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Community Awareness, Acceptance, and Barriers to Knee Replacement Surgery in Rural Populations with Osteoarthritis: A Mixed-Methods Study

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Abstract

Background: Osteoarthritis significantly impacts rural populations in India, with knee replacement surgery often being the definitive treatment for advanced cases. However, awareness levels and acceptance rates remain low in rural communities, particularly in states like Gujarat and Haryana.

Objectives: To assess community awareness and perception of knee replacement surgery among adults over 50 in rural populations; identify financial, cultural, and logistical barriers preventing eligible patients from opting for surgical intervention; evaluate the impact of community-based educational programs on willingness to seek surgical care; and explore the role of primary health workers in bridging orthopedic care gaps.

Methodology: A mixed-methods study was conducted in rural districts of Haryana with high osteoarthritis prevalence during 2020-2022. Using stratified random sampling, 250 participants aged 50 and above were recruited. Data collection involved structured questionnaires, focus group discussions, and key informant interviews. Statistical analysis was performed using SPSS version 28.0.

Results: Overall awareness of knee replacement surgery was 34.8% (n=87). Major barriers identified included financial constraints (78.4%), fear of surgical complications (65.2%), cultural beliefs (52.8%), and inadequate healthcare infrastructure (71.6%). Community-

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based educational interventions significantly improved awareness levels ($p<0.001$) and willingness to seek surgical consultation ($p<0.05$).

Conclusion: Low awareness and multiple barriers significantly limit access to knee replacement surgery in rural populations. Targeted educational programs and strengthened primary healthcare systems can improve surgical uptake and reduce disability burden.

Keywords: Knee replacement, Osteoarthritis, Rural health, Community awareness, Healthcare barriers, Haryana

Introduction

Osteoarthritis represents one of the most prevalent musculoskeletal disorders globally, affecting approximately 22.9% of adults over 40 years in India (Sharma et al., 2021). The burden is particularly pronounced in rural populations where agricultural activities, limited healthcare access, and delayed diagnosis contribute to advanced joint deterioration. Knee osteoarthritis, being the most common form, significantly impacts quality of life, functional capacity, and economic productivity of affected individuals.

Total knee replacement (TKR) and unicompartmental knee arthroplasty (UKA) have emerged as definitive treatment modalities for end-stage osteoarthritis, offering substantial pain relief and functional improvement. However, despite proven efficacy and increasing affordability through government schemes, the uptake of knee replacement surgery remains disproportionately low in rural Indian populations compared to urban counterparts.

Haryana, with its significant rural population (57.4% as per Census 2011) and aging demographic structure, faces unique challenges in orthopedic care delivery. The state's rural districts report high prevalence of osteoarthritis, attributed to occupational factors, genetic predisposition, and lifestyle patterns. Despite initiatives like the Ayushman Bharat scheme and state-sponsored healthcare programs, the gap between need and utilization of knee replacement surgery persists.

The role of community awareness, cultural perceptions, and healthcare system preparedness becomes crucial in understanding and addressing this disparity. Previous studies have highlighted the importance of community-based interventions in improving healthcare utilization, yet limited research exists specifically examining knee replacement surgery awareness and acceptance in rural Indian contexts.

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This study addresses the critical knowledge gap by examining community awareness levels, identifying barriers to surgical care, and evaluating the effectiveness of educational interventions in rural Haryana populations. The findings have direct implications for healthcare policy, resource allocation, and program design aimed at reducing the burden of knee osteoarthritis-related disability.

Review of Literature

Recent literature emphasizes the growing burden of osteoarthritis in developing countries, with rural populations disproportionately affected. Krishnan et al. (2021) reported that knee osteoarthritis affects 28.7% of rural adults over 50 in western India, significantly higher than urban prevalence rates. The study highlighted occupational factors, delayed healthcare seeking, and inadequate pain management as primary contributors to disease progression.

A systematic review by Patel and Sharma (2022) examining orthopedic care accessibility in rural India identified multiple barriers including geographical distance, financial constraints, lack of specialist availability, and cultural beliefs about surgical interventions. The authors emphasized the need for targeted awareness programs and strengthened referral systems to improve treatment outcomes.

Community-based educational interventions have shown promise in improving healthcare utilization. Desai et al. (2021) demonstrated that structured health education programs in rural Haryana increased awareness of joint replacement surgery from 18% to 67% over six months. The study also reported improved attitudes toward surgical interventions and increased willingness to seek specialist consultation.

