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Development of Physical and Digital Resources in Medical College Libraries of Indore

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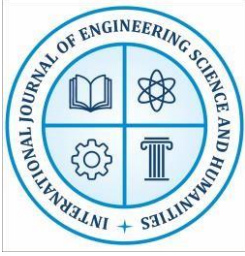
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Abstract -This study provides a comprehensive investigation into the growth and development of medical college libraries in Indore, Madhya Pradesh, during the period from 2011 to 2020. The primary objective is to evaluate how these libraries have transformed in response to the evolving academic and informational needs of students, faculty, and researchers in the medical field. The study emphasizes the changes in infrastructure, library resources, and services offered over the decade, highlighting how advancements in technology and shifts in educational practices have influenced library operations. A key focus is the expansion of library collections, both physical and digital, and how effectively these collections support academic and clinical learning. The role of Information and Communication Technology (ICT) is critically analyzed, particularly its integration into library services such as online databases, e-journals, digital catalogs, and remote access platforms. The adoption of ICT has significantly altered the traditional functions of libraries, making them more dynamic and accessible. The research also assesses current infrastructure, including physical spaces, reading facilities, internet connectivity, and the availability of trained library staff. It investigates whether these facilities align with the needs of a modern medical education environment. Moreover, the study explores the information-seeking behavior of library users—how they access and utilize resources, the challenges they face in finding relevant information, and their expectations regarding library improvements. By understanding user behavior and needs, the study offers insights into how libraries can become more user-centric. The analysis also projects future requirements to ensure medical college libraries remain relevant and effective. These include upgrading digital infrastructure, expanding access to international databases, and improving staff training. The findings serve as a valuable guide for library administrators, academic institutions, and policymakers committed to strengthening library systems to support medical education and research excellence in Indore.

Keywords: Medical College Libraries; ICT Integration; Digital Resources; Library Infrastructure; Information-Seeking Behaviour; Indore (Madhya Pradesh)

I INTRODUCTION

The Growth and Development of Medical College Libraries: A Comprehensive Introduction



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Medical college libraries have long served as the intellectual heart of academic medicine. They are more than just repositories of books and journals—they are dynamic centers of knowledge creation, access, and application. From their humble beginnings as collections of a few essential medical texts housed in single rooms, these libraries have evolved into sophisticated information hubs that support education, research, and clinical practice. Their development reflects the broader transformation of medical education, the digitization of knowledge, and the ever-growing demands of the healthcare industry [1].

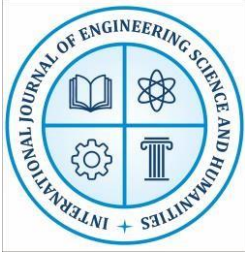
As the field of medicine has developed, so too has the role of medical college libraries. When medical schools started to take shape in the late 19th and early 20th centuries, libraries were built to meet the information demands of the teachers and a select few students. Collections were modest, focused largely on anatomy, pathology, and clinical medicine, and heavily reliant on printed books and periodicals [2]. As the medical curriculum expanded and specialized disciplines emerged, so too did the library holdings. The mid-20th century marked a significant phase of expansion with the proliferation of medical colleges worldwide, and libraries began to include audiovisual materials, microfilms, and reference tools to support the growing complexity of medical education [3].

Revolutionary shifts occurred as a result of technological developments in the past and early modern eras. The dissemination and accessibility of medical knowledge were both altered by the rise of the internet, electronic databases, and electronic journals. Medical college libraries began investing in electronic resources such as PubMed, UpToDate, ClinicalKey, and access to high-impact medical journals and e-books. These digital transformations not only increased the accessibility of resources for students and faculty but also allowed for remote learning and research collaboration across borders. Libraries became hybrid in nature—combining physical and digital resources—offering flexible, user-centered services [4].

