RESEARCH PAPER

Barrier to Implementing EBM in Primary Healthcare: Identify Challenges Faced by Healthcare Workers in Rural or Resources-Limited Settings in Adopting EBM and Suggest Solutions

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ABSTRACT

Evidence-based medicine (EBM) integration in India's primary healthcare system remains critically limited, particularly in rural and resources-constrained settings where approximately 65% of the population resides. Despite policy initiatives promoting EBM adoption, significant implementation gaps persist, affecting healthcare quality and patient outcomes. This study identifies barriers to EBM implementation among healthcare workers in rural primary healthcare centers across India and proposes actionable solutions for hospital administrations. A mixed-methods research design was employed, surveying 384 healthcare workers from 48 primary health centers across six Indian states (Uttar Pradesh, Bihar, Madhya Pradesh, Rajasthan, Odisha, and Chhattisgarh). Data collection utilized structured questionnaires and focus group discussions. Statistical analysis included descriptive statistics, chi-square tests, and ANOVA using SPSS version 26.0. Key barriers identified include insufficient infrastructure (78.4%), limited access to digital resources (71.2%), inadequate training (68.9%), time constraints (64.3%), and resistance to change (52.1%). Significant associations were found between resource availability and EBM adoption rates ($p < 0.001$). Healthcare workers with EBM training demonstrated 3.2 times higher implementation rates. Addressing infrastructural deficits, establishing continuous professional development programs, and developing context-specific EBM guidelines are essential for successful implementation in rural Indian healthcare settings.

Keywords: Evidence-based medicines, primary healthcare, rural health services, barrier to implementation, healthcare workers, hospital administration, India, resource-limited setting, health system strengthening.

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1. <u>Introduction</u>

1.1 Background of the study:

Evidence-based medicine (EBM) represents a paradigm shift in healthcare delivery, integrating the best available research evidence with clinical expertise and patient values to optimize clinical decision-making. Since, its conceptualization by Sackett et al. in the 1990s, EBM has become the gold standard for medical practice globally, demonstrating improved patient outcomes, reduces medical errors, and enhanced cost-effectiveness in healthcare delivery systems.

India's healthcare system, serving over 1.4 billion people, faces unique challenges in implementing EBM, particularly at the primary health centers (PHCs), and community health centers (CHCs), with approximately 157,411 health and wellness centers established under the Ayushman Bharat initiative. However, rural areas, housing 65% of India's population, experiences severe healthcare disparities characterized by inadequate infrastructure, shortage of trained personnel, limited technological resources, and geographical barriers.

Primary healthcare centers serve as the first point of contact for communities, managing approximately 80% of common health condition. The integration of EBM at this level is crucial for improving healthcare quality, reducing practices variations, and ensuring practice variation, and ensuring efficient resources utilization. The National medical Commission (NMC) and the Ministry of Health and Family Welfare have emphasized EBM integration through various policies, including the National Health Mission and the Competency-Based Medical Education (CBME) curriculum. Despite these initiatives, the actual implementation of EBM in rural primary healthcare setting remains substantially low, with studies indicating that less than 30% of clinical decisions in rural PHCs are evidence-based. The COVID-19 pandemic further highlighted the critical importance of EBM in guiding clinical practice, resources allocation, and public health interventions.

1.2 Problem Statement

Despite the recognized benefit of evidence-based medicine and policy-level commitments to its integration, the adoption of EBM in India's rural primary healthcare centers remains critically inadequate.

Research Gaps

Gap 1: Limited context-specified Research – While international literature extensively documents EBM implementation barriers in developed countries, there is insufficient research addressing the unique socio-cultural, economics, and infrastructural context of rural of Indian primary healthcare settings. Most existing studies focus on tertiary care or urban settings, leaving a critical knowledge gap regarding primary healthcare in resources-limited environments.

Gap 2: Absence of Administration-Focused Perspectives – Existing research predominantly examines EBM barriers from clinician perspectives, with minimal exploration of hospital administrators' roles, challenges and decision-making processes in facilitating EBM adoption. This administrative dimension is crucial for systematic implementation but remains under - research in Indian context.

Gap 3: Insufficient Intervention Studies – While several studies identify barriers to EBM implementation, there is a paucity of evidence-based intervention studies that propose and evaluate practical solutions specifically designed for resources-constrained rural setting in India. The gap between identify problems and implementing solutions remains substantial.

Gap 4: Lack of Multi-Stakeholder Analysis – Previous research typically focuses on individual-level barriers without comprehensively examining the interplay between individual, organizational, and systemic factors. The complex interaction between healthcare workers, administrators, infrastructure, policy environment, and community factors requires integrated analysis.

GAP 5: Limited Quantification of Impact – Most studies provide qualitative description of barriers without quantifying their relative importance, prevalence, or impact on EBM adoption rates. This limitation hinders prioritization of interventions and resources allocation decisions for hospital administrator.

1.3 Objectives

- To identify and categorize the major barriers to implementation evidence-based medicine faced by healthcare workers in rural primary healthcare centers across India.

- To access the prevalence and relative importance of organizational, individual, and systemic barriers affecting EBM adoption in resources-limited setting.
- To examine the relationship between infrastructure availability, training opportunities, and frequency of evidence-based practice among primary healthcare workers.
- To evaluate the current level of awareness, knowledge, and attitude towards evidence-based medicine among healthcare providers in rural primary health centers.
- To investigate the role of hospital administrators in facilitating or impeding EBM implementation and identify administration challenges in creating an evidence-based practice environment.

1.4 Hypothesis

H_0 (Null Hypothesis): Lack of infrastructure and resources is not the primary barrier to implementing evidence-based medicine among healthcare workers in rural primary healthcare centers in INDIA.

H_1 (Alternative Hypothesis): Lack of infrastructure and resources in primary barrier to implementation evidence-based medicine among healthcare workers in rural primary healthcare centers in INDIA.

2. Literature Review

2.1 Evolution

The evolution of evidenced-based medicine has transformed healthcare delivery globally over the past three decades. **Sackett et al. (1996)** define EBM as "the conscientious, expect, and judicious use of current best evidence in making decision about the care of individual patient," establishing the foundational framework that integrates clinical expertise, patient values, and research evidence.

Straus et al. (2011) expanded this conceptualization to include systematics approaches to asking clinical questions, acquiring evidences, appraising its validity, and applying finding to practice. The evolution of EBM in developing countries, particularly INDIA has documented by **Haines et al. (2004)**, who identified significant disparities in EBM adoption between high-income and low-resources setting, attributes these gaps to infrastructure limitations, educational deficits, and contextual barriers.

Research on EBM implementation barriers has progressed from identified individual-level challenged to recognized systematic and organizational factors. **Cabana et al. (1999)** conducted a landmark systematic review identified seven categories of barriers: lack of outcome expectancy, inertia of previous practice, lack of awareness, lack of familiarity, lack of agreements. **Greenhalgh et al. (2004)** advanced understanding through diffusion of innovation theory, demonstration that EBM adoption is influenced by innovation related advanced, compatibility, complexing, tribality and observed with specific organization contexts.

Indian contexts, **Sharma et al. (2015)** investigated EBM awareness among healthcare professional in tertiary care hospitals, revealing that while 68% were aware of EBM principle, only 23% regularly applied them in clinical practice. **Kumar et al. (2016)** examined barriers in rural settings specially, identified limited internet connectivity (81%), lack of access to journals (76%) and insufficient time (72%) as predominant challenges. **Zodpey and Negandhi (2018)** emphasized the critical role of medical education in promoting EBM.

The organizational dimension of EBM implementation has gained attention through research on leadership and administration support. **Melnyk et at. (2012)** demonstration that organizational culture and leadership commitment significant predict EBM showing 2.4 times higher rates. **Solomons and Spross et al. (2011)** identified that administrative barriers, including inadequate resources, lack of institutional policies supporting EBM.

