From ICT to AI: Preparing Medical College Libraries in Bihar for Next-Generation Technologies

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ABSTRACT

This study looks at the current state of the Information and Communication Technology (ICT) facilities in nine medical college libraries in Bihar, India. It also checks to see if these libraries are ready to use Artificial Intelligence (AI) technologies. Nine government medical colleges in Bihar were surveyed to find out about their ICT infrastructure, digital tools, staff skills, and readiness for adopting AI. The colleges were named ANMMCH, DMCH, GMC Bettiah, JNKTMCH, JLNMCH, NMCH, PMCH, SKMCH, and BMIMS (VIMS).

The study shows that there are big differences in the ICT infrastructure of different organizations. For example, 67% of libraries have basic digital facilities, but only 22% are ready for AI. Major problems include not having enough professional knowledge (78%), not having enough money (85%), and not having enough training programs (73%). This study is the first to look at medical college libraries in Bihar as a whole and see how they've changed from using standard ICT to using AI-enabled services. It also shows how to improve technology in educational settings with limited resources.

Keywords: Artificial Intelligence, Medical Libraries, ICT Infrastructure, Digital Transformation, Medical Education, Bihar

1. INTRODUCTION

Adding Artificial Intelligence (AI) and machine learning technologies is changing the way medical education and healthcare information management are done (Bohr & Memarzadeh, 2020). Medical college libraries used to be places where people could find information, but now they're changing into places where people can learn and use new technologies to help with evidence-based practice and study (Ting et al., 2020). Modernizing medical college libraries is an important step toward better medical education and better health results in developing areas like Bihar, India, where healthcare infrastructure faces many problems.

The Government of Bihar (2023) says that the state needs a strong medical school infrastructure because it has more than 125 million people and a doctor-to-patient ratio that is much lower than the national average. The state runs nine large government medical colleges. Each one has libraries that serve thousands of students, teachers, and health care workers. But the change from traditional library services to ICT-enabled systems and then to platforms with AI still isn't complete and isn't happening evenly across institutions.

Recent research has focused on how AI can change medical libraries. Some examples are intelligent search systems, personalized learning recommendations, automated cataloging, clinical decision support, and

predictive analytics for resource management (Beam & Kohane, 2018; Esteva et al., 2019). But using these technologies in places with few resources comes with its own problems when it comes to infrastructure, expertise, funds, and getting organizations ready (Char et al., 2018).

This study fills in a very important gap in our knowledge about the current state of technology in medical college libraries in Bihar and shows how AI can be successfully used in these libraries. The study's goals are to (1) look at the current ICT infrastructure across nine medical schools, (2) find things that stop technology from getting better, (3) see how ready institutions are to use AI, and (4) come up with a plan for long-term technological change.

2. LITERATURE REVIEW

2.1 Evolution of Medical Libraries: From Print to Digital

There have been big changes in medical libraries over the last 30 years. Starting in the 1990s, the digitization movement completely changed how people got information. Electronic journals, databases, and digital libraries became the main sources of information (Plutchak, 2012). Because of this change, a lot of money had to be spent on ICT infrastructure, like computers, servers, networking gear, and approved digital resources.

Tella and Issa's (2017) study showed that the use of ICT in academic libraries is linked to more research being done and better learning outcomes. But their study also showed that developing countries have a hard time keeping up with developed countries when it comes to technology. This is mostly because they don't have enough resources or ability.

2.2 Artificial Intelligence in Medical Education and Health Care

AI uses in healthcare have grown quickly and now include genomics, clinical decision support, diagnostic imaging, and drug development (Topol, 2019). AI technologies make it possible for adaptive learning systems, virtual patients, automated testing,

and smart teaching systems to be used in medical education (Chan & Zary, 2019). These apps have a lot of promise to make education more efficient and tailored to each student.

Wartman and Combs (2018) said that medical education needs to change to get future doctors ready for clinical practice with AI. As we move forward, we have to update medical libraries so that they can be used as test beds and places where medical students and teachers can learn how to use AI.

2.3 AI Can Be Used in Library Science

More and more research in library science talks about AI applications, such as chatbots for reference services, machine learning for cataloging and creating metadata, natural language processing for literature searches, and recommendation systems for finding the right resources for you (Cox et al., 2019). Lund and Wang (2020) looked into how AI could change the way information is organized. They said that machine learning techniques could make it much easier to find things and classify them correctly.

Wheatley and Hervieux (2019) noted that AI in libraries presents data privacy, algorithmic bias, professional identity, and digital gap issues. These issues are crucial in underdeveloped countries with lax safety laws.

2.4 Technology Adoption in Low-Resource Areas

Poor infrastructure, technical know-how, money, change resistance, and institutional backing make it hard for developing countries to adopt new technology (Moahi, 2019). In example, Arif and Kanwal (2009) found that poor facilities, training, and funding prevented Indian academic libraries from adopting ICT.