Another significant trend in the development of medical college libraries has been their growing role in supporting research and evidence-based practice. Librarians are now not just custodians of information, but active collaborators in the research process [5]. They assist in systematic reviews, teach information literacy, help in citation management, and provide guidance on ethical publication practices. Furthermore, the implementation of integrated library management systems (ILMS), institutional repositories, and open-access initiatives has enhanced knowledge sharing and academic visibility.

Medical libraries also play a vital role in accreditation processes and quality assurance in medical education. They are evaluated for their infrastructure, staffing, collection development policies, and user services. In India, for instance, the National Medical Commission (NMC) mandates specific library standards that medical colleges must adhere to, ensuring uniformity and quality across institutions [6].

Despite this progress, medical college libraries face challenges such as budget constraints, the need



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for continuous technological upgrades, and training demands for both users and staff. Nonetheless, their commitment to adapting and innovating has ensured their continued relevance. The development and growth of libraries date back to ancient times, as far back as 600 BC. The growth of libraries witnessed a steady progress through several civilizations for example, Egypt, Mesopotamia, Greece, Rome etc. It was evident that news and ideas sent out by words of mouth were often slow in reaching their destinations and were sometimes distorted. This gave rise to writing with ancient materials such as papyrus, stone, parchment, vellum, clay etc. Writing was also done on cave walls, tree barks and stones before the invention of paper and printing [7]. Consequently, writing itself gained refinement, and records could be kept very easily.

The need arose for the written records to be kept and maintained. This was the beginning of libraries. Libraries started as a collection of written records, whereby works of groups of priests and other persons were collected and stored in various locations. The emergence of many professionals and educational activities increased the output of written works. Library systems emerged in response to the need to acquire, organize, and preserve these materials. Any gathering of books housed in a specific location for the purpose of reading or study is referred to as a library. [8] Libraries are defined by Nwosu (2000) as collections of books and other information materials that are organized and stored for the purposes of reading, studying, and referencing.

To [9-10] a library is a place, building or vehicle (in the case of mobile library) where books and non book materials like slides, filmstrips, films, Compact Disc-Read Only Memory (CD-Rom), microform, Video Compact Disc (VCD) etc are organized and kept for use. The word “organization” distinguishes a library from any type of book collection and ensures proper use of the resources of the library [11].

Sumeria is given the credit as the cradle/beginning of civilization. They were later conquered by the Babylonians who were also later conquered by the Assyrians. It is worthy of note that with each conquest, the civilization of the conquered was not destroyed rather it was improved upon. The lives of these ancient people revolved around their city capitals: Sumeria’s capital was Ur, Babylon was also Babylon and Assyria was Nineveh. These capitals were destroyed and rebuilt several times. Archeologists who studied ancient history dug up the capital city of Sumeria, Ur and discovered 12 different layers of the city. Among the discoveries were temples and in these temples, there was found evidence of schools, markets, industries and several thousand clay tablets indicating evidence of organized record keeping. The scribes and priests lived in the temples, and the major function of the scribes was writing. One of the major records discovered was THE CODE OF HAMMURABI (Stele of Hammurabi). A stele was a monument of hard clay with writings on both sides and the stele was placed in the city market which was a public place [5]. It served as the ancient newspaper and it contained information on law, tax, myth and legend. Remnants of these were kept in the British Museum – London[12-13].

Attempts to arrange document collections are the initial steps in the history of libraries. It are



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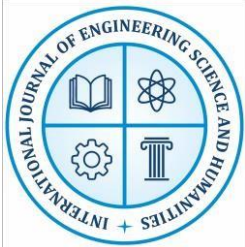
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interested in hearing about the following topics: library accessibility, collection acquisition, organization and discovery tools, book trade, language distribution, library function in education, literacy rates, funding, staffing, library programming for specific audiences, library architecture, library use patterns, library sponsorship (public, private, or mixed), and library impact on national heritage. The advent of digitalization and computerization in the 1960s revolutionized libraries in numerous ways [14]