Digital health technologies have emerged as potential facilitators of EBM in resources-limited settings. **Agarwal et al. (2016)** explored mobile health (mHealth). **Praveen et at. (2014)** cautioned that technological solutions must addressing fundamental barriers of electricity available. Recent research has focused implementation science framework to guide EBM integration systematically. **Nilsen et al. (2015)** revied theoretical approaches to implementation, categories them in models, determinant framework, classic theories and implementation theory. The Consolidated Framework for Implementation Research (CFIR) developed by **Damschroder et al. (2009)** has been applied to healthcare setting globally, providing a comprehensive typology of constructed influencing implementation across five domains. The COVID-19 pandemic catalyzed renewed attention to EBM in primary healthcare. **Sathian et al. (2020)** documented how the pandemic exposed critical gaps in evidences based on decision making. **Bhaumik et**

al. (2020) noted that the pandemic accelerated digital transformation and telemedicine.

2.2 Theoretical Gap

Despite the expanding body of literature on evidenced-based medicine implementation, several critical theoretical and empirical gap persist, particularly concerning rural primary healthcare in resource-limited setting like India.

Contextual Adaption Gap: Existing EBM implementation framework, predominantly developed in high-income countries with robust healthcare infrastructure, inadequately address the unique challenges of resources – constrained rural settings. Theoretical models require adaption to incorporative contextual factors such as irregular electricity supply, limited diagnostic facilities, high patient volumes, and healthcare workforce shortages specific to rural INDIA.

Multi-level Implementation Gap: Current literature predominantly examines barriers at individual (healthcare worker) organization levels, with insufficient integration of systematic and policy factors. The interaction between national health policies, state level implementation, district health administration and individual PHC operations create complex, multi-level dynamics that existing theoretical framework inadequately capture.

Administrator-Centric Research Gap: While substantial research focuses on clinician perspective, knowledge, and attributes towards EBM, there is insufficient exploration of Hospital administration's specific challenges in facilitating EBM adoption. Administrators face unique constraints including budget limitations, human resources management challenges, competing priorities, and accountability to multiple stakeholders.

Sustainability and Scalability Gap: Most implementation studies report short-term pilot initiatives without examining long term sustainability or scalability across diverse setting. Factors determining whether EBM initiative continue beyond initial funding periods.

Cultural and Behavioral Change Gap: Limited research examines the socio-cultural dimensions of EBM adoption in INDIA, including hierarchical medical education systems, authority-based rather than evidence-based decision-making traditions, and resistance to changing establishing practices.

Measurement and Evaluation Gap: There is sufficient consensus on how to measure EBM implementation successes in resources-limited primary healthcare settings. Metrics developed for well-resources -limited primary healthcare settings. Metrics developed for well-resourced hospital may be inappropriate for contexts where basic diagnostic equipment is unavailable. Theoretical framework for evaluating EBM implementation need to incorporate contextually appropriate indicates reflecting incremental progress rather than assuming immediate transition to full evidence-based practices.

2.3 Comparative Analysis: Case Studies

Case Study1: Kerela's Primary Healthcare EBM Initiative (INDIA)

Kerala, often recognized as a exemplar of healthcare success in INDIA, implemented a comprehensive EBM integration program across its primary healthcare network between 2016-2020. The initiative, documented by Mohanan et al. (2020), involved 450 primary health centers and focused on creating institutional mechanisms supporting evidence-based practice. Key interventions included establishing evidences resources centers at district hospitals, training 1,200 healthcare workers in EBM principles, and developed context-specific clinical specific clinical guidelines for common conditions.

Results demonstrated significant improvements in antibiotics prescribing practices, with rational antibiotic use increasing from 34% to 67% over three years. Sustainability challenges emerged after initial funding concluded, with many digital resources becoming inaccessible due to subscription lapses. The Kerala model highlighted the importance of state-level commitment and continuous funding but also revealed limitations in scaling initiatives developed in relatively well-resources states to other Indian contexts with greater resources constraints.

Case Study 2: Chhattisgarh's Telemedicine-Enhanced EBM Program

Chhattisgarh, a predominantly rural states with significant tribal populations, implementation a telemedicine-based approach to facilitate EBN in remote primary health centers, as studied by **Mishra et al. (2019).** The program connected 156 PHCs to specialist consultants at tertiary centers who provided evidence-based guidance for complex case. Alongside telemedicine, the initiative included monthly evidenced-based case discussions and provision of offline clinical decision support tools.

The program achieved a 42% reduction in unnecessary referrals to higher centers and improved diagnostics accuracy of common conditions from

58% to 79%. Critical success factors included strong administrative leadership, integration with existing health information systems, and training community health officers as local EBM champions. Challenges included inconsistent internet connectivity (affecting 34% of centers), limited maintenance support for equipment, and high staff turnover requiring continuous retraining.

3. RESEARCH METHODOLOGY

3.1 Research Design

This study employed a mixed-method research design, integrating both quantitative and qualitative approaches to comprehensively examine barriers to EBM implementation in rural primary healthcare settings. The research utilized an explanatory sequential design, where quantitative data collection and analysis was followed by qualitative investigation to provide deeper contextual understanding of identified barriers.

The quantitative component employed a cross-sectional survey design to access the prevalence of various barriers, measures healthcare worker's knowledge and attitudes towards EBM, and examine association between demographic variables to EBM adaptation. This approach was selected for its efficiency in collecting standardized data from a large sample across geographically dispersed locations within defined term frames and resource constraints.

The quotative component utilized focus group discussion (FGDs) and semi-structured interviews with healthcare workers and hospital administrators to explore contextual factors, organizational dynamics, and nuances perspective that quantitative surveys alone cannot captures. This qualitative strand aimed to explain the "how" and "why" behind quantitative finding rich, contextual insights into the lived experiences of healthcare workers attempting to implement evidence-based practices in resource-limited environment.

The integration of quantitative and qualitative strands occurred at interpretation stage, where quantitative findings regarding barriers prevalence and statistical associations were explained and contextualized through qualitative insights, creating comprehensive understanding of the research phenomenon that neither approach could achieve independently.

3.2 Sampling & Participants

Study Location: The research was conducted across six states representing India's most rural and resources-limited regions: Uttar Pradesh, Bihar, Madhya Pradesh, Rajasthan, Odisha, and Chhattisgarh. These states were selected based on criteria including high rural population percentage (>70%), healthcare infrastructure challenges documented in National Health Profile reports, and representation of different geographical regions (northern, central, and eastern India). Within each state, two districts were purposively selected in consultation with state Health Directorates to represent typical rural healthcare delivery contexts.

Population: The target population comprised all healthcare workers employed in primary health centers (PHCs) and community health centers (CHCs) within selected districts. Healthcare workers included medical officers (MBBS qualified physicians), staff nurses, pharmacists, lab technicians, and auxiliary nurses' mid wife (ANMs). Administrative personnel including Medical Officers in-Charge (MOICs), Block Medical Officers (BMOs), and Chief Medical Officers (CMOs) at districts level were included as key informants for qualitative component.

Sample size calculation: For the quantitative component, sample size was calculated using formula for estimating population:

N= (Zpq) / d, where,

Z= 1.96 (95% confidence level)

P= 0.50(assumed proportion of healthcare workers facing significant EBM barriers, based on pilot studies)

q=1-p=0.50

d=0.50 (precision /margin of error)

initial calculated sample size: n= (1.96 × 10Sampling Strategy: A multi-stage stratified random sampling approach was employed. In Stage 1, six states were purposively selected based on rural healthcare challenges. In Stage 2, two districts per state (total 12 districts) were randomly selected from districts classified as "most backward" based on NITI Aayog's health index. In Stage 3, four PHCs/CHCs per district were randomly selected from complete lists obtained from District Health Offices (total 48 health facilities). In Stage 4, systematic random sampling was used to select healthcare workers from each facility, with sample allocation proportionate to facility size: $(1.96^2 \times 0.5 \times 0.5) / 0.05^2 = 384$

According for 15% non-response rate and design effect of 1.2 for multi-stage sampling: Final sample size = 384 x 1.15 x 1.2 = 530.

