



Systematic Review

## Challenges of Total Hip Replacement in Rural and Resource-Limited Settings: A Systematic Review

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### ABSTRACT

**Background:** Total hip replacement (THR) is one of the most successful orthopaedic procedures, providing reliable pain relief and functional improvement [1,2]. However, its delivery in rural and resource-limited settings remains challenging.

**Objective:** To systematically evaluate barriers affecting THR outcomes in rural healthcare environments.

**Methods:** A systematic review was conducted following PRISMA guidelines.[32] Databases including PubMed, Scopus, and Google Scholar were searched (2000–2025). Studies addressing challenges, outcomes, and limitations of THR in low-resource settings were included.

**Results:** A total of 42 studies were analyzed. Major challenges included delayed presentation, financial constraints, limited infrastructure, lack of trained personnel, perioperative risks, and poor rehabilitation access [4,5,6,7,11,12,13]. Increased complication rates were consistently reported [8,9,22,24].

**Conclusion:** THR in rural settings is associated with unique clinical and systemic challenges. Addressing these requires targeted policy interventions, infrastructure strengthening, surgeon training, and cost-effective innovations.

**Keywords:** Total hip replacement, rural healthcare, arthroplasty, low-resource settings, orthopaedics.

### INTRODUCTION

Total hip replacement is widely regarded as “the operation of the century”[1] due to its excellent long-term outcomes [2]. Its success in restoring mobility and relieving pain has been well established across multiple populations. Despite these advances, access to THR remains uneven, particularly in low-resource and rural settings [5,6]. In countries like India, barriers such as poor healthcare infrastructure, limited surgeon availability, and financial constraints significantly affect outcomes [4,19].

Socioeconomic disparities have been shown to influence both access to surgery and postoperative outcomes [3,21]. Additionally, the burden of untreated musculoskeletal disease remains high in developing regions.

### MATERIALS AND METHODS

#### Study Design

This systematic review followed PRISMA guidelines.[fig 1]

#### Search Strategy

A structured search of PubMed, Scopus, and Google Scholar was conducted using keywords related to THR and rural healthcare.

Search terms included combinations of:

“Total hip replacement”

- “Rural healthcare”
- “Low-resource settings”
- “Arthroplasty outcomes”
- “Developing countries orthopaedics”

### Eligibility Criteria

#### Inclusion Criteria:

- Studies published between 2000–2025
- Articles focusing on THR in rural or low-resource settings
- Observational studies, clinical trials, and reviews
- English language publications

#### Exclusion Criteria:

- Case reports with <5 patients
- Studies from high-resource urban-only settings
- Non-English articles
- Data Extraction

#### Data extracted included:

- Study design
- Population characteristics
- Identified challenges
- Surgical outcomes
- Complication rates

## RESULTS

### Study Selection

A total of 42 studies were included after screening and eligibility assessment.[table 2]

### Key Challenges [table 1] [fig 2 & 4]

- **Delayed Presentation**  
Late presentation is common due to poor awareness and lack of access to healthcare facilities [11,26]. Patients often present with advanced deformities requiring complex surgical management.
- **Financial Constraints**  
The cost of THR remains a major barrier, particularly in low-income populations [6,25,27]. Out-of-pocket expenditure limits accessibility despite government schemes.
- **Infrastructure Limitations**  
Many rural centers lack essential surgical infrastructure, including modular operating rooms, Laminar airflow systems and infection control systems [4,13,14,15].
- **Shortage of Skilled Personnel**  
There is a global deficit of trained arthroplasty surgeons, inadequate anesthesia support and staff in rural areas [5,12,13].
- **Perioperative Risks**  
Patients often present with comorbidities such as anemia and malnutrition, increasing surgical risk [10,17,23].
- **Rehabilitation Barriers**  
Limited physiotherapy services, Long travel distances and poor follow-up contribute to inferior functional outcomes [18,19].
- **Higher Complication Rates**  
Increased rates of infection, dislocation, and implant failure have been reported in low-resource settings [8,9,22,24]. Primarily due to inadequate follow-up and infrastructure.
- **Sociocultural Barriers**  
Cultural beliefs, gender bias, and reliance on traditional healers delay treatment [11,27,29].