II LITERATURE REVIEW

Author(s) & Year	Application Domain	Dataset / Context	Methodology / Techniques	Key Contributions / Findings	Performance Metrics
Naeem Iqbal <i>et al.</i> , 2020[15]	Academic library analytics	Jeju National University Library (Republic of Korea); 2.2M rental records, 78 parameters	Data mining, DNN, SVR, Random Forest	Proposed a predictive model for rental book forecasting to support library resource planning and management	MAE, MSE, RMSE
Delfina Ramos-Vidal <i>et al.</i> , 2021[16]	Digital library software systems	Semi-automatic digital library generation	Software Product Line (SPL), feature modeling	Developed an SPL-based framework to generate DL applications efficiently, reducing development effort	Development effort savings
Wouter Hajnal <i>et al.</i> , 2022[17]	Spectral libraries for remote sensing	Sentinel-2 imagery (Brussels urban area)	M-CORE, MUSIC extension, library pruning	Introduced a multi-step spectral library trimming approach improving land cover fraction mapping accuracy	Mapping accuracy improvement
Yanghua Zhang <i>et al.</i> , 2022[18]	Android third-party library identification	3.9M+ Google Play apps	Clustering-based detection (LibHawk eye), dependenc	Achieved higher precision in detecting external libraries without package homogeneity assumptions	93.25% accuracy



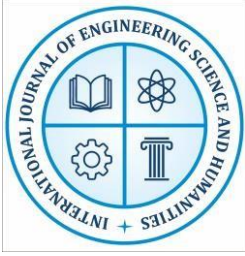
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			y networks		
Xian Zhan <i>et al.</i> , 2022[19]	Android third-party library analysis	74 studies (2012–2020)	Systematic Literature Review (SLR)	Presented taxonomy, challenges, and future research directions in Android TPL analysis	Qualitative synthesis
Xinfa Zhang <i>et al.</i> , 2023[20]	Standard cell libraries (VLSI)	16/14 nm technology nodes	Sensitivity analysis, aging-aware characterization	Reduced SPICE simulations while maintaining accuracy using crucial transistor identification	Avg. error 1%, speedup up to 305×
Jing Lin <i>et al.</i> , 2024[21]	Public library lighting systems	20 Swedish public libraries (>55°N)	Qualitative field study, interviews, gap analysis	Identified gaps in human-centric lighting practices and proposed improved asset management strategies	Qualitative outcomes
Yanan Zhang <i>et al.</i> , 2024[22]	Open-source software component libraries	30,000+ GitHub projects; vehicle firmware	Fingerprint-based feature extraction, SCA	Achieved high accuracy in binary component and version identification	83.33% (layout), 96.81% (version)
Yimin Yin <i>et al.</i> , 2024[23]	Digital library security	R2L attack dataset; two digital libraries	PDCA framework, enhanced SVM	Proposed a continuous risk control model achieving high detection accuracy	96.46% accuracy
Pinjia Hu <i>et al.</i> , 2025[24]	Digital library recommendation systems	Large-scale digital library dataset	VAE, Adam optimizer, Lookahead	Improved catalogue optimization, recommendation accuracy, and user engagement	Accuracy & engagement gains

III RESEARCH METHODOLOGY



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Objective of Study

The main objective of the present study is The Growth and Development of Medical College Libraries in Indore, MP: A Study from 2011 to 2020 is as follows

- To learn how medical college libraries have evolved through time and how their collections have grown.
- To examine the impact of ICT on growth and development of medical college libraries.
- To examine the infrastructure of medical college libraries.
- To examine the library collection and development of medical college libraries.
- To examine the information seeking behavior of users of medical college libraries.
- To examine the future requirement and updation required for Medical College libraries in Indore, Madhya Pradesh.

Hypotheses

To forecast the link between two variables, one may make a testable statement, or hypothesis. H1 presupposes a substantial relationship, whereas H0 presupposes no relationship at all.