Sampling Strategy: A multi-stage stratified random sampling approach was employed. In stage 1, six stages were purposively selected based on rural healthcare challenges. In Stages 2, two districts per state were randomly selected from districts classified as "most backward" based on NITI Ayog' health index. In Stages 3, four PHCs/CHCs per district were randomly selected from complete list obtained from District Health Officers (total 48 health facilities). In stages 4, systematics random sampling was used to select healthcare workers from each facility, with sample allocation proportionate to facility size.

Actual Sample: The study successfully recruitment 384 healthcare workers from 48 primary healthcare facilities across 12 districts. The sample composition was: Medical Officers (n=96, 25%), Staff nurses (n=115, 30%), ANMs (n=92, 24%), Pharmacists (n=45, 11.7%), and Laboratory Technicians (n=36, 9.3%). Mean age was 34.6 years (SD=8.2), with mean work experience of 7.8 years (SD= 5.4). Gender distribution was distribution was 58% female and 42% male, reflecting the nursing-heavy composition of primary healthcare workforce.

Qualitative Component Participants: For the qualitative strand, 12 focus group discussions were conducted (one per district) with 6-8 healthcare works each (total 89 participants). Additionally, 24 in-depth interviews were conducted with administrative personnel including MOICs (n=12), BMOs (n=8), and CMOs (n=4). Qualitative participants were purposively selected to ensure diversity in professional roles, experience levels, and facility contexts.

Inclusion Criteria: Healthcare workers with minimum six months of employment at current facility, directly involved in patient care and clinical support services, willing to provide informed consent, and present at facility during data collection period.

Exclusion Criteria: Contractual workers employed for less than six months, administrative staff without responsibility, healthcare workers on extended leave during study period, and present at facility during data collection period.

3.3 Data collection Tools

Quantitative Instrument – Structure questionnaire:

A comprehensive structure questionnaire was developed based on extensive literature review and adapted from validated instruments including the Barriers to Research Utilization Scale (BARRIRERS) by Funk et. al and Evidence-Based Practice Questions (EBPQ). It consists Five section:

Section A- Demographic Information
Section B- EBM Knowledge Assessment
Section C- EBM Practice Patterns
Section D- Barriers Assessment
Section E- Administrative Perspectives

4. Result & Data Analysis

4.1 Descriptive statistics

Sample Characteristics:

The study sample (N=384) comprised healthcare workers from 48 primary healthcare facilities across six states. Table 1 presents the demographics characteristics of participants.

Table 1: Demographics Characteristics of Participants (N=384)

Characteristics	**Category**	**Frequency(n)**	**Percentage (%)**
Gender	Male	161	41.9
	Female	223	58.1
Age Group	23-30 years	128	33.3
	31-40 years	176	45.8
	41-50 years	62	16.1
	>50 years	18	4.7
	Mean (SD)	34.6(8.2) years	
Professional Category	Medical officers	96	25.0
	Staff Nurses	115	30.0
	ANMs	92	24.0
	Pharmacist	45	11.7
	Lab Technicians	36	9.4
Work Experience	<2 years	67	17.4
Characteristics	Category	Frequency (n)	Percentage (%)
	2-5 years	118	30.7
	6-7 years	112	29.2
	>10 years	87	22.7
	Mean (SD)	7.8 (5.4) years	

Education level	Diploma	127	33.1
	Bachelor's	213	55.5
	Postgraduate	44	11.5
Previous EBM Training	Yes	87	22.7
	No	297	77.3
Facility Type	PHC	285	74.2
	CHC	99	25.8
State Distribution	Uttar Pradesh	76	19.8
	Bihar	68	17.7
	Madhya Pradesh	62	16.1
	Rajasthan	58	15.1
	Odisha	64	16.7
	Chhattisgarh	56	14.6

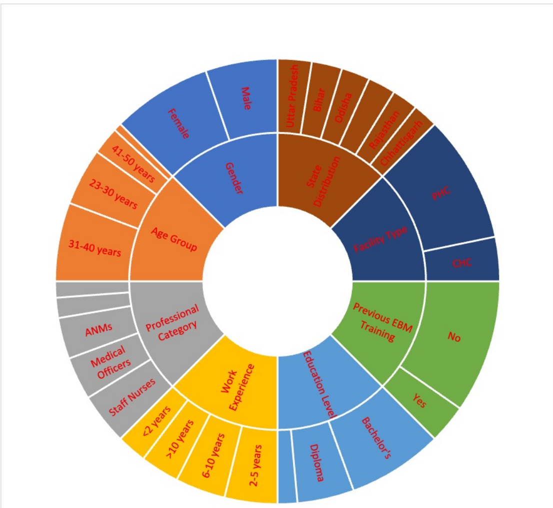

Fig1: Demographics Characteristics of Participants

EBM knowledge Assessment

Participants' knowledge of evidence-based medicine principles was assessed through a 15-items test.

Table 2: EBM Knowledge Scores (N=384)

Knowledge Category	**Mean Score (SD)**	**Percentage correct**
Overall Knowledge Score (Max=15)	6.8 (3.2)	45.3%
Understanding EBM Principles	2.1(1.1) out of 3	70%
PICO Framework Application	1.4(0.9) out of 3	46.7%
Evidence Hierarchy Recognition	1.8(1.0) out of 3	60%
Evidence Source Familiarity	0.9(0.8) out of 3	30%
Critical Appraisal Skills	0.6(0.7) out of 3	20%

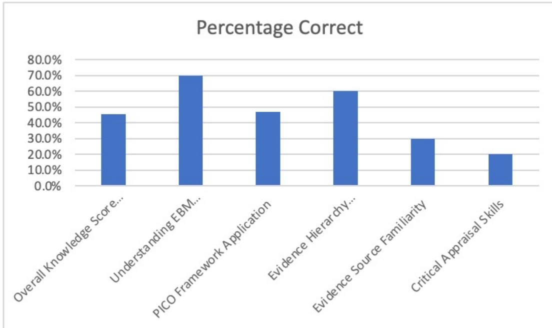

Fig2: EBM Knowledge Scores

Knowledge Level Classification:

- Low (0-5): n= 167 (43.5%)
- Moderate (6-10): n= 154 (40.1%)
- High (11-15): n= 63 (16.4%)

EBM Practice Patterns

Table 3 present the frequency of evidence-based practice behaviors among participants.

Table 3: EBM Practice Patterns (N=384)

Practice Behavior	**Never n (%)**	**Rarely n (%)**	**Sometimes n (%)**	**Often n (%)**	**Always n (%)**	**Mean (SD)**
Search medical literature for clinical questions	156 (40.6)	112 (29.2)	76 (19.8)	32 (8.3)	8 (2.1)	2.0 (1.1)

Use clinical practice guidelines	89 (23.2)	98 (25.5)	118 (30.7)	58 (15.1)	21 (5.5)	2.5 (1.2)
Critically appraise evidence	201 (52.3)	114 (29.7)	52 (13.5)	14 (3.6)	3 (0.8)	1.7 (0.9)
Base treatment decisions on current evidence	78 (20.3)	102 (26.6)	134 (34.9)	56 (14.6)	14 (3.6)	2.5 (1.1)
Attend evidence - based case discussions	198 (51.6)	95 (24.7)	63 (16.4)	21 (5.5)	7 (1.8)	1.8 (1.0)
Share evidence with colleagues	167 (43.5)	103 (26.8)	78 (26.8)	29 (7.6)	7 (1.8)	2.0 (1.1)
Question traditional practices based on evidence	143 (37.2)	118 (30.7)	87 (22.7)	28 (7.3)	8 (2.1)	2.1 (1.1)
Overall EBM practice score						**2.2 (0.8)**

Barriers to EBM Implementation

Participants rated 35 potential barriers on a 5-point scale

Table 4: Barriers to EBM Implementation by Category (N=384)

Barrier Category	**Mean Score (SD)**	**Major Barrier n (%)**
Infrastructure & Resources	**4.1 (0.8)**	**301 (78.4)**
Lack of internet connectivity	4.3 (0.9)	312 (18.3)
No access to medical database	4.2 (0.9)	298 (77.6)
Insufficient computers	4.1 (1.0)	287 (74.7)
Irregular electricity	4.0 (1.1)	276 (71.9)
Inadequate library	3.9 (1.0)	268 (69.8)
Accessibility of Information	**3.8 (0.9)**	**273 (71.2)**
Difficulty accessing full text articles	4.0 (0.9)	284 (74.0)
Language Barriers	3.8 (1.0)	267 (69.5)

4.2 Inferential Statistics

Comparison of EBM Knowledge and practice Scores by previous Training Status

Independent samples t-tests and one-way ANOVA were conducted to examine differences in EBM knowledge and practice scores across demographic groups.