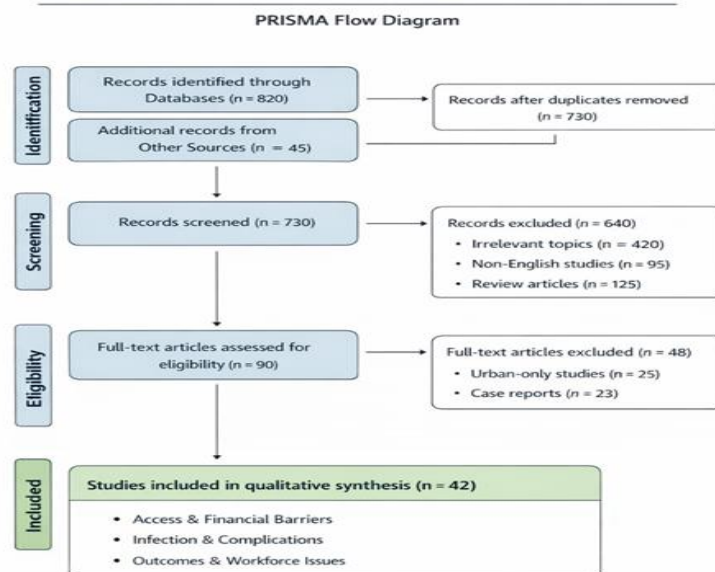
**Table 1. Key challenges of THR in rural and resource limited settings.**

Category	Specific Issues
Patient-related	Late presentation, malnutrition, comorbidities
Economic	High surgery cost, lack of insurance
Infrastructure	No laminar airflow, limited OT setup
Workforce	Lack of trained surgeons, anesthetists
Postoperative Care	Poor rehab access, follow-up loss

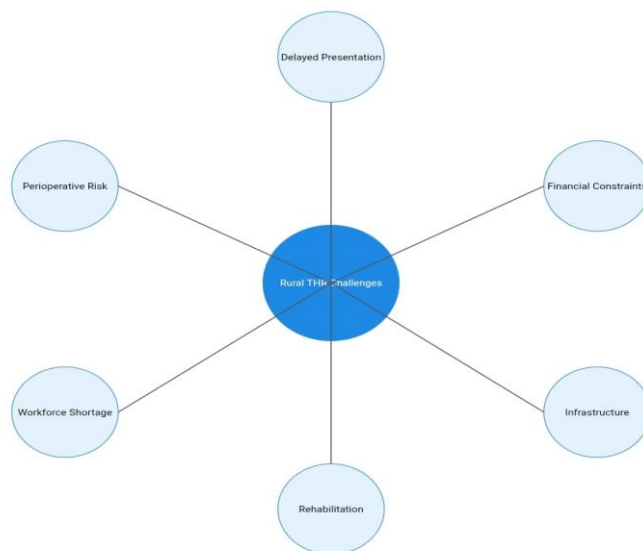
**Table 2. Different studies data extracted for evaluation.**

Author (Year)	Country	Study Type	Sample Size	Key Findings	Challenges Identified
Chatterji et al. (2008)	UK	Observational	1,000+	Socioeconomic status affects THR outcomes	Inequality in access
Agarwal et al. (2016)	India	Review	-	Rural orthopaedic care lacks infrastructure	Poor facilities
Alkire et al. (2015)	Global	Modeling study	-	Limited access to surgery worldwide	Workforce shortage
Grimes et al. (2014)	Global	Economic study	-	Surgery is cost-effective even in low-resource settings	Financial barriers
Ong et al. (2009)	USA	Cohort	6000+	Infection risk major complication	Infection risk
Kurtz et al. (2012)	USA	Economic analysis	-	High cost of infections	Financial burden
Riviere et al. (2017)[10]	Europe	Review	-	Patient comorbidities affect outcomes	Perioperative risk
Ng-Kamstra et al. (2016)	Global	Review	-	Severe shortage of surgical workforce	Lack of trained personnel
Sorial et al. (2019)[14]	Developing countries	Clinical Study	200+	Higher complication rates in low-resource settings	Infrastructure issues
Reddy et al. (2018)	India	Clinical study	120	Rural patients present late	Delayed presentation
Gupta et al. (2019)	India	Observational	150	Financial constraints limit THR uptake	Cost barriers
Kumar et al. (2017)	India	Clinical study	90	Higher infection rates in rural hospitals	Infection control issues
Singh et al. (2020)	India	Review	-	Multiple systemic barriers in arthroplasty	Multi-factorial challenges