Hypothesis1

- H₀₁: There has been no significant historical growth or pattern in the collection development of medical college libraries in Indore.
- H₁₁: There has been a significant historical growth and identifiable pattern in the collection development of medical college libraries in Indore.

Hypothesis2

- H₀₂: ICT has no significant impact on the growth and development of medical college libraries in Indore.
- H₁₂: ICT has a significant impact on the growth and development of medical college libraries in Indore.

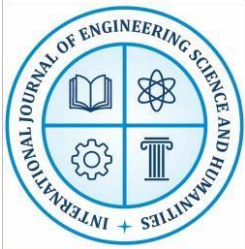
Hypothesis3

- H₀₃: The infrastructure of medical college libraries has not significantly improved over the period 2011–2020.
- H₁₃: The infrastructure of medical college libraries has significantly improved over the period 2011–2020.

Hypothesis4

- H₀₄: There has been no significant development in the library collections of medical college libraries in Indore.
- H₁₄: There has been significant development in the library collections of medical college libraries in Indore.

Hypothesis5



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- H_{05} : There is no significant variation in the information-seeking behavior among users of medical college libraries in Indore.
- H_{15} : There is a significant variation in the information-seeking behavior among users of medical college libraries in Indore.

Hypothesis6

- H_{06} : There is no significant need for future updates and changes in the medical college libraries of Indore.
- H_{16} : There is a significant need for future updates and changes in the medical college libraries of Indore.

Sampling Method

Stratified random sampling is a method of selecting a sample from a larger population by dividing it into smaller, non-overlapping groups called "strata" using predetermined criteria. Typically, these strata are similar-looking groups with similar age, gender, socioeconomic status, level of education, or some other pertinent qualification. Following the establishment of these strata, a random selection is made from every subgroup. Our goal is to guarantee that every subgroup is appropriately represented in the sample so that we may obtain more accurate and trustworthy results.

Source of Data Collection

The sources of data collection for this study are as follows:

The term "Source of Data Collection" describes the places and things from which a researcher compiles their study's data. Main data and secondary data are the usual categories for the sources:

Primary Data: Surveys and Questionnaires: Questionnaires are designed to collect structured responses from participants. Surveys can be distributed online, via email, or in person. **Secondary Data:** This involves gathering existing data that has been previously collected and published. Sources include research articles, industry reports, government publications, company records, and online databases.

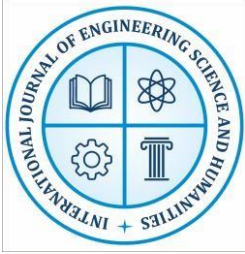
Data collection strategy

Primary Data Collection: To conduct the research at hand, it is necessary to acquire data directly from the source, which is known as primary data. The main sources of information for this study will be:

Structured Questionnaire: In order to collect quantitative data from many people, a well-designed questionnaire will be utilized. The Department of Library and Information Science will be thoroughly covered in the questionnaire.

Research Strategy

The research strategy for this study will focus on a survey-based approach. Surveys are a reliable method for collecting large-scale data from a broad population, especially when assessing consumer preferences across a diverse audience. The survey will be conducted using a structured



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questionnaire designed to capture detailed responses from participants. This method will enable the collection of both quantitative and qualitative data, giving a comprehensive view of the Department of Library and Information.

Area of Study

The area of study is limited to medical college libraries located in Indore, Madhya Pradesh. It includes both government and private institutions offering undergraduate and postgraduate medical education. The study examines library infrastructure, resource development, ICT adoption, and user behavior within the period of 2011 to 2020.

Sample Design and Selection

For this study, Probability sample will be used as the sample technique. In order to minimize bias and maximize sample representation, probability sampling guarantees that every individual in the population has an equal and known probability of being chosen.

Since this research focuses on gathering data from a large-scale subscriber base, probability sampling will allow for accurate generalization of the results to the broader population.