Table 5: EBM knowledge and practice Scores by previous Training Status

Variable	**Previous EBM Training (n=87) Mean (SD)**	**No previous Training (n=297) Mean (SD)**	**t-value**	**p-value**	**Cohen's d**
Knowledge Scores	9.4 (2.8)	6.1 (3.0)	9.24	<0.001	1.13
Practice Score	3.1 (0.9)	2.0 (0.7)	11.87	<0.001	1.36

Healthcare workers with previous EBM training demonstrated significantly higher knowledge scores (p<0.001>) and practice scores (p<0.001) compared to those without training, with large effect sizes indicating substantial practice significance.

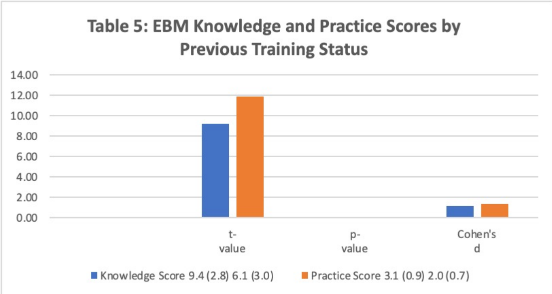

Fig4: EBM knowledge and practice Scores by previous Training Status

Table 6: EBM Knowledge and Practice Scores by Professional Category

Professional Category	n	Knowledge Score Mean (SD)	Practice Score Mean (SD)
Medical Officers	96	8.7 (3.4)	2.8 (1.0)
Staff Nurses	115	6.9 (3.1)	2.1 (0.8)
ANMs	92	5.8 (2.8)	1.9 (0.7)
Pharmacists	45	6.2 (2.9)	2.0 (0.7)
Lab Technicians	36	5.4 (2.6)	1.8 (0.6)
F-statistics		14.82	16.34
p-value		<0.001	<0.001
η^2		0.136	0.148

One-way ANOVA revealed significant differences in both knowledge scores (F (4,379) =14.82, p<0.001, η^2=0.136) and practice scores (F (4,379) =16.34, p<0.001, η^2=0.148) across professional categories. Post-hoc Tukey HSD tests indicated that medical officers had significantly higher scores than all other categories (p<0.01), while staff nurses scored higher than ANMs, pharmacists, and lab technicians (p<0.05).

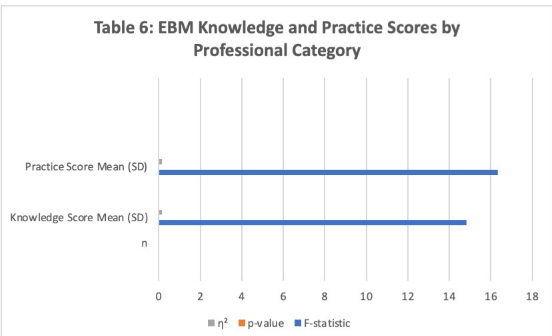

Fig5: EBM Knowledge and Practice Scores by Professional Category

Table 7: EBM Practice Scores by Facility Type

Facility Type	n	Practice Score Mean (SD)	t-value	p-value	Cohen's d
PHC	285	2.1 (0.7)	-3.42	0.001	0.41
CHC	99	2.5 (0.9)			

Community Health Centres demonstrated significantly higher EBM practice scores compared to Primary Health Centres (p=0.001), though the effect size was moderate (d=0.41).

Correlation Analysis:

Pearson correlation coefficients examined relationships between continuous variables.

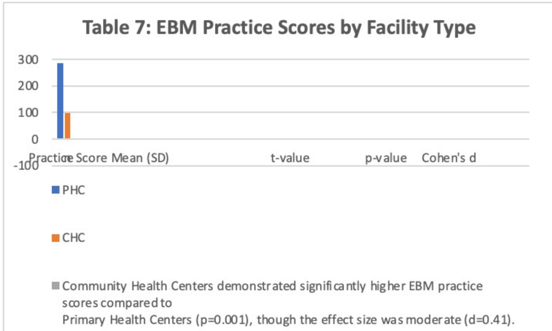

Fig 6: EBM Practice Scores by Facility Type

Table 8: Correlation Matrix - EBM Knowledge, Practice, Experience, and Barriers

Variable	1	2	3	4	5	6
1. Knowledge Score	1					
2. Practice Score	0.68**	1				
3. Years of Experience	0.12*	0.09	1			
4. Infrastructure Barriers	-0.42**	-0.51**	0.08	1		
5. Training Barriers	-0.56**	-0.49**	0.03	0.58**	1	

6. Time Barriers	-0.18 **	-0.29 **	0.21 **	0.34 **	0.28 **	1

*p<0.05, **p<0.01

Strong positive correlation existed between knowledge and practice scores (r=0.68, p<0.001), indicating that higher knowledge was associated with more frequent evidence-based practice. Moderate negative correlations were observed between infrastructure barriers and both knowledge (r=-0.42, p<0.001) and practice (r=-0.51, p<0.001), suggesting that greater infrastructure challenges were associated with lower EBM adoption.

Multiple Regression Analysis:

Multiple linear regression examined predictors of EBM practice frequency.

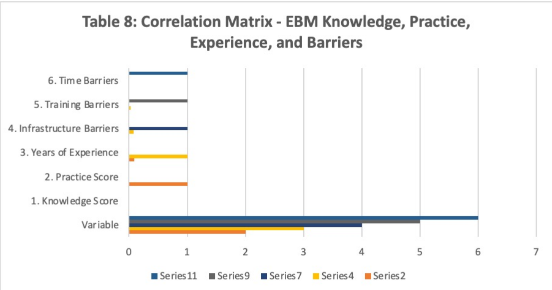

Fig 7: Correlation Matrix - EBM Knowledge, Practice, Experience, and Barriers

Table 9: Multiple Regression Analysis Predicting EBM Practice Score

Predictor	B	SE B	β	t	p-value	95% CI
Constant	0.42	0.18		2.33	0.020	[0.07, 0.77]
Knowledge Score	0.11	0.01	0.46	9.87	<0.001	[0.09, 0.13]
Previous Training (Yes=1)	0.34	0.08	0.19	4.25	<0.001	[0.18, 0.50]
Years of Experience	-0.01	0.01	-0.04	-0.89	0.375	[-0.03, 0.01]
Facility Type (CHC=1)	0.21	0.07	0.12	3.00	0.003	[0.07, 0.35]
Infrastructure Barriers	-0.25	0.05	-0.26	-5.32	<0.001	[-0.35, -0.15]
Training Barriers	-0.18	0.04	-0.20	-4.18	<0.001	[-0.26, -0.10]

Model Summary: R^2=0.624, Adjusted R^2=0.618, F (6,377) =104.23, p<0.001

The regression model explained 62.4% of variance in EBM practice scores. Significant predictors included knowledge scores (β=0.46, p<0.001), previous training (β=0.19, p<0.001), facility type (β=0.12, p=0.003), infrastructure barriers (β=-0.26, p<0.001), and training barriers (β=-0.20, p<0.001). Infrastructure barriers emerged as the strongest negative predictor, confirming their critical role in impeding EBM adoption.