More recently, Rafiq et al. (2021) examined AI preparedness in South Asian university libraries and found that while people were aware of AI technology, they weren't employing them due to space and resource constraints. Their study found that step-by-step implementation strategies, skill-building

programs, and collaborative networks help people adopt new technology.

3. Research Objectives
This study aims to:
1. To examine the current status of ICT integration in Medical College Libraries of Bihar.
2. To analyse the readiness and awareness of LIS professionals towards AI adoption.
3. To develop a framework for transitioning from ICT based to AI- driven library services.

4. METHODOLOGY
4.1 Research Design
This study employed quantitative surveys and qualitative interviews to assess ICT infrastructure and AI preparedness in nine Bihar government medical college libraries. Between January 2024 and October 2024, the study was done.

4.2 Study Population
The study encompassed all nine government medical colleges in Bihar:
1. **ANMMCH** - Anugrah Narayan Magadh Medical College and Hospital, Gaya Ji
2. **DMCH** - Darbhanga Medical College and Hospital, Darbhanga
3. **GMC Bettiah** - Government Medical College, Bettiah
4. **JNKTMCH** - Jan Nayak Karpoori Thakur Medical College & Hospital, Madhepura
5. **JLNMCH** - Jawaharlal Nehru Medical College and Hospital, Bhagalpur
6. **NMCH** - Nalanda Medical College and Hospital, Patna
7. **PMCH** - Patna Medical College and Hospital, Patna
8. **SKMCH** - Sri Krishna Medical College and Hospital, Muzaffarpur
9. **BMIMS (VIMS)** - Bihar Medical Institute and Medical Sciences (Vardhman Institute of Medical Sciences), Pawapuri

4.3 Data Collection
Quantitative Part: A structured questionnaire was sent to the heads of libraries and senior library staff at each school. The questionnaire had 87 parts that were divided into seven groups: (1) physical infrastructure, (2) digital infrastructure, (3) electronic resources, (4) staff competencies, (5) user services, (6) funding and budgets, and (7) strategy planning for adopting technology.

The qualitative part included semi-structured interviews with 15 faculty members who use the library a lot (n=15), 9 library heads (n=9), and 6 IT directors. Interview protocols examined how people felt about current services, technology, barriers to progress, and future hopes.

Analysis of Documents Institutional annual reports, strategy plans, funding allocations, and policy papers supported the survey and interviews.

4.4 Data Analysis
Quantitative data were analyzed using descriptive statistics, frequency distributions, and comparative analyses. Qualitative data from interviews were transcribed, coded thematically, and analyzed using content analysis procedures. Python programming language was used for data visualization and statistical calculations.

5. FINDINGS
5.1 Current ICT Infrastructure Status
The assessment of ICT infrastructure across the nine medical college libraries revealed substantial variation in technological capacity. Table 1 presents a comparative overview of basic infrastructure components.

Table 1: ICT Infrastructure Components Across Bihar Medical College Libraries

Infrastructure Component	ANMMCH	DMCH	GMC Bettiah	JNKTMCH	JLNMCH	NMCH	PMCH	SKMCH	BMIMS (VIMS)
Computer Terminals (n)	15	22	8	28	12	35	42	18	10
Internet Bandwidth (Mbps)	50	100	20	100	50	150	200	75	30
WiFi Coverage (%)	60	80	40	85	55	90	95	70	45
Servers (Dedicated)	1	2	0	2	1	3	4	1	1
Backup Systems	Partial	Yes	No	Yes	Partial	Yes	Yes	Yes	No
RFID System	No	No	No	Yes	No	Yes	Yes	No	No
Digital Catalog	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Partial
Institutional Repository	No	Partial	No	Yes	No	Yes	Yes	No	No

The data reveals that PMCH and NMCH, both located in Patna (the state capital), possess significantly more advanced infrastructure compared to newer or geographically peripheral institutions. PMCH leads with 42 computer terminals, 200 Mbps internet connectivity, and comprehensive WiFi coverage (95%). In contrast, GMC Bettiah and BMIMS demonstrate minimal infrastructure development, with limited computer access, low bandwidth, and absence of advanced systems like RFID or institutional repositories.

5.2 Digital Resource Availability

Access to digital resources represents a critical component of modern medical education. Table 2 summarizes the availability of major electronic databases and resources across institutions.