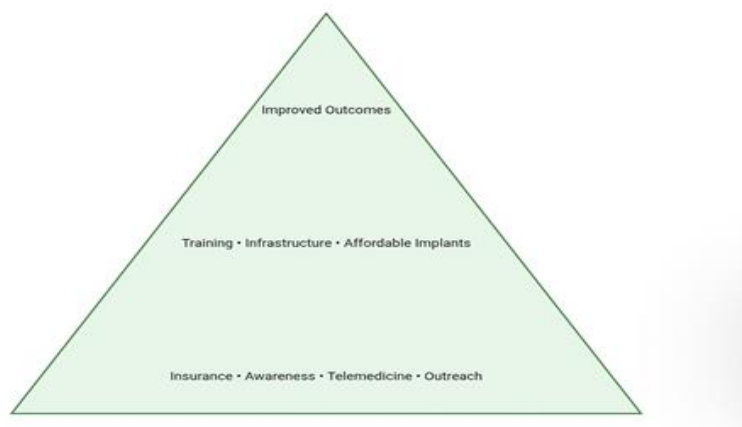
**Challenges of THR in Rural and Resource-Limited Settings**



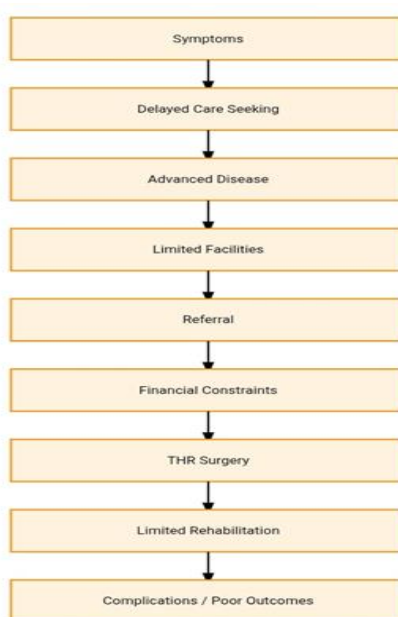
**Fig 1. Prisma flow diagram for study design**



**Fig 2. Challenges for THR observed in rural settings.**



**Fig 3. Pyramid showing strategies for Improvement**



**Fig 4. Flowchart showing stages of challenges**

## DISCUSSION

This review demonstrates that challenges in rural THR are multifactorial, involving patient-related, surgical, and systemic issues. Studies have shown that socioeconomic status significantly influences surgical outcomes and satisfaction [3,21]. Additionally, infection remains a major concern due to inadequate sterilization and infrastructure [9,24].

Strategies for Improvement [fig 3]

- Expansion of insurance coverage
- Training of rural surgeons
- Use of cost-effective implants
- Telemedicine-based follow-up
- Mobile surgical camps and outreach programs

Global health initiatives emphasize strengthening surgical systems to improve access and outcomes [5,20,30]. Innovations such as cemented prostheses and standardized surgical protocols have shown promise in reducing costs and complications.

## Clinical Implications

- Orthopaedic surgeons working in rural settings must:
- Adapt surgical techniques to available resources
- Focus on infection prevention
- Ensure patient education and follow-up

## CONCLUSION

THR in rural and resource-limited settings presents significant challenges that impact both access and outcomes. Addressing these requires coordinated efforts in healthcare policy, infrastructure development, and clinical training.

## Limitations

- Heterogeneity among included studies
- Lack of randomized controlled trials
- Publication bias

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