitals (CHCs) of Gondia district. A total of 60 admitted patients (20 from each CHC) who underwent radiological investigations using teleradiology services were included. Data were collected using a pretested questionnaire capturing demographic details, type of imaging study, turnaround time, satisfaction with reporting, and clinical utility. Turnaround time was measured from requisition to delivery of final report. Satisfaction was rated on a five-point Likert scale. Data were analyzed using SPSS version 26.0, with results expressed as frequencies, percentages, and means.

Results:
Of the 60 patients, the majority underwent X-ray (70%), followed by ultrasound (20%) and CT scan (10%). The mean turnaround time was 5.6 ± 2.1 hours; 71.7% of reports were delivered within 6 hours, 23.3% within 7–12 hours, and only 5% beyond 12 hours. Overall, 81.7% of patients reported being satisfied or very satisfied with teleradiology services, while 5% expressed dissatisfaction. Clinical utility was high, with 76.7% of treating physicians reporting that teleradiology reports directly guided immediate management decisions, and 18.3% noting their usefulness in referral decisions.

Conclusion:
Teleradiology significantly improved access to diagnostic services in rural Gondia district by reducing delays and avoiding unnecessary referrals. High patient satisfaction and clinician-reported clinical utility highlight its potential as a sustainable model to strengthen rural healthcare delivery. Expansion of teleradiology to other rural regions, supported by infrastructure development and training, is strongly recommended.

Keywords: Teleradiology, rural healthcare, community health centres, diagnostic access, patient satisfaction

INTRODUCTION

Radiology is an essential component of modern healthcare, playing a crucial role in the diagnosis and management of a wide spectrum of diseases. Access to timely imaging services such as X-ray, CT, and MRI has a direct impact on patient outcomes, particularly in emergency and critical care settings. However, in many low- and middle-income countries, including India, access to radiology services in rural areas remains inadequate due to shortages of trained radiologists, infrastructure limitations, and geographical barriers [1].

Teleradiology, defined as the electronic transmission of radiological images from one location to another for interpretation, has emerged as a promising solution to bridge the rural–urban gap in healthcare delivery. Globally, teleradiology has been widely adopted in high-income countries for round-the-clock reporting and subspecialty consultations. In countries like the United States and parts of Europe, over 60% of hospitals utilize teleradiology services to manage workload and ensure after-hours coverage [2]. Studies have demonstrated that teleradiology improves diagnostic accuracy, reduces reporting turnaround times, and enhances access to expert radiological opinion in underserved areas [3].

In India, the shortage of radiologists is stark, with an estimated ratio of 1 radiologist per 100,000 population, disproportionately affecting rural regions where nearly 70% of the population resides [4]. Most community health centers (CHCs) and district hospitals lack in-house radiologists, and X-rays are often reported by non-specialist medical officers or remain unreported. Teleradiology networks, through digital image transfer and centralized reporting, have shown potential to overcome these challenges. Pilot projects in states such as Maharashtra, Karnataka, and Gujarat have demonstrated that teleradiology can significantly improve timely reporting and reduce unnecessary referrals to higher centers [5,6]. However, utilization remains inconsistent, hindered by infrastructural gaps, connectivity issues, and lack of awareness among healthcare providers [7].

In Gondia district of Maharashtra, like many rural areas of India, community health centers serve as the secondary referral units for surrounding Primary Health centre and villages. Despite the availability of basic radiology equipment, the absence of radiologists limits effective service delivery. Implementation of teleradiology services in these rural hospitals provides an opportunity to assess their role in improving diagnostic access, reducing delays, and enhancing patient care.

The objective was to evaluate the role of utilization of teleradiology services in terms of accessibility, timeliness, clinical usefulness, and patient satisfaction. The expected future outcome is to generate evidence supporting the expansion of teleradiology services in rural India as a sustainable model to strengthen secondary healthcare delivery, optimize referrals, and improve equity in access to diagnostic services.

METHODOLOGY

This cross-sectional study was conducted between November 2019 to March 2020 in three rural hospitals (Community Health Centres) of Gondia district, Maharashtra. Each hospital contributed 20 participants, making a total sample size of 60. The study population included adult patients admitted at the CHCs who underwent radiological investigations and utilized teleradiology services during their hospital stay. Patients who were referred directly to tertiary hospitals without use of teleradiology were excluded.