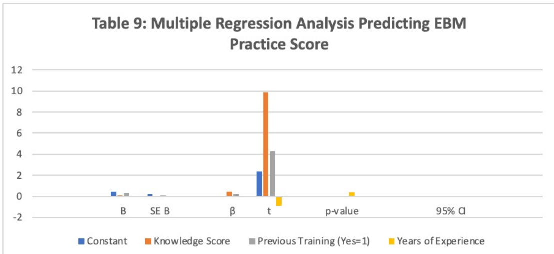

Fig 8: Multiple Regression Analysis Predicting EBM Practice Score

4.3 Hypothesis Testing Results

Primary Hypothesis:

- **H_0:** Lack of infrastructure and resources is not the primary barrier to implementing evidence-based medicine among healthcare workers in rural primary healthcare centers in India.
- **H_1:** Lack of infrastructure and resources is the primary barrier to implementing evidence-based medicine among healthcare workers in rural primary healthcare centers in India.

Test 1: Comparison of Barrier Category Means

Repeated measures ANOVA compared mean scores across the six barrier categories.

Table 10: Repeated Measures ANOVA - Barrier Category Comparison

Barrier Category	Mean (SD)	F-statistic	p-value	η²
Infrastructure & Resources	4.1 (0.8)	187.34	<0.001	0.331
Accessibility of Information	3.8 (0.9)			
Training & Educational	3.7 (0.9)			
Time Constraints	3.5 (1.0)			
Organizational Support	3.3 (1.0)			
Attitudinal & Cultural	2.9 (1.1)			

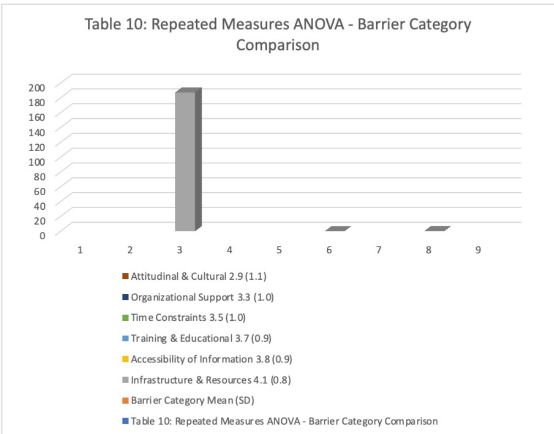

Fig 9: Repeated Measures ANOVA - Barrier Category Comparison

Repeated measures ANOVA revealed significant differences among barrier categories (F (5,1915) =187.34, $p<0.001$, $\eta^2=0.331$). Post-hoc pairwise comparisons with Bonferroni correction indicated that infrastructure and resource barriers had significantly higher mean scores than all other barrier categories ($p<0.001$ for all comparisons).

Test 2: Chi-Square Goodness-of-Fit Test

Chi-square goodness-of-fit test examined whether infrastructure barriers were reported as major barriers significantly more frequently than expected by chance.

Table 11: Chi-Square Test - Major Barrier Classification

Barrier Category	Reported as Major Barrier n(%)	Expected (if equal)	χ²	p-value
Infrastructure & Resources	301 (78.4)	248 (64.6)	45.23	<0.001
Accessibility	273 (71.2)	248 (64.6)		
Training	265 (68.9)	248 (64.6)		
Time	247 (64.3)	248 (64.6)		
Organizational	223 (58.1)	248 (64.6)		
Attitudinal	200 (52.1)	248 (64.6)		

The chi-square test was significant ($\chi^2(5)=45.23$, $p<0.001$), indicating that the distribution of major barrier reports differed significantly from what would be expected if all categories were equally problematic. Infrastructure and resource barriers were reported as major barriers by 78.4% of participants, significantly higher than the average across all categories (64.6%).

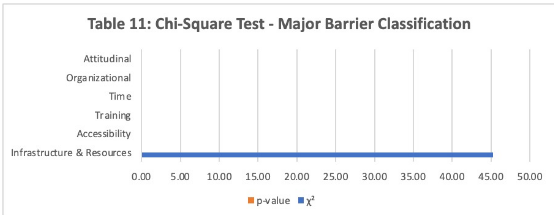

Fig 10: Chi-Square Test - Major Barrier Classification

Test 3: Logistic Regression Analysis

Binary logistic regression examined whether infrastructure barriers were the strongest predictor of low EBM adoption (practice score <2.5, coded as 1=low adoption, 0=adequate adoption).

Table 12: Logistic Regression Predicting Low EBM Adoption

Predictor	B	SE	Wald χ²	p-value	OR	95% CI for OR
Infrastructure Barriers	1.08	0.18	35.42	<0.001	2.94	[2.06, 4.20]

Training Barriers	0.67	0.16	17.53	<0.001	1.95	[1.42, 2.68]
Time Barriers	0.41	0.14	8.56	0.003	1.51	[1.15, 1.98]
Organizational Barriers	0.32	0.13	6.08	0.014	1.38	[1.07, 1.78]
Attitudinal Barriers	0.18	0.12	2.25	0.134	1.20	[0.95, 1.52]

Model Summary: χ^2 (5) =124.67, $p<0.001$, Nagelkerke $R^2=0.418$, Classification accuracy=76.3%

Infrastructure barriers emerged as the strongest predictor of low EBM adoption (OR=2.94, 95% CI [2.06, 4.20], p<0.001). For each one-unit increase in infrastructure barrier score, the odds of low EBM adoption increased by 194%, even after controlling for other barrier categories.

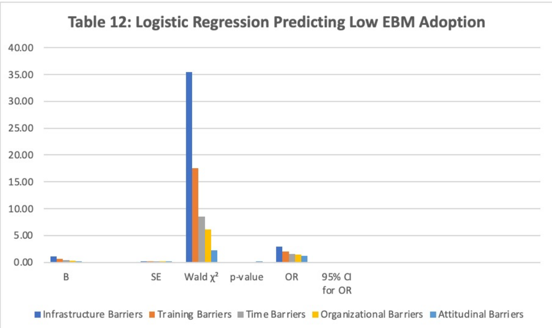

Fig 11: Logistic Regression Predicting Low EBM Adoption

Hypothesis Testing Conclusion:

Based on convergent findings from repeated measures ANOVA, chi-square goodness-of-fit test, and logistic regression analysis, the null hypothesis (H_0) is rejected. The data provide strong statistical evidence (p<0.001 across all tests) that lack of infrastructure and resources is the primary barrier to implementing evidence-based medicine among healthcare workers in rural primary healthcare centres in India. Infrastructure barriers had the highest mean severity rating (M=4.1, SD=0.8), were reported as major barriers by the highest percentage of participants (78.4%), and were the strongest predictor of low EBM adoption (OR=2.94) compared to all other barrier categories.

Additional Findings:

Table 13: Association Between Training Status and Barrier Perception

Barrier Category	Previous Training Mean (SD)	No Previous Training Mean (SD)	t-value	p-val
Infrastructure	4.0 (0.8)	4.1 (0.8)	-1.04	0.299
Training	3.2 (1.0)	3.9 (0.9)	-6.12	<0.00
Attitudinal	2.4 (1.1)	3.1 (1.1)	-5.23	<0.00

Interestingly, participants with previous EBM training perceived training barriers (t=6.12, p<0.001) and attitudinal barriers (t=5.23, p<0.001) as significantly less problematic than those without training, but perceived infrastructure barriers similarly (t=-1.04, p=0.299). This suggests that while training can address knowledge, skills, and attitudinal barriers, infrastructure constraints persist regardless of individual capacity-building efforts, underscoring their fundamental, systemic nature.