Table 2: Digital Resource Subscriptions and Access

Resource Type	ANMMCH	DMCH	GMC Bettiah	JNKTMCH	JLNMCH	NMCH	PMCH	SKMCH	BMIMS (VIMS)
PubMed Access	Free	Free	Free	Free	Free	Free	Free	Free	Free
Cochrane Library	No	No	No	Consortium	No	Consortium	Consortium	No	No
MEDLINE/ Ovid	No	No	No	No	No	Yes	Yes	No	No
UpToDate	No	No	No	No	No	No	Yes	No	No
DynaMed	No	No	No	No	No	Yes	Yes	No	No
ClinicalKey	No	Yes	No	Yes	No	Yes	Yes	Yes	No
ProQuest Medical	No	No	No	Yes	No	Yes	Yes	No	No
E-books Collection (titles)	250	450	120	890	320	1200	1580	380	180
E-journals (titles)	1200	2100	580	3200	1450	4500	5200	1800	920

While all institutions benefit from free access to PubMed, subscription-based premium resources remain limited. PMCH demonstrates the most comprehensive digital collection with 1,580 e-book titles and 5,200 e-journal titles, along with multiple premium databases including UpToDate, DynaMed, MEDLINE, and ClinicalKey. Several institutions (JNKTMCH, NMCH, PMCH) benefit from consortium arrangements that

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provide shared access to expensive resources like the Cochrane Library.

Notably, only 33% of institutions (NMCH, PMCH, SKMCH) have access to clinical decision support tools like DynaMed, which represent important precursors to AI-enabled clinical support systems. This limited access constrains students' and faculty's exposure to evidence-based clinical resources and sophisticated information technologies.

5.3 Staff Competencies and Training

Human capital represents a critical factor in technology adoption. The survey assessed library staff qualifications, technical competencies, and training experiences. Figure 1 presents the distribution of staff educational qualifications across all nine institutions.
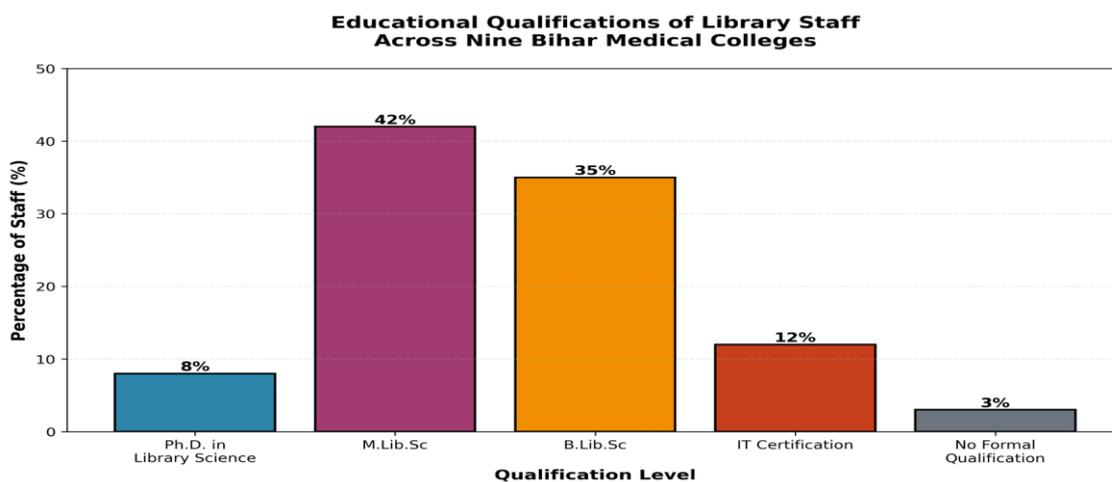

Figure 1: Educational Qualifications of Library Staff Across Nine Bihar Medical Colleges

The data reveals that while 85% of library staff possess formal library science qualifications, only 12% have specialized IT certifications. Notably, just 8% hold doctoral degrees, limiting research capacity and advanced expertise within library systems.

Figure 2 illustrates the current technical competency levels of library staff across key technology domains relevant to AI adoption.
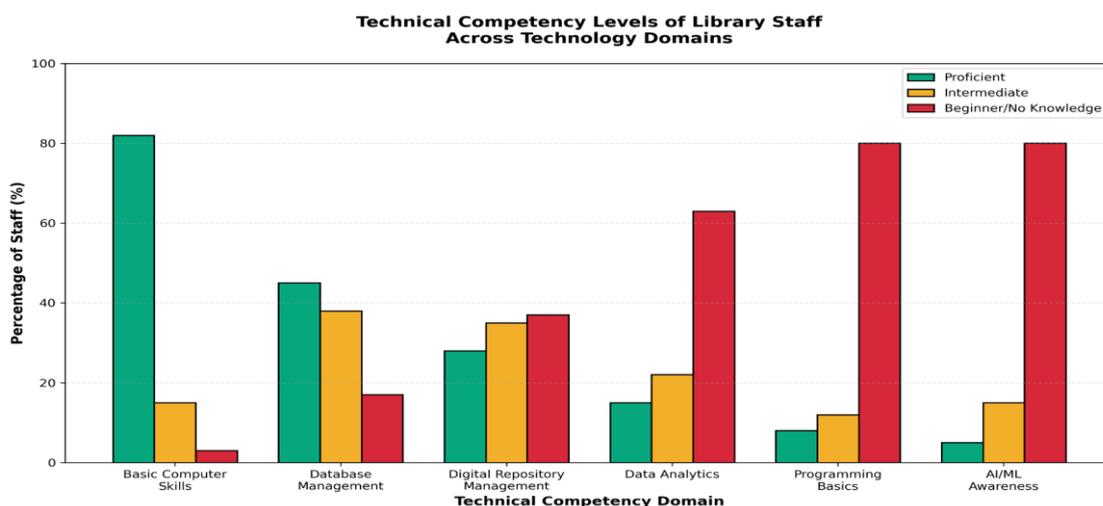