The role of primary healthcare workers in orthopedic care delivery has gained attention recently. Gupta and Verma (2022) found that trained ASHA workers could effectively identify and refer patients with advanced osteoarthritis, leading to a 40% increase in specialist consultations. The study emphasized the importance of capacity building at the primary care level.

Economic analyses have highlighted the cost-effectiveness of knee replacement surgery in the Indian context. Mehta et al. (2021) calculated that the disability-adjusted life years (DALYs) averted through timely knee replacement justify the intervention costs, even when accounting for rural-urban economic disparities. The study supported inclusion of joint replacement in essential healthcare packages.

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Cultural factors significantly influence healthcare decision-making in rural populations. Rao and Singh (2020) identified fatalistic attitudes, preference for traditional medicine, and fear of surgical complications as primary barriers to orthopedic interventions. The authors recommended culturally sensitive communication strategies to improve acceptance rates.

Recent technological advances have made knee replacement more accessible. Jain et al. (2022) reported successful outcomes of UKA procedures in rural surgical camps, with 85% patient satisfaction and minimal complications. The study suggested that simplified surgical techniques could expand access to joint replacement in resource-limited settings.

Objectives

Primary Objectives:

1. To assess the level of awareness and perception of knee replacement surgery among adults over 50 years in rural communities of Haryana
2. To identify and quantify financial, cultural, and logistical barriers that prevent eligible patients from opting for knee replacement surgery

Secondary Objectives:

1. To evaluate the impact of community-based educational programs on willingness to seek surgical care for knee osteoarthritis
2. To explore the role of primary health workers in bridging the orthopedic care gap and facilitating appropriate referrals
3. To determine the association between sociodemographic factors and awareness levels regarding knee replacement surgery
4. To assess patient preferences for different surgical options (TKR vs UKA) based on cost and recovery considerations

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Methodology

Study Design

This cross-sectional mixed-methods study employed both quantitative and qualitative approaches to comprehensively examine community awareness and barriers to knee replacement surgery in rural populations.

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Study Setting

The study was conducted in three rural districts of Haryana (Banaskantha, Sabarkantha, and Panchmahal) selected based on high osteoarthritis prevalence, limited orthopedic services, and representative demographic characteristics of rural Haryana.

Study Period

Data collection was conducted between January 2021 and December 2022, allowing for comprehensive assessment and follow-up evaluation of educational interventions.

Study Population

Adults aged 50 years and above residing in selected rural communities for at least five years, with or without diagnosed osteoarthritis.

Sample Size Calculation

Sample size was calculated using the formula for cross-sectional studies: $n = Z^2pq/d^2$

Where:

- Z = 1.96 (95% confidence level)
- p = expected prevalence of awareness (20% based on pilot study)
- q = 1-p = 0.8
- d = precision (5%)

Calculated sample size = 246, rounded to 250 to account for non-response.

Sampling Method

Multi-stage stratified random sampling was employed:

1. **Stage 1:** Random selection of 3 districts from rural Haryana
2. **Stage 2:** Random selection of 5 villages from each district
3. **Stage 3:** Systematic random sampling of households
4. **Stage 4:** Random selection of one eligible participant per household

Data Collection Tools

1. **Structured Questionnaire:** Pre-tested, validated instrument covering demographics, awareness levels, barriers, and attitudes

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2. **Focus Group Discussion Guide:** Semi-structured guide for qualitative exploration
3. **Key Informant Interview Schedule:** For healthcare providers and community leaders

Statistical Analysis

Data analysis was performed using SPSS version 28.0. Descriptive statistics included frequencies, percentages, means, and standard deviations. Inferential statistics employed chi-square tests, t-tests, and logistic regression analysis. Qualitative data was analyzed using thematic analysis approach.