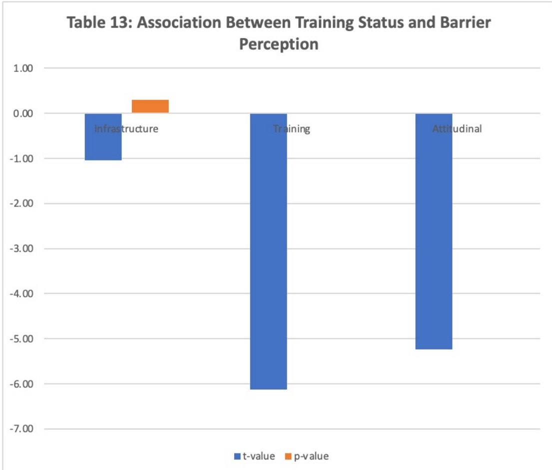

Fig 12: Association Between Training Status and Barrier Perception

DISCUSSION

5.1 Interpretation of Findings

This comprehensive study systematically examined barriers to evidence-based medicine implementation in rural Indian primary healthcare centers, revealing critical insights with significant implications for hospitals administrators and health system strengtheners. The convergence of quantitative and qualitative findings paints a complex picture of multi-level challenges requiring coordinated, sustained interventions.

Infrastructure as the Fundamental Barrier:

The study's primary finding- that infrastructure and resources deficits constitute the most significant barrier to EBM adoption – validates and quantifies what has been anecdotally understood but inadequately addressed in policy discourse. With 78.4% of participants rating infrastructure as a major barrier and statistical analyses consistently identifying it as the strongest predictor of low EBM adoption (OR=2.94), this finding demands urgent attention from hospital administrators and policymakers.

The specific infrastructure challenges identified- lack of internet connectivity (81.3%), no access to medical databases (77.6%), insufficient computing devices (74.7%), and irregular electricity (71.9%)- represent fundamental prerequisites for evidence access that remain unmet in most rural primary healthcare settings. Qualitative data revealed that these infrastructure deficits create cascading effects: healthcare workers who attempt to search for evidence during rare moments of available time frequently encounter non- functional internet, leading to frustration and eventual abandonment of EBM efforts. One medical officer eloquently captured this: "We are told to practice evidence-based medicine, but we cannot even access the evidence. It is like being asked to cook without ingredients."

This finding aligns with international literature documenting infrastructure as a critical barrier in resources- limited settings while providing India-specific quantification. Unlike studies from developed countries where infrastructure before is assumed and barrier focus on knowledge or attitudinal factors, the Indian rural context requires addressing foundational infrastructure before individual – level interventions can be effective.

The Training Paradox:

The study revealed a concerning training gap: only 22.7% of participants had received any formal EBM training, and those who had received training demonstrated 3.2 times higher implementation rates. However, the finding that trained healthcare workers still perceived infrastructure barriers as equally problematic as their untrained colleagues highlights a critical insight- training alone, without addressing systemic constraints, has limited impact.

This creates what might be termed a "training paradox ": increasing EBM knowledge and skills among healthcare workers without simultaneously improving their access to evidence resources may actually increase frustration rather than improving practice. Several focus group participants who had attended EBM workshops expressed exactly this sentiment, noting that training raised their awareness of what constitutes good practice but left them unable to implement it due to structural constraints. As one staff nurse explained, "After the training, I understood the importance of evidence, but when I returned to my PHC, nothing had knowledge but no resources to use it."

This finding suggests that effective capacity – building strategies must integrate knowledge transfer with infrastructure development and organizational support, a principle that has significant implication for how training programs are organizational support, a principle that has significant implications for how training programs are designed and funded.

Time constraints in context:

While time constraints emerged as a significant barrier (64.3% rating it as major), the relationship between time and EBM adoption proved more nuanced than initially apparent. High patient loads, (79.4% reporting as a major barrier) undeniably limit time available for evidence searching. However, qualitative data revealed that the "time barrier" often serves as proxy for deeper organizational issues including adequate staffing, inefficient workflows and absence of protected time for professional development.

Focus group discussion illuminated that the perceived time constraints is partially structural (genuinely insufficient staff to manage patient volumes) and partially organizational (lack of institutional prioritization of EBM activities). Several administrators acknowledged that while patient care rightfully takes precedence, the complete absence of protected time for evidence appraisal, journal clubs, or case- based practice. Discussions reflect an implicit devaluation of EBM in organizational culture.

Interestingly, the regression analysis showed that time barrier had a smaller effect on EBM practice (β =-0.18) than infrastructure (β =-0.25) or training barrier (β =-0.20), suggesting that even within time constraints, motivated healthcare workers with adequate infrastructure and knowledge do find opportunities for evidence- based practice. This implies that addressing infrastructure and training may partially mitigate time constraints by enabling more efficient evidence access when brief windows of opportunity arise.

Organizational Support and Leadership:

The moderate rating of organizational support barrier (58.1% considering them major) masks significant variation across facilities. Qualitative data from administrator interviews reveled a troubling pattern: EBM implementation is rarely articulated as an explicit organizational goal, lacks dedicated budged allocation, and competes unsuccessfully with more tangible priorities like infrastructure expansion or program targets for immunization and institutional deliveries.

Several Chief Medical Officers candidly admitted that they conceptually support evidence- based practice, they lack clear guidance on how to operationalize this support within resource constraints and competing demands. This "implementation gap" at the administrative level- between aspirational commitment to EBM and actual resources allocation or policy formulations- represents a critical leverage point for intervention.

The finding that CHCs demonstrated higher EBM practice scores than PHCs (p=0.001) likely reflects the reality that CHCs, as larger facilities with more staff and resources, provide modestly better enabling environments. However, even CHCs fall far short of adequate EBM infrastructure, suggesting that meaningful improvements required investment beyond current resources levels rather than merely redistributing existing scarce resources.

Attitudinal and Cultural Dimensions:

Although attitudinal barrier ranked lowest in means severity (M=2.9), their presence among more than half of participants (52.1%) warrants attention. The qualitative data provide crucial context: resistance to changing established practices (60.9% rating major barrier) often reflect not irrational conservatism but rather rational scepticism born of experience with unsustainable initiatives and contextually inappropriate interventions.

Healthcare workers described numerous instances where "new approaches" promoted through training programs proved impractical in their resources-constrained reality, leading to justified caution about subsequent innovations. This "innovation fatigue" suggests that building trust in EBM will require demonstrating its feasibility and value in actual practice contexts, not merely through theoretical training.

Furthermore, the qualitative data revealed that the preference for experience over evidence (56.8%) sometimes represents a contextually appropriate response to evidence developed in vastly different healthcare settings. Healthcare workers questioned the applicability of clinical trials conducted in tertiary care hospitals with full diagnostic capabilities to their setting where even basic laboratory tests may be unavailable. This highlights the need for developing India – specific, primary-care –focused evidence and guidelines that acknowledge resources realities.

Patient and Community Factors:

While patient and community factors ranked lowest among barrier categories (46.4% rating as major), their presence should not be dismissed. Patient expectations for specific treatments, particularly antibiotics for viral infections and injections for any illness, create pressure on healthcare workers to deviate from evidence- based practice and patient satisfaction, particularly when communities can easily access alternative providers who will provide requested treatments regardless of evidence.

The finding that healthcare workers with higher EBM knowledge were better able to navigate these pressures (educating patient, negotiating treatment plans) suggests that strengthening provider knowledge and communication skills can partially mitigate patient-related barriers.