Figure 2: Technical Competency Levels of Library Staff Across Technology Domains

The competency assessment reveals a significant skills gap in advanced technical domains. While 82% of staff demonstrate proficiency in basic computer skills, this percentage drops dramatically for specialized competencies: only 15% are proficient in data analytics, 8% in programming basics, and a mere 5% possess AI/ML awareness. This skills deficit

represents a major barrier to implementing advanced technologies.

Regarding training opportunities, 73% of respondents indicated that their institutions lack systematic professional development programs for emerging technologies. Among the 27% who reported receiving training, most described brief workshops (1-3 days)

rather than comprehensive capacity-building programs.

5.4 Current Library Services and User Engagement

Traditional library services remain dominant across all institutions, though digital services are gradually expanding. Table 3 presents the availability of various service categories.

Table 3: Library Services Availability Across Institutions

Service Category	Available in n Institutions	Percentage
Traditional Services		
Reference/Circulation	9	100%
Reading Room Facilities	9	100%
Photocopying	9	100%
Basic Digital Services		
Online Catalog (OPAC)	8	89%
Digital Resource Access	9	100%
Computer/Internet Access	9	100%
Document Delivery	6	67%
Advanced Digital Services		
Remote Access to E-resources	6	67%
Institutional Repository	4	44%
Mobile App	2	22%
Research Data Management	2	22%
Bibliometric Services	3	33%
Emerging Technology Services		
Virtual Reference (Chatbot)	0	0%
AI-assisted Search	0	0%
Personalized Recommendations	0	0%
Text Mining Tools	0	0%
Virtual Reality Resources	0	0%

While traditional and basic digital services demonstrate near-universal availability, advanced digital services show limited adoption (22-44% of institutions), and notably, no institution has implemented any emerging technology services involving AI or machine learning.

User engagement patterns were assessed through circulation statistics, digital resource usage, and user satisfaction surveys. Figure 3 illustrates average monthly usage patterns across different resource types.

Usage patterns show clear academic calendar influences, with peaks during examination periods (March, September-November) and troughs during vacation months (May-June). Physical books remain the most-utilized resource, though digital resource usage is growing. The relatively low database search numbers (averaging 590 monthly searches across institutions serving thousands of users) suggest underutilization of advanced research tools, possibly due to limited awareness, insufficient training, or poor interface design.
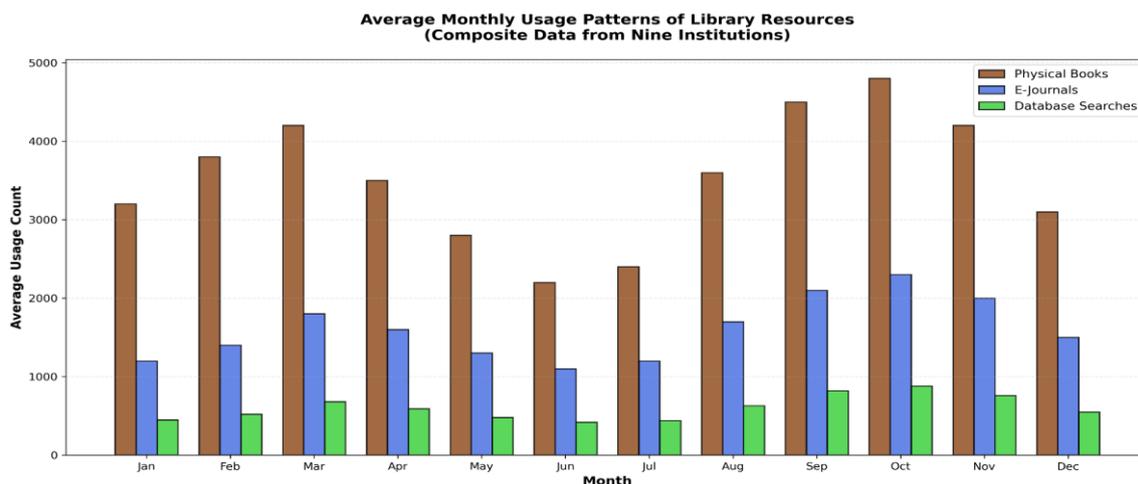
Figure 3: Average Monthly Usage Patterns of Library Resources