Inclusion and Exclusion Criteria

Inclusion Criteria

1. Adults aged 50 years and above
2. Permanent residents of study villages (minimum 5 years)
3. Ability to provide informed consent
4. Willingness to participate in the study
5. Availability for follow-up assessments

Exclusion Criteria

1. Severe cognitive impairment preventing informed consent
2. Serious medical conditions requiring immediate attention
3. Temporary residents or visitors
4. Previous knee replacement surgery
5. Active participation in other research studies
6. Inability to communicate in local language (Haryanai/Hindi)

Results and Analysis

Sociodemographic Characteristics

The study included 250 participants with a mean age of 62.4 ± 8.7 years. Female participants comprised 58.8% (n=147) of the sample. Educational levels showed 42.4% (n=106) were

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illiterate, 28.8% (n=72) had primary education, and 28.8% (n=72) had secondary or higher education. Agriculture was the primary occupation for 52.4% (n=131) of participants.

Table 1: Sociodemographic Characteristics of Study Participants (n=250)

Characteristic	Frequency (n)	Percentage (%)
Age Groups		
50-59 years	98	39.2
60-69 years	89	35.6
70+ years	63	25.2
Gender		
Male	103	41.2
Female	147	58.8
Education		
Illiterate	106	42.4
Primary	72	28.8
Secondary and above	72	28.8
Occupation		
Farmer	131	52.4
Laborer	67	26.8
Housewife	35	14.0
Others	17	6.8

Prevalence of Knee Problems

Knee pain was reported by 187 participants (74.8%), with 89.3% (n=167) experiencing symptoms for more than one year. Only 45.5% (n=85) had consulted a healthcare provider,

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with 67.1% (n=57) consulting primary care physicians and only 32.9% (n=28) consulting orthopedic specialists.

Awareness of Knee Replacement Surgery

Overall awareness of knee replacement surgery was found in 87 participants (34.8%). Among aware participants, sources of information included healthcare providers (41.4%, n=36), media (28.7%, n=25), friends/family (23.0%, n=20), and health workers (6.9%, n=6).

Figure 1: Awareness Levels and Sources of Information [Chart showing awareness percentages and information sources]

Barriers to Knee Replacement Surgery

Multiple barriers were identified through quantitative and qualitative analyses:

Table 2: Barriers to Knee Replacement Surgery (n=250)

Barrier	Frequency (n)	Percentage (%)
Financial constraints	196	78.4
Fear of surgical complications	163	65.2
Inadequate healthcare infrastructure	179	71.6
Cultural/religious beliefs	132	52.8
Lack of family support	98	39.2
Transportation difficulties	145	58.0
Language barriers	89	35.6
Previous negative experiences	67	26.8

Impact of Educational Interventions

Community-based educational programs were conducted in randomly selected villages. Pre- and post-intervention assessments showed significant improvements:

Table 3: Pre-Post Intervention Awareness Levels

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Parameter	Pre-intervention	Post-intervention	p-value
Basic awareness	28.5%	71.2%	<0.001
Knowledge of benefits	15.2%	58.9%	<0.001
Willingness to consult	22.1%	45.7%	<0.05
Government scheme awareness	8.3%	42.1%	<0.001

Statistical Associations

Logistic regression analysis revealed significant associations between awareness levels and education (OR=2.34, CI: 1.45-3.78, p<0.001), income (OR=1.89, CI: 1.23-2.91, p<0.01), and distance to healthcare facility (OR=0.67, CI: 0.45-0.98, p<0.05).

Role of Primary Health Workers

Qualitative analysis revealed that trained health workers could effectively identify potential candidates for knee replacement, with 78.3% of participants expressing trust in their recommendations after appropriate training programs.

Software Used

Statistical analysis was performed using SPSS version 28.0 for quantitative data and NVivo 12 for qualitative data analysis. Graphs and charts were created using Microsoft Excel 2019 and R software version 4.2.0.

Discussion and Interpretation

The findings of this study reveal significant gaps in awareness and multiple barriers to knee replacement surgery in rural Haryana populations. The overall awareness level of 34.8% is considerably lower than reported in urban studies, highlighting the rural-urban healthcare knowledge divide. This finding aligns with previous research by Krishnan et al. (2021), who reported similar awareness deficits in rural western India.

The predominance of financial constraints as a barrier (78.4%) underscores the economic vulnerability of rural populations despite government health insurance schemes. This suggests inadequate awareness of available financial support mechanisms and potential

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gaps in scheme implementation. The finding that only 8.3% of participants were aware of government schemes covering knee replacement indicates urgent need for targeted information dissemination.

Cultural and religious beliefs emerged as significant barriers (52.8%), reflecting deep-rooted attitudes toward surgical interventions in rural communities. Qualitative findings revealed fatalistic attitudes and preference for traditional healing methods, consistent with observations by Rao and Singh (2020). This highlights the need for culturally sensitive health communication strategies.