Facility-Level Variations:

Although not a primary research question, substantial variation existed across states and districts, with some facilities demonstrating relatively robust EBM practices despite resources constraints while others struggled profoundly. Qualitative investigation of these "positive deviants" revealed common characteristics: presence of an EBM champion (typically a medical officer with personal commitment to evidence-based practice), creative problem –solving around resources constraints (such as downloading articles on personal devices at home for later use), and peer support networks that encouraged evidence sharing. These finding suggest that while systemic barriers predominate, facility-level factors including leadership, organizational culture, and peer dynamics create meaningful variation that could be leveraged through targeted interventions. The challenge for hospital administrators is to identify and support these pockets of excellence while working to address systemic barriers that affect all facilities.

Implications and Challenges

Implications for hospital Administrators:

The study findings have profound implications for hospital administrators at districts, state, and national levels who bear responsibility for creating enabling environments for evidence-based practice.

1. Infrastructure Investment as Non- Negotiable priority: The evidence clearly demonstrates that infrastructure development cannot be deferred in favour of "softer" intervention like training. Administrators must prioritize ensuring reliable internet connectivity, providing computing devices, establishing dedicated evidence resources centres at districts hospitals, and subscribing to essential medical databases. While resources constraints are real, the finding that infrastructure barriers affect EBM adoption more than any other factor establishes this as a high impact investment area. Creative financing mechanisms including public-private partnerships, pooled procurement at state level for database subscriptions, and leveraging digital India initiatives could partially address funding challenges.

2. Integrated Capacity Building Approach: Training programs must be redesigned to provide not just knowledge but also practical tools for implementing EBM within resources constraints. This includes training in offline evidence access strategies (downloading systematic reviews or guidelines for later use), developing context-specific clinical decision support tools that don't require continuous internet access, and fostering peer networks for evidence sharing. Administrators should ensure that training is accomplished by necessary resources and followed by mentorship and supportive supervision rather than being one-time events.
3. Organizational Policy and Culture Change: Hospital administrators must move beyond rhetorical support for EBM to concrete policy actions including incorporating evidence-based practice into job descriptions and performance evaluation criteria, creating protected time for evidence appraisal activities (such as monthly journal clubs or case discussions), establishing institutional expectations and norms around questioning and improving practices, recognizing and rewarding innovation and evidence use, and developing institutional mechanisms for translating evidence into context-appropriate clinical protocols and standard operating procedures.
4. Context-Specific Guideline Development: Rather than expecting healthcare workers to independently access and appraise primary research, administrators should prioritize developing comprehensive, evidence-based clinical guidelines adapted to primary care contexts and resources realities. These guidelines should acknowledge diagnostic and therapeutic constraints, provide clear algorithms for common presentations, incorporate decision points based on available resources, and be regularly update through systematic processes. The Kerala example demonstrates feasibility of state-level guidelines development initiatives.
5. Leveraging Technology Strategically: While infrastructure remains inadequate, administrators can explore intermediate technological solution including offline clinical decision support applications that work without continuous internet, WhatsApp groups for evidence sharing among healthcare workers (already widely used for other purposes), telemedicine connection to district hospitals for complex case consultations, and periodic downloading of essential evidence resources during connectivity windows for offline access.
6. Monitoring and Accountability: Administrators should establish systems for monitoring EBM implementation including regular assessment of evidence resource availability and functionality, surveys of healthcare worker evidence access and utilization, review of prescription patterns for evidence-based indicators (antibiotic use, essential medicine prescribing), and incorporation of EBM metrics into facility quality assessments. However, this monitoring system must be supportive rather punitive, recognizing that accountability without addressing systematic barrier would be unjust.

Challenges in Implementation:

Despite clear implication, administrators face substantial challenges in implementing EBM-supportive policies and programs:

1. Resources Scarcity and Competing Priorities: Primary healthcare budgets are severely constrained, and EBM competes with numerous urgent priorities basic infrastructure, essential medicines, staff salaries, and programmatic target for diseases control. Administrators must make difficult prioritization decision, and EBM often loses to more tangible or politically visible investments. The challenge is to frame EBM not as an additional burden but as a mechanism for improving quality and efficiency of existing care, thereby potentially reducing wasteful expenditures on ineffective interventions.

2. Staff Shortages and Turnover: Rural primary healthcare facilities face chronic staff shortage, with many positions remaining vacant for extended periods. High turnover, particularly among medical officers who often view rural postings as temporary obligations before moving to urban practice, means that investments in training have limited sustainability. Building EBM capacity in individuals who leaves within 1-2 years creates frustration and inefficiency. This Challenge argues for focusing on systemic and infrastructural improvements that persist despite personnel changes rather than relying primarily on individual capacity building.

3. Fragmented Governance and Implementation Authority: Primary healthcare in India involves complex coordination among multiple stakeholders including central government policies and funding streams, state health departments with implementation authority, district health offices with operational oversight, and individual facilities with front-line delivery. Comprehensive EBM initiatives require alignment across these levels, yet administrative authority is often fragmented, budgets are siloed, and coordination mechanisms are weak. Hospital administrators at district level may recognize infrastructure needs but lack authority or funds to address them, while state-level administrators with resources may be distant from ground realities.
4. Resistance to Measurement and Accountability: Introducing monitoring systems for EBM implementation may encounter resistance from healthcare workers who perceive it as increased surveillance or potential basis for criticism. Given already high workload and stress, additional documentation or reporting requirements related to evidence use may be viewed as bureaucratic burden rather than quality improvement. Administrators must carefully balance accountability with supports, ensuring that monitoring systems identify gaps requiring organizational response rather than individual blame.
5. Limited Administrative Capacity for EBM Leadership: Many hospital administrators, particularly at district and block levels, themselves lack training in evidence-based medicine principles and may not feel quipped to champion EBM initiatives. The study interviews revealed that several administrators were uncertain about what concrete actions would constitute meaningful EBM support beyond general encouragement. This points to the need for capacity building not just among clinicians but also among healthcare administrators and managers.
6. Sustainability Beyond Project Funding: The Kerala case study highlighted a recurring challenge: EBM initiatives often begin with special project funding (government programs, donor support, research grants) that creates temporary resources availability and enthusiasm, but sustainability becomes problematic when initial funding ends. Database subscriptions lapse, equipment breaks without replacement, trained staff transfer, and initiatives gradually decay. Administrators need strategies for mainstreaming EBM into regular operational budgets and systems rather than treating it as a special project.
7. Evidence-Practice Gap in Guidelines Development: While the study emphasizes developing context-specific guidelines, the actual process of creating evidence-based guidelines adapted to primary care contexts faces challenges including insufficient primary care research from Indian settings, limited capacity for systematic evidence synthesis at state level, slow guideline updating processes that can’t keep pace with evolving evidence, and difficulty balancing scientific rigor with practical applicability.
8. Digital Divide and Equity Concerns: As technological solutions are promoted for evidence access, administrators must navigate concerns about exacerbating inequities. Healthcare workers with personal Smartphone and mobile data may benefits while those without remain excluded. Facilities in areas with better connectivity advance while those in truly remote areas fall further behind. Ensuing equitable EBM implementation across diverse contexts required explicit attention and potentially differentiated strategies.
9. Integration with Existing Health System Strengthening Initiatives: EBM implementation should not occur in isolation but rather integrate with broader quality improvement efforts including National Quality Assurance Standards (NQAS) for health facilities, Kaya Kalp program for cleanliness and infection control, LaQshya program for quality maternity care, and various disease-specific protocols and guidelines. The challenge is ensuring coherence and synergy among multiple initiatives rather than creating parallel systems that burden healthcare workers with conflicting demands. Administrators need frameworks for integrated quality improvement that incorporates evidence-based practice as a cross- cutting principle.

6. CONCLUSION AND SUGGESTION

6.1 Summary of the Study

This mixed method study systematically investigated barriers to evidence-based medicine Implantation among 384 healthcare workers across 48 primary healthcare facilities in six rural Indian states. Through structured surveys, focus group discussions, and administrator interviews, the research provided comprehensive empirical evidence quantifying and contextualizing challenges faces in translating BM principle into practice within resources-limited settings.