5.5 Institutional Readiness for AI Adoption

AI readiness was assessed using a composite index incorporating infrastructure, human resources, strategic planning, and organizational culture dimensions. Each institution was scored on a 100-point scale across these dimensions. Figure 4 presents the AI Readiness Index scores.
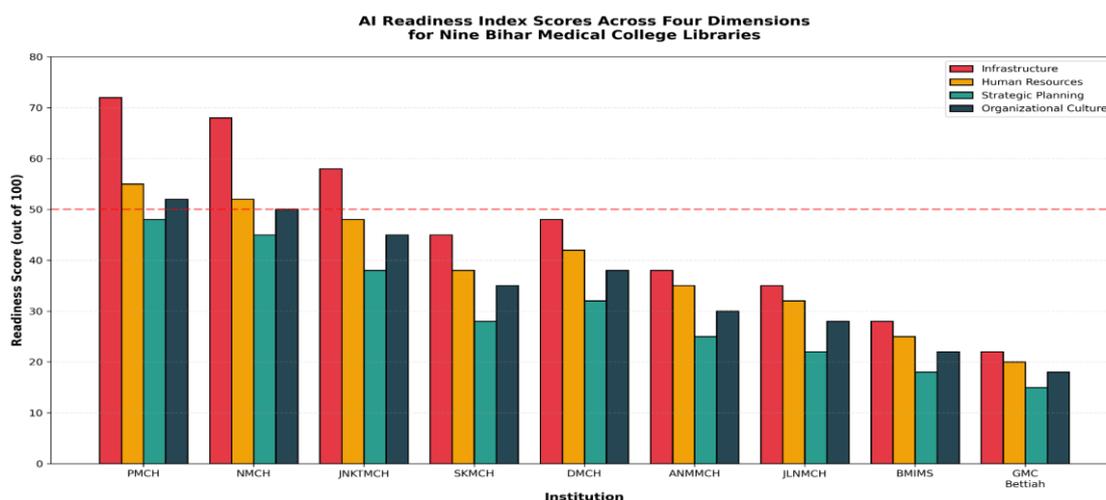

Figure 4: AI Readiness Index Scores Across Four Dimensions

The readiness assessment reveals significant disparities. PMCH and NMCH demonstrate moderate readiness (scoring above 50 in infrastructure), while newer institutions like GMC Bettiah and BMIMS show minimal readiness across all dimensions. Notably, even the highest-performing institutions score below 60% in human resources and strategic planning dimensions, indicating substantial capacity gaps.

Only two institutions (PMCH, NMCH) have incorporated AI or emerging technologies into their strategic planning documents. Seven institutions (78%) reported having no formal technology roadmap beyond basic ICT maintenance and incremental improvements.

5.6 Barriers to Technology Advancement

Respondents identified multiple barriers to advancing from current ICT systems to AI-enabled services. Figure 5 presents the frequency and perceived severity of various barriers.
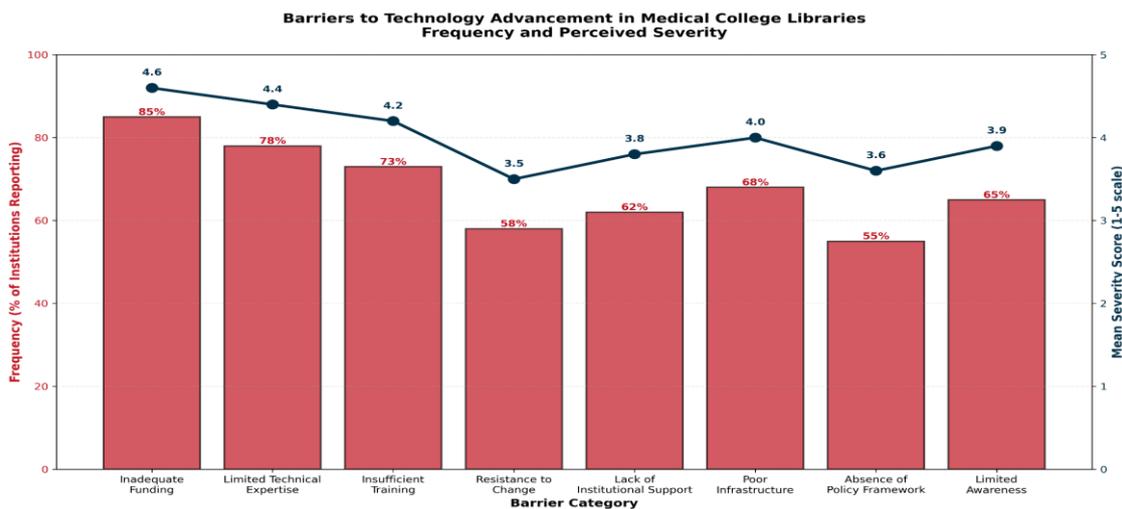
Figure 5: Barriers to Technology Advancement - Frequency and Perceived Severity