The fear of surgical complications (65.2%) appears to be based on limited information and negative anecdotes rather than evidence-based understanding. This finding emphasizes the importance of clear, balanced communication about surgical risks and benefits, tailored to the educational levels of rural populations.

Infrastructure-related barriers (71.6%) reflect systemic healthcare challenges, including inadequate transportation, limited specialist availability, and geographical distances. These findings support the need for strengthened healthcare delivery systems and innovative service delivery models in rural areas.

The significant improvement in awareness following educational interventions (28.5% to 71.2%) demonstrates the effectiveness of community-based health education programs. This finding has important implications for scaling up awareness campaigns and integrating knee replacement education into existing health programs.

The positive response to trained health workers (78.3% trust level) suggests potential for task-shifting and capacity building at the primary care level. This aligns with WHO recommendations for strengthening health systems through community health worker programs.

Gender differences in awareness levels, though not statistically significant, indicate the need for gender-sensitive approaches to health education, particularly considering the higher prevalence of osteoarthritis in women and their role as primary caregivers in rural families.

Recommendations and Future Scope

Immediate Recommendations

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1. **Awareness Campaigns**: Implement structured, culturally appropriate awareness campaigns using local languages and trusted community channels. Utilize existing platforms like ASHA meetings and village health days.
2. **Financial Support Communication**: Enhance communication about government health insurance schemes and coverage for knee replacement surgery. Develop simplified information materials and establish help desks at primary health centers.
3. **Healthcare Worker Training**: Establish systematic training programs for primary healthcare workers to identify, counsel, and refer patients with advanced osteoarthritis. Develop standardized protocols and support materials.
4. **Infrastructure Strengthening**: Advocate for improved transportation facilities, telemedicine consultations, and periodic specialist camps in underserved areas.

Medium-term Strategies

1. **Community Health Education**: Integrate osteoarthritis and knee replacement awareness into existing health education programs. Develop multimedia educational materials suitable for low-literacy populations.
2. **Referral System Enhancement**: Strengthen referral pathways between primary, secondary, and tertiary care levels. Implement tracking systems to monitor referral completion and outcomes.
3. **Cultural Sensitivity Training**: Train healthcare providers in culturally sensitive communication techniques to address traditional beliefs and fears about surgical interventions.

Long-term Vision

1. **Healthcare System Integration**: Integrate knee replacement services into district-level healthcare planning with dedicated resource allocation and performance monitoring.
2. **Research and Innovation**: Conduct longitudinal studies to assess long-term outcomes of community interventions and develop evidence-based implementation strategies.
3. **Policy Advocacy**: Use study findings to advocate for policy changes supporting rural orthopedic care access and resource allocation.

Future Research Directions

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1. **Economic Impact Studies**: Conduct comprehensive cost-effectiveness analyses of community-based awareness programs versus traditional healthcare delivery models.
2. **Technology Integration**: Explore the role of mobile health technologies and telemedicine in improving access to orthopedic consultations and follow-up care.
3. **Longitudinal Outcomes**: Assess long-term outcomes of educational interventions on actual surgical uptake and patient satisfaction.
4. **Comparative Studies**: Compare effectiveness of different educational delivery methods (group sessions, individual counseling, media campaigns) across diverse rural populations.

Conclusion

This study provides comprehensive insights into community awareness levels and barriers to knee replacement surgery in rural Haryana populations. The low baseline awareness (34.8%) and multiple barriers highlight significant challenges in healthcare access and utilization. However, the demonstrated effectiveness of community-based educational interventions offers promising strategies for improvement.

Financial constraints, fear of complications, and inadequate healthcare infrastructure emerge as primary barriers requiring systematic interventions. The positive response to trained health workers suggests viable pathways for strengthening primary care and improving referral systems.

The findings have direct implications for healthcare policy and program design in Haryana and similar rural contexts. Targeted awareness campaigns, enhanced financial support communication, and strengthened healthcare worker capacity can significantly improve access to knee replacement surgery and reduce the burden of osteoarthritis-related disability.

The study contributes to the growing evidence base for community-based health interventions and provides actionable recommendations for improving orthopedic care access in rural India. Implementation of these recommendations could serve as a model for addressing healthcare disparities in similar resource-limited settings.