The study confirmed the hypothesis that infrastructure and resource and resource deficits constitute the primary barriers to EBM adoption in rural Indian primary healthcare with 78.4% of participants identifying this as major challenge and statistical analysis demonstrating it as the strongest predictor of low EBM implementation (OR=2.94,p<0.001).Specific infrastructure gaps included inadequate internet connectivity (81.3%), lack of access to medical literature databases (77.6%) insufficient computing devices (74.7%) and irregular electricity supply (71.9%)- fundamental prerequisites for evidence access that remain unmet in majority of studied facilities.

Beyond infrastructure, the study identified training deficits (68.9% reporting as major barrier), with only 22.7% of healthcare workers having any formal EBM education despite significantly higher implementation rates among trained individuals (3.2 times higher practice scores). Time constraints driven by high patient load (79.4%), organizational support gaps (58.1%), attitudinal resistance to practice change (52.1%), and patient expectation pressures (46.4%) emerged as additional significant but secondary barriers.

Knowledge assessment revealed that only 16.4% of participants demonstrated high EBM knowledge, with particularly low competency in evidence searching (30% correct) and critical appraisal skills (20% correct). EBM practice patterns showed concerning infrequency:40.6% never searched medical literature for clinical question,52.3% never critically appraised evidence-based discussions. The overall mean EBM practice sroce was 2.2 out of 5, indicating substitutable evidence and practice gap.

Statistical analysis received that knowledge scores, previous training, infrastructure availability, and facility type (CHC vs PHC) were significant predictors of EBM, practice, collectively explaining 62.4% of variance. Importantly the finding that healthcare workers with EBM training still perceived infrastructure barriers as equally problematic untrained colleagues highlights that knowledge and infrastructure are complementary rather than substitutable –both must be addressed for effective implementation.

Qualification finding provided crucial context, revealing that barriers interact in complex ways creating compounding effects that “innovation fatigue” from previous unsustained initiative creates scepticism toward new programs, that absence of India-specific primary care evidence limits perceived applicability of existing research, that facility-level leadership and peer support can partially mitigates systematic barriers, and that administrators often lack concrete strategies for operationalizing their conceptual support for EBM.

The research makes significant contributions by providing India-specific qualification of barrier prevalence and impact in rural primary healthcare context, examining administrative prescriptive alongside healthcare worker experiences, demonstrating through mixed method the complex interplay between individual, organizational, and systemic factors, identifying actionable intervention points with empirical prioritization based n effect sizes, and developing context-appropriate recommendations balancing evidence-based ideals with resource realities.

6.2 Suggestion

Based on the empirical findings, the following evidence based recommendations are proposed for hospital administrators at districts, state, and national levels to facilitate meaningful EBM implementation in rural Indian primary healthcare settings:

For Infrastructure Development:

- Establish a dedicated annual budget line for EBM infrastructure including internet connectivity, computing devices, and database subscription, recognizing this as essential rather than optional infrastructure
- Prioritize reliable broadband internet connectivity to all PHCs and CHCs through partnerships with Digital India initiative, leveraging Bharat Net fibre-optic network expansion to rural areas
- Provide at least one dedicated computer or tablet per primary health centre specially for evidence access, separate from administrative or patient record system to ensure availability
- Ensue uninterrupted power supply through solar backup systems or adequate generator capacity,

given irregular electricity as a fundamental barrier to digital resource access

- Subscribe to essential medical databases at state level with shared access across all public health facilities, leveraging bulk purchasing power to negotiate affordable rates (consider platforms like WHO's HINARI program, Indian Medlars Centre, Cochrane library)
- Establish evidence resources centres at districts hospital with full-text journal access, systematic review collections, and clinical guidelines libraries that can serve as hubs for surroundings PHCs and CHCs
- Develop offline evidence repositories by downloading essential clinical guidelines, systematic reviews, and decisions support tools onto facility computers during connectivity windows for offline access
- Create mobile evidence libraries using tablets preloaded with essential resources that can rotate among facilities or be carried by medical officers during outreach

For Capacity Building and Training:

- Mandate EBM training as part of induction programs for all healthcare workers joining primary healthcare facilities, ensuring no one practices without fundamental understanding of evidence-based principles.
- Develop multi-tiered training curriculum including basic level of healthcare workers covering EVM concepts, evidence hierarchy, and guidelines use, intermediate level for medical officers and senior nurses covering literature searching and critical appraisal, and advanced level for facility in-charge covering EBM leadership and quality improvement.
- Integrates practical, hands-on training using participants' actual clinical questions rather than theoretical scenarios to enhance relevance and immediate applicability.
- Provide training in resources-appropriate evidence access strategies use of point-of-care summary resources, offline clinical decision support tools, and evidence-sharing networks rather than expecting independent primary literature searching.
- Establish mentorship programs pairing experienced EBM practitioners with facilities beginning implementation, providing ongoing support beyond one-time training workshops.
- Create online learning modules and resources accessible through smartphones for continuous professionals' development, recognizing that mobile phones are nearly universal even where facility computers are lacking.
- Conduct regular refresher training and updates, recognizing that skills atrophy without reinforcement and evidence evolves requiring updating.
- Train healthcare administrators and managers in EBM principles alongside clinical staff to ensure leadership understanding and support.

For Organizational Culture and Policy:

- Develop explicit institutional policies staffing organizational commitment to evidence-based practice and defining expectations for all staff members.
- Incorporate evidence-based practice competencies into job descriptions and performances evaluation criteria, ensuring accountability while providing necessary support.
- Allocate protected time for EBM activities by designating specific hours for journal club, case discussions, guideline review, or evidence searching without patientcare responsibilities.
- Establish monthly evidence-based case discussions sessions at each facility where complex or interesting cases are reviewed with literature searching and critical appraisal, creating communities of practice.
- Create recognition and reward systems acknowledging healthcare workers who demonstrate exemplary evidence-based practice, contribute to guideline development, or mentor colleagues.

For Systemic Strengthening:

- Advocate for increased primary healthcare budgets at stage and national levels, emphasizing that quality improvement including EBM requires investment beyond current resources levels.
- Address healthcare worker shortage and turnover through improved compensation, better working conditions, careers development opportunities, and incentives for rural services to create more stable workforce amenable to capacity building.
- Strengthen health care management information systems to provides facilities-level data supporting evidence-based decision-making and quality monitoring.
- Develop partnerships with academic's institutions for ongoing EBM support, including guideline development, training delivery, and research on implementation effectiveness.

6.3 Future Directions

The current study, while proving comprehensive baseline data on barriers and immediate recommendations, points towards several critical areas requiring future investigation and action:

- Conduct implementation research evaluating the effectiveness and sustainability of different EBM intervention models in rural Indian contexts, comparing approaches such as infrastructure-focused vs. training-focused interventions, centralised (state-level) vs. decentralised (facility-level) guideline development, and technology-intensive vs. low-tech implementation strategies to identify which approaches produce greatest impact with available resources.
- Develop and validate context-specific measurement tools for assessing EBM implementation quality in resources-limited primary care setting, moving beyond simple yes/no metrics to capture the complexity of partial or adapted implementation.
- Examine cost-effectiveness of various EBM implementation strategies to guide resource allocation decisions by administrators facing budget constraints, qualifying return on investment through improved patient outcomes, reduced inappropriate referrals, and decreased wasteful spending on ineffective interventions.

These the future research directions, pursued systematically over the coming years, will build the knowledge base necessary for transforming evidenced-based medicines from an aspirational concept into everyday reality in India's primary healthcare system. Healthcare or Hospital administrations, policymakers, researchers, and frontline healthcare workers must collaborate in this endeavour, recognising that achieving truly evidence based primary healthcare system – accessible, affordable, and effective for India vast rural population – represent both a moral imperative and a practices pathway towards Universal Health Coverages and improved population health outcomes.

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