Inadequate funding emerges as both the most frequently cited (85%) and most severe (4.6/5) barrier. Library directors consistently reported that budget allocations remain stagnant or declining in real terms, with most funds allocated to maintaining existing subscriptions rather than investing in new technologies. One library director stated: *"We struggle to maintain current database subscriptions. Investment in AI technologies seems like a distant dream when we cannot even afford basic infrastructure upgrades."*

Limited technical expertise (78% frequency, 4.4 severity) and insufficient training (73%, 4.2) represent interconnected human resource challenges. Most institutions lack staff with programming skills, data science knowledge, or AI/ML understanding necessary to implement and maintain advanced systems.

5.7 Stakeholder Perspectives and Priorities

Interviews with faculty members and library directors revealed diverse perspectives on technology priorities and the role of AI in medical education. Table 4 summarizes the priority rankings for various technological interventions.

Table 4: Stakeholder Priority Rankings for Technology Investments

Technology Intervention	Library Directors (Mean Rank)	Faculty Members (Mean Rank)	IT Coordinators (Mean Rank)	Overall Priority
Increased Digital Resource Subscriptions	1.8	1.3	2.8	High
Enhanced Internet Infrastructure	2.1	2.9	1.2	High
Staff Training Programs	3.2	4.6	2.5	High
Mobile Access Applications	4.5	2.2	4.1	Medium
Institutional Repository Development	3.8	5.3	3.9	Medium
AI-powered Search Systems	5.7	3.8	4.8	Medium
Virtual Reference Services (Chatbots)	6.2	4.9	5.5	Medium
Learning Analytics Platforms	5.9	4.1	5.2	Medium
VR/AR Learning Resources	7.1	6.8	6.9	Low
Blockchain for Credentials	7.8	7.6	7.2	Low

Rankings: 1 = highest priority, 8 = lowest priority

Stakeholders demonstrate consensus on fundamental needs (digital resources, infrastructure, training) but diverge regarding advanced technologies. Faculty members show greater interest in AI-powered search and learning analytics compared to library directors, who prioritize capacity building and infrastructure consolidation before advancing to AI systems.

Several faculty members expressed enthusiasm about AI potential while acknowledging current limitations. One clinical faculty member noted: *"AI could revolutionize how students access clinical guidelines and evidence. But we need reliable basic systems first. There's no point in sophisticated AI if the internet connection drops frequently."*

5.8 Comparative Analysis with National and International Standards

To contextualize Bihar medical college libraries within broader frameworks, a comparative analysis was conducted against national (India) and international benchmarks. Table 5 presents this comparison.

Table 5: Comparative Analysis with National and International Benchmarks

Indicator	Bihar Medical Colleges (Average)	Indian Medical Colleges (National Average) *	International Standard (Developed Countries) **
Computer terminals per 100 users	1.2	3.8	8.5
Internet bandwidth per user (Kbps)	8.5	25.3	120.0
E-journal titles per institution	2,326	4,890	12,500
E-book titles per institution	487	1,250	5,800
Library budget as % of total institutional budget	1.8%	3.2%	6-8%
Staff with advanced IT training (%)	12%	28%	65%
AI/ML technology implementation	0%	8%	42%
User satisfaction score (out of 10)	6.3	7.1	8.4

*Data from Medical Council of India reports and survey of 45 medical colleges (2022-2023) **Data from Association of Academic Health Sciences Libraries (2023)

This comparison reveals significant gaps across all metrics. Bihar medical college libraries operate with approximately 32% of the national average computer availability, 34% of bandwidth, and 48% of digital resources. The gap widens further when compared to international standards, with Bihar institutions possessing only 14% of the computer terminals and 7% of bandwidth available in developed country medical libraries.

Notably, no Bihar medical college library has implemented any AI/ML technologies, compared to 8% nationally and 42% internationally. This technology gap risks widening educational quality disparities and limiting students' preparedness for technology-enabled healthcare practice.