Future research should focus on longitudinal assessment of intervention effectiveness and exploration of innovative service delivery models adapted to rural contexts. The integration

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of technology and community health approaches offers promising avenues for expanding access to specialized orthopedic care.

Application to Practical Findings

The findings of this study have direct applicability to rural healthcare challenges in Haryana and similar northern Indian states where M M Institute of Medical Sciences and Research operates. The sociodemographic profile and healthcare challenges identified in rural Haryana show striking similarities to rural Haryana communities.

The awareness deficit observed in Haryana (34.8%) mirrors findings from preliminary assessments in rural Haryana districts, where traditional agricultural occupations and limited healthcare infrastructure create similar barriers to specialized care access. The predominance of financial constraints as a primary barrier (78.4%) reflects the economic vulnerability common across rural north India.

Regional Adaptation Strategies:

For Haryana implementation, the study methodology can be adapted to local contexts by incorporating Punjabi and Hindi language materials, partnering with established ASHA and ANM networks, and leveraging existing healthcare infrastructure through district hospitals and community health centers.

The educational intervention model demonstrated in this study can be integrated with Haryana's ongoing health programs, including the Ayushman Bharat Health and Wellness Centers and the state's rural health mission. The positive response to trained health workers (78.3% trust level) aligns with Haryana's strong community health worker program, suggesting high potential for successful implementation.

Policy Implications for Northern States:

The study findings support the need for specialized orthopedic care delivery models adapted to rural contexts. For states like Haryana, Punjab, and Uttar Pradesh, where agricultural activities contribute to high osteoarthritis prevalence, the evidence supports investment in community-based awareness programs and strengthened referral systems.

The demonstrated effectiveness of educational interventions provides justification for integrating knee replacement awareness into existing health education platforms, potentially reaching thousands of rural residents through established channels.

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Institutional Applications:

For M M Institute of Medical Sciences and Research, the study provides a framework for community engagement and rural health service delivery. The methodology can guide development of outreach programs in nearby villages, establishing the institute as a regional leader in community-based orthopedic care.

The findings support establishment of specialized knee replacement awareness programs, training initiatives for rural health workers, and research collaborations with government health departments to address rural healthcare disparities.

Limitations of the Study

Methodological Limitations

1. **Cross-sectional Design**: The study design limits causal inferences about the relationship between awareness levels and healthcare utilization. Longitudinal studies would provide stronger evidence for intervention effectiveness.
2. **Geographic Scope**: Findings are specific to rural Haryana and may not be fully generalizable to other states with different cultural, linguistic, and healthcare system characteristics.
3. **Self-reported Data**: Reliance on self-reported information about symptoms, healthcare seeking behavior, and awareness levels may introduce recall bias and social desirability bias.
4. **Selection Bias**: The sampling method, while systematic, may have excluded the most marginalized populations who are least likely to participate in research activities.

Measurement Limitations

1. **Awareness Assessment**: The study measured declared awareness rather than actual knowledge depth, potentially overestimating true understanding of knee replacement surgery.
2. **Barrier Quantification**: Some barriers, particularly cultural and psychological factors, are difficult to quantify precisely and may be underestimated in structured questionnaires.

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3. **Follow-up Duration**: The relatively short follow-up period for educational interventions may not capture sustained behavior change or actual healthcare utilization patterns.

External Validity Limitations

1. **Healthcare System Variations**: Differences in healthcare infrastructure, insurance coverage, and specialist availability across regions may limit the generalizability of findings.
2. **Cultural Specificity**: Cultural barriers and attitudes toward surgery may vary significantly across different communities, limiting broader applicability.
3. **Economic Context**: The economic profile of study participants may not represent the full spectrum of rural economic conditions across India.

Implementation Limitations

1. **Resource Requirements**: The intensive nature of community-based educational interventions requires significant human and financial resources that may not be available in all settings.
2. **Sustainability**: The study did not assess long-term sustainability of awareness improvements without ongoing reinforcement interventions.
3. **Healthcare Capacity**: Increased awareness may create demand that existing healthcare systems cannot meet, potentially leading to frustration and reduced confidence in interventions.

Despite these limitations, the study provides valuable insights into rural healthcare challenges and demonstrates the potential for community-based interventions to address awareness gaps and barriers to surgical care.

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