Data was collected using a predesigned, pretested questionnaire. The tool was administered to eligible patients after they had received their radiological services through the teleradiology system. Information recorded included demographic details, type of radiological investigation (X-ray, CT, or ultrasound), time taken from request to report delivery, ease of access to services, satisfaction with timeliness and quality of reporting, and the perceived usefulness of teleradiology reports in guiding treatment decisions. Responses regarding satisfaction were obtained on a five-point Likert scale ranging from "very dissatisfied" to "very satisfied."

The functioning of teleradiology services at each CHC involved digital transmission of imaging data to a central reporting hub, where radiologists interpreted the images and sent back structured reports electronically. Turnaround time was recorded from the moment of test requisition to the delivery of the finalized report. Clinical utility was assessed by asking patients and their attending clinicians about whether the report contributed to further diagnosis, treatment, or referral decisions.
Data were compiled in Microsoft Excel and analyzed using SPSS version 26.0. Quantitative variables such as turnaround time were expressed as mean ± standard deviation, while categorical variables such as satisfaction levels were presented as frequencies and percentages. Comparisons between subgroups (e.g., type of investigation and satisfaction level) were assessed using chi-square test or Fisher's exact test, as appropriate. A p-value of less than 0.05 was considered statistically significant.
Ethical clearance was not obtained since the study involved service utilization feedback from admitted patients without collection of sensitive personal information or intervention. Informed consent was taken verbally from all participants prior to inclusion in the study. Confidentiality of patient data was maintained throughout the process.

RESULTS

A total of 60 admitted patients who availed teleradiology services across three rural hospitals (CHCs) in Gondia district were included in the study. The mean age of participants was 42.6 ± 12.4 years, with a slight male predominance (55%). The majority of patients (65%) belonged to low socioeconomic backgrounds and had limited prior access to specialist radiology services.

The most commonly utilized investigation through teleradiology was X-ray (70%), followed by ultrasound (20%) and CT scan (10%). The mean turnaround time from requisition to delivery of final report was **5.6 ± 2.1 hours**, with 72% of reports delivered within 6 hours and 95% within 12 hours. Turnaround time was shortest for X-rays (mean 4.8 hours) and longest for CT scans (mean 8.2 hours).
In terms of satisfaction, 81.7% of patients reported being satisfied or very satisfied with teleradiology services, particularly appreciating timely reporting and avoidance of travel to tertiary centers. Around 13.3% remained neutral, while only 5% expressed dissatisfaction, mainly due to perceived delays in urgent CT reporting. Among those satisfied, 85% specifically mentioned that teleradiology reduced the financial and logistic burden of referrals.
From the perspective of clinical utility, attending physicians reported that 76.7% of teleradiology reports directly contributed to patient management decisions, including timely initiation of treatment at the CHC and reducing unnecessary referrals. In 18.3% of cases, reports supported referrals to higher centers with clearer documentation, and in 5% of cases, reports were judged as inconclusive, necessitating further imaging.

Overall, the findings highlight that teleradiology services were well-utilized and valued by patients in rural Gondia district, with high levels of satisfaction, reduced turnaround time, and significant contribution to clinical decision-making at the CHC level.

Table 1: Demographic Profile and Service Utilization (n = 60)

Variable	No. of Patients	Percentage (%)
Age Group (years)		
≤ 30	12	20.0
31–50	28	46.7
> 50	20	33.3
Sex		
Male	33	55.0
Female	27	45.0
Type of Investigation		
X-ray	42	70.0
Ultrasound	12	20.0
CT Scan	6	10.0

Table 2: Turnaround Time of Teleradiology Reports (n = 60)

Turnaround Time	No. of Patients	Percentage (%)
≤ 6 hours	43	71.7
7–12 hours	14	23.3
> 12 hours	3	5.0
Mean ± SD (hours)	**5.6 ± 2.1**	–

Table 3: Satisfaction and Clinical Utility of Teleradiology Services (n = 60)

Parameter	No. of Patients	Percentage (%)
Patient Satisfaction		
Very Satisfied	28	46.7
Satisfied	21	35.0
Neutral	8	13.3
Dissatisfied	3	5.0
Clinical Utility (as per treating physicians)		
Guided immediate management	46	76.7
Supported referral decisions	11	18.3
Inconclusive / required repeat	3	5.0