6. DISCUSSION

6.1 The Digital Divide Within Bihar's Medical Education System

The findings reveal a pronounced digital divide not only between Bihar and more developed regions but also among institutions within Bihar itself. PMCH and NMCH, established institutions in the state capital, demonstrate significantly greater technological capacity than newer peripheral institutions like GMC Bettiah and BMIMS. This intra-state disparity risks creating a two-tiered medical education system where students' learning experiences and competencies vary substantially based on institutional location.

This pattern aligns with broader literature on technology diffusion in developing regions,

where urban-rural and central-peripheral divides persist (Moahi, 2019).

6.2 The Readiness Gap: Infrastructure vs. Human Capital

Despite infrastructure shortages, the human capital gap is more pressing. When funded, infrastructure may be purchased and deployed fast, but technical expertise requires continual training, professional development, and retention measures.

The finding that only 5% of library staff possess AI/ML awareness presents a significant barrier to technology adoption. Even in institutions with adequate infrastructure, the absence of personnel capable of implementing, customizing, and maintaining AI systems constrains adoption. This aligns with Rafiq et al.'s (2021) findings that capacity constraints represent a primary barrier to AI adoption in South Asian libraries.

Moreover, the limited availability of training programs (reported by 73% of respondents) suggests systemic rather than individual-level challenges. Medical colleges in Bihar appear to lack mechanisms for continuous professional development of library staff in emerging technologies. Creating such mechanisms—whether through partnerships with technical institutions, online learning programs, or consortium-based training—represents a high-leverage intervention.

6.3 Funding Constraints and Sustainability

The prominent role of funding constraints (cited by 85% of respondents with high severity ratings) demands deeper examination. Medical college libraries in Bihar typically receive 1.8% of institutional budgets, substantially below the 6-8% recommended by international standards. This chronic underfunding creates a vicious cycle: limited resources → minimal technology adoption → low perceived value → continued underfunding.

It takes better library services and outcomes to break this loop. Ironically, such demonstration sometimes needs prior technology investments that budget limits prevent. According to this chicken-and-egg problem, state government special allocations, central government initiatives, or development partners must provide catalytic funds to start transformation processes that can be sustained by regular budgets.

Cost-effective technology adoption may be possible through the consortium approach, which gives some institutions access to the Cochrane Library. Collective staff training, AI infrastructure, and tool development could be part of consortium arrangements beyond content licensing. This would spread costs and build capacity.

6.4 AI Integration Routes: Phased Methodology

Rapid adoption of advanced AI technologies seems unlikely given present readiness levels. Phased growth from present capacities to AI-enabled services is more probable.

Phase 1: Foundation Strengthening (Years 1-2)
- Upgrading computer, WIFI, and bandwidth infrastructure
- Normalizing library management systems at all institutions
- Opening institutional repositories
- Staff and users learning digital literacy
- Technology roadmaps and governance mechanisms

Phase 2: Intermediate Digital Services (Years 2-4)
- Implementing powerful search and discovery platforms
- Creating library mobile apps
- Starting research data management services
- Integrated learning management system
- Training workers in data analytics and information architecture

Phase 3: AI-Enabled Services (Years 4-6)
- Piloting chatbot-based virtual reference services
- Implementing AI-powered literature search and recommendation systems

- Deploying learning analytics to personalize resource recommendations
- Establishing clinical decision support tool integration
- Developing predictive analytics for resource management and user services

This phased approach allows institutions to build capacity incrementally, learning from early pilots before scaling successful interventions. It also accommodates the reality that different institutions begin at different readiness levels and will progress at varying paces.

6.5 Potential AI Applications in Medical College Libraries

Looking toward future possibilities, several AI applications show particular promise for medical college libraries in resource-constrained settings:

Intelligent Search and Discovery: Natural language processing (NLP) algorithms can help users formulate better queries and retrieve more relevant results from complex medical literature databases. This addresses a common challenge where users, particularly junior students, struggle with technical search syntax and medical terminology (Beam & Kohane, 2018).

Personalized Learning Recommendations: Machine learning algorithms analyzing usage patterns, course enrollments, and learning objectives could recommend relevant resources to individual students, enhancing their learning efficiency. Such systems could help students navigate the overwhelming volume of medical literature by surfacing materials aligned with their current learning needs.

Automated Literature Review Assistance: AI tools using text mining and summarization techniques could assist students and researchers in conducting systematic reviews, identifying key papers, extracting relevant data, and synthesizing findings—tasks that are currently time-intensive and require sophisticated information literacy skills.

Virtual Reference Assistants: Chatbots trained on medical terminology and common library queries could provide 24/7 basic reference assistance, answering frequently asked questions about library services, resources, and procedures. This would extend service hours without adding workers.

Predictive Resource Management: Machine learning algorithms may estimate resource demand based on previous usage data, academic calendars, and enrollment trends, optimizing acquisitions and ensuring high-demand material availability during important periods.