Figure 1: Patient Satisfaction with Teleradiology Services

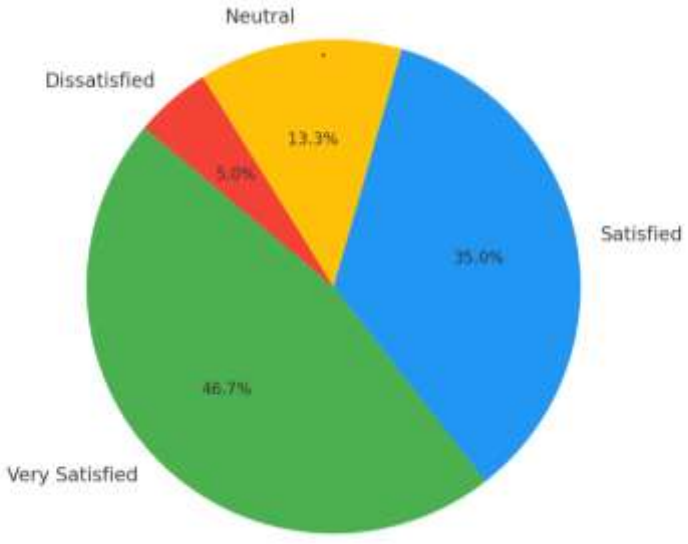
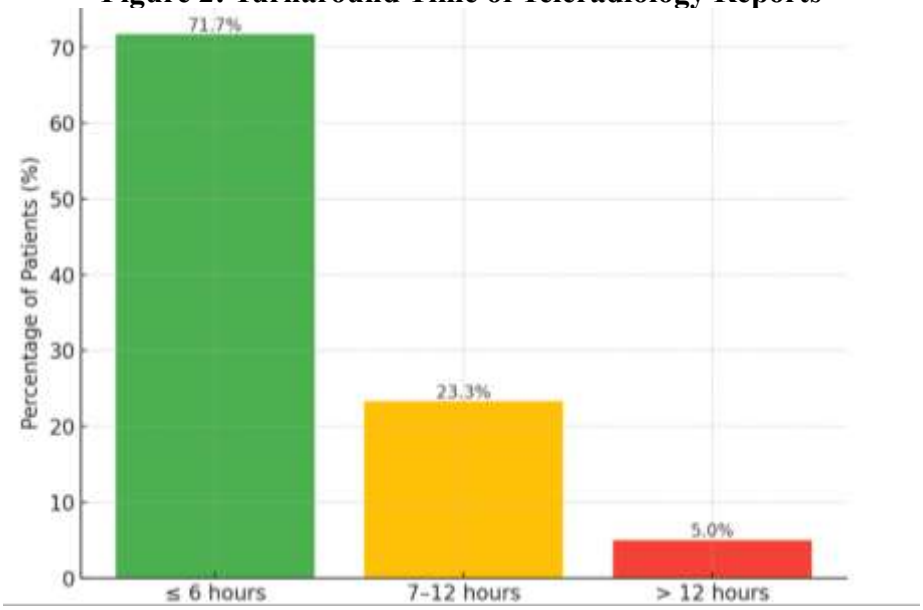


Figure 2: Turnaround Time of Teleradiology Reports



DISCUSSION

This cross-sectional study conducted in three rural hospitals of Gondia district highlights the important role of teleradiology in bridging the diagnostic gap in underserved areas. Among the 60 admitted patients assessed, the majority utilized X-ray services, with teleradiology providing timely reports in more than 70% of cases within six hours. Overall satisfaction levels were high, with more than 80% of patients reporting that teleradiology improved their access to imaging services and reduced the need for unnecessary referrals to higher centers.

The findings are in line with global experiences where teleradiology has been shown to enhance diagnostic accessibility and turnaround time. Thrall noted that in the United States, more than 60% of hospitals employ teleradiology services, primarily to ensure round-the-clock coverage and subspecialty interpretation [2]. Similarly, Duerinckx and Pisa reported that teleradiology reduces reporting delays and enables equitable access to radiology expertise across geographically distant hospitals [3]. In our study, the mean turnaround time was 5.6 hours, which compares favorably with international benchmarks of less than 8 hours for rural or remote hospitals.

Indian studies have also highlighted the utility of teleradiology in rural healthcare. Ganapathy and Ravindra documented the Apollo Telemedicine experience, showing that teleradiology reduced patient referrals to tertiary centers by 30% and provided faster diagnosis in rural regions [5]. A study from Gujarat by Desai et al. demonstrated that district-level hospitals equipped with teleradiology achieved report delivery within 6–12 hours in most cases, improving clinical decision-making and patient satisfaction [6]. Our study findings are consistent with these results, particularly regarding improved patient satisfaction and reduced delays.

From the perspective of clinical utility, 76.7% of attending physicians in this study reported that teleradiology reports directly contributed to patient management decisions. This supports earlier evidence from Reddy and Prasad, who identified that clinician confidence in diagnosis improved significantly when teleradiology services were available [7]. Importantly, patients in our study also emphasized reduced financial burden, since local management was made possible without frequent travel to urban centers for radiological consultations.

Despite these positive findings, certain limitations were observed. A small subset of patients (5%) expressed dissatisfaction due to delays in urgent CT reporting, reflecting the challenges of connectivity and infrastructure in rural India. Similar barriers, including poor internet connectivity, lack of technical staff, and inadequate awareness among healthcare providers, have been reported in prior studies [8]. These systemic issues highlight that while teleradiology is a promising solution, its success requires reliable infrastructure, continuous training, and robust policy-level support.

Overall, this study reinforces that teleradiology is an effective tool to improve healthcare delivery in rural India by providing timely radiology services, enhancing clinician confidence, and increasing patient satisfaction. Expanding such services to all community health centers can play a significant role in achieving equity in healthcare access, particularly in underserved populations.

CONCLUSION

This study demonstrated that teleradiology services play a vital role in improving access to diagnostic imaging in rural India. In three community health centers of Gondia district, the majority of patients received radiology reports within six hours, with a mean turnaround time of 5.6 hours. More than 80% of patients expressed satisfaction with the service, and over three-quarters of clinicians reported that teleradiology directly contributed to patient management decisions. By reducing delays, avoiding unnecessary referrals, and lowering financial burdens, teleradiology proved to be an effective and patient-centered solution for bridging the rural–urban healthcare divide.

LIMITATIONS AND RECOMMENDATIONS

This study was limited by its small sample size of 60 patients and single-district setting, which may restrict the generalizability of findings to other regions. Only admitted patients were included, and the study did not assess cost-effectiveness or long-term clinical outcomes associated with teleradiology utilization. Furthermore, infrastructure-related challenges such as inconsistent internet connectivity and occasional delays in CT scan reporting were observed, which could affect the reliability of services.

Despite these limitations, the study highlights the strong potential of teleradiology to strengthen rural healthcare delivery. It is recommended that teleradiology services be expanded to all community health centers and district hospitals, supported by government health programs. Investment in digital infrastructure, training of healthcare providers, and creation of standardized reporting workflows are essential for sustainable implementation. Regular audits and multicentric studies with larger populations should be conducted to assess the long-term impact of teleradiology on patient outcomes and healthcare equity.

REFERENCES

1. Reiner BI, Siegel EL. Radiology reporting: Returning to our image-centric roots. AJR Am J Roentgenol. 2006;187(5):1151–5.
2. Thrall JH. Teleradiology part I. History and clinical applications. Radiology. 2007;243(3):613–7.
3. Duerinckx AJ, Pisa EJ. Teleradiology: Past, present, and future. Radiographics. 1998;18(6):1535–47.
4. Ananthakrishnan R, Ravikumar R. Radiology manpower in India: Current scenario and future directions. Indian J Radiol Imaging. 2016;26(4):463–5.
5. Ganapathy K, Ravindra A. Telemedicine in India: The Apollo story. Telemed J E Health. 2009;15(6):576–85.
6. Desai S, Mehta S, Kotwal A, Dholakia D. Role of teleradiology in Gujarat: An experience from district hospitals. Indian J Public Health. 2013;57(1):43–6.
7. Reddy B, Prasad S. Barriers to teleradiology adoption in India: A critical review. Health Policy Technol. 2018;7(3):318–25.
8. Mishra SK, Kapoor L, Singh IP. Telemedicine in India: Current scenario and the future. Telemed J E Health. 2009;15(6):568–75.