Given the rise of predatory publishing and questionable research, AI-powered tools could help teach academic integrity by checking plagiarism and teaching proper citation.

6.6 Ethical and Practical Considerations

AI usage in medical libraries creates ethical issues. Algorithmic bias is a major issue: AI systems trained on data from industrialized nations or certain demographic groups may perform badly in Indian medical contexts or perpetuate medical knowledge biases (Char et al., 2018).

Data privacy needs consideration too. Search histories, borrowing patterns, and learning analytics are needed for AI systems. Effective data governance systems must gather, store, and use such data with unambiguous consent and privacy protections.

Consider technological reliance risk. Overreliance on AI technologies may degrade library staff and users' information literacy. Automation efficiency benefits must be balanced with critical thinking and analytical skills.

In resource-constrained contexts, AI implementations' durability is dubious. Maintenance, updates, and technical assistance for many AI systems may surpass local capacity. We recommend open-source solutions, systems with robust user communities, and technologies with low external dependencies.

6.7 Policy Implications and Recommendations

The findings recommend several policy interventions:

1. Equity-Focused Resource Allocation: The Bihar Department of Health and Medical Education should allocate resources to neglected institutions to fill capacity gaps. To meet technical standards, newer and peripheral universities need more funding.
2. Statewide Library Consortium: A Bihar Medical College Library Consortium might enable resource sharing, digital subscription collective bargaining, collaborative technological projects, and cooperative training. Consortia have worked in other Indian states and abroad.
3. Required Technology Planning: Medical colleges should design and update technology roadmaps for accreditation. These strategies should set measurable goals for digital resource access, infrastructure development, and personnel proficiency.
4. Partnership with Technical Institutions: Bihar medical colleges and engineering/computer science institutions should collaborate to provide technical knowledge for library technology projects and real-world learning for technology students.
5. Central Government Scheme Utilization: The Digital India program, National Knowledge Network, and higher education quality development schemes subsidize educational technology. Grant writing and project management training should help medical colleges access these resources.
6. Professional Development Framework: The state should require library staff training, certification in emerging technology, and skill-based career promotion.

6.8 Limitations of the Study

Some limitations must be noted. First, the study is a snapshot of a quickly changing technology context; findings may become old as institutions improve. Second, the study included all Bihar government medical colleges but not private medical college libraries, limiting generalizability. Third, while comprehensive, the AI readiness index is researcher-created and may not capture all essential preparation features. Instead of direct surveys, library usage data and faculty interviews were used to include student and resident perspectives, perhaps ignoring critical user experience and needs.

7. CONCLUSION

The move from ICT to AI-enabled services presents complicated opportunities and problems, as shown by this extensive analysis of nine Bihar medical college libraries. All institutions have basic digital infrastructure, but advanced technological capabilities, human skills, financing, and strategic planning are lacking.

Research found three significant finding clusters:

Infrastructure and resources divide first: Established core institutions (PMCH, NMCH) have much more technological capacity than newer peripheral institutions. This intra-state difference risks unequal medical student education and outcomes by institution location.

Human capital challenge #2: Beyond infrastructure, a lack of workers with advanced technical skills—particularly in data analytics, programming, and AI/ML—impedes technology growth. Only 5% of librarians are aware of AI/ML, while 73% of institutions lack emerging technology professional development.

Third, sustainability: Insufficient financing (1.8% of institutional budgets) limits library operations and innovation. Breaking this loop requires external catalytic finance, consortiums, and increased service value development.

Despite these obstacles, progress is possible. The suggested framework stresses gradual implementation from foundation strengthening to intermediary services to AI integration. This strategy recognizes capacity

constraints and sets a realistic technical advancement roadmap.

Medical education and healthcare information management could benefit from AI technologies including personalized learning, intelligent search, automated literature review, and predictive resource management. For successful deployment, you need reliable infrastructure, trained staff, appropriate funds, robust governance structures, and user-centered design.

The study's findings can inform medical education technology planning in resource-constrained countries beyond Bihar. Infrastructure shortages, capacity limits, and finance constraints affect emerging regions. Phased implementation, consortium approaches, external collaborations, and policy interventions may be more applicable. Bihar medical college libraries face a precarious future. The rapid speed of technological development in healthcare and medical education requires these institutions to become active partners in technology-enabled learning and research. State government policymakers, institutional administrators, library professionals, academics, and the medical education community must commit to this shift. ICT-to-AI is neither easy nor quick. Patient capacity building, strategic investment, collaboration, and learning are needed. Improved educational quality, research output, better-prepared healthcare workers, and better health outcomes for Bihar's people justify the effort and expense. As medical education globally adopts technology-augmented pedagogy and healthcare increasingly uses AI for diagnosis and treatment, providing Bihar medical students with cutting-edge library and information services is not only a quality improvement but also an equity imperative.

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