Collection of Data from below Medical colleges

1. Index Medical College, Hospital & Research Centre
2. Sri Aurobindo Institute of Medical Sciences
3. Modern Medical College and SEWAKUNJ Hospital & Research Center
4. Mahatma Gandhi Memorial Medical College Indore

Sample Size

The study will consider a sample size of 510 respondents. A sample of this size is sufficient to achieve a high level of statistical confidence and is typical for survey-based research. A larger sample size will help to capture a diverse range of consumer opinions and reduce sampling error.

Data Collection Method

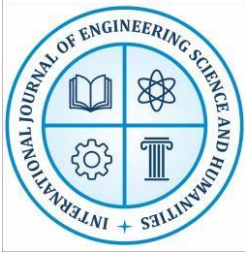
Data will be collected through both primary and secondary sources:

- Primary Data will be gathered through structured questionnaires, personal interactions, and interviews, ensuring that the data is relevant and specific to the research objectives.
- Secondary Data will be collected from reliable sources such as books, magazines, websites, and policy statements to provide contextual information and support the primary data findings.

This combined approach will ensure that the study draws from both original insights from consumers and secondary information to create a well-rounded and accurate picture of the current OTT landscape in Indore city.

Secondary Method

Papers published in scholarly journals, annual reports on micro, small, and medium-sized businesses, books, magazines, websites, and other online resources made up the secondary data. Secondary data is when researchers make use of information that is already in the public domain.



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In contrast to primary research methods like surveys or experiments, secondary research entails obtaining and analyzing data and information that already exists. Academic journals, books, papers, databases, and historical records are examples of pre-existing sources that researchers use in secondary research. This helps them obtain relevant information for their queries or objectives. This approach is commonly used to understand a subject better, verify results, or set the stage for primary research. Using secondary sources allows scholars in a wide variety of disciplines to build upon the work of others and enhance their own studies. In most cases, it is more efficient and requires less time and money than direct research. In order to evaluate the situation, a temporal analysis of data was conducted using secondary sources. These sources included prior census data on labour participation, as provided by the government of Madhya Pradesh, as well as reports, research, and existing papers.

3.15 Data Presentation Tools and Statistical Techniques for Analysis

The study's needs and requirements informed the choice of analytical instrument. This research makes use of graphical representations such as bar graphs, percentage charts, and averages. Data is presented using an Excel sheet.

For testing and findings, statistical software like SPSS will be used to process the acquired data. Research and analysis cannot be completed without data display tools and statistical approaches. Researchers are better able to convey their results and derive useful inferences from their data when they use these tools and procedures. Bar charts, line graphs, pie charts, tables, graphs, and visualizations are some of the most frequent ways to present data. These graphics have the ability to make complicated data easy to comprehend. A variety of statistical methods are available to researchers, including descriptive statistics (mean, median, mode) and inferential statistics (t-tests, ANOVA, regression analysis), which lay the groundwork for valid research conclusions by revealing relationships, patterns, and significant differences within data sets. Research results are more understandable and useful when these tools and approaches are used effectively.

IV STATISTICAL ANALYSIS

Data acquired for statistical information, including tests and results, will be processed using software such as SPSS. "The Growth and Development of Medical College Libraries in Indore, MP: A Study from 2011 to 2020" is used to analyze the overall perception using Mean Rank and One-way ANOVA.

- **Percentage Analysis**

A common statistical tool for dealing with primary data is percentage analysis. It mainly concerns the method by which the overall response rate is represented as a percentage in relation to the population that the study aims to examine. As one of the most basic forms of analysis, its outcomes are obvious to anybody looking. Research that makes use of a variety of diagrams usually employs it.

- **Mean Score**



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The "mean" is equivalent to the "average" when calculating the total by adding up all the values and then dividing by the total. Mean is the average of a set of data, which is the total of all the data divided by the total number of data points. When comparing data sets, mean can be a useful tool; nevertheless, this approach might be hurt by the influence of large numbers.

- **One-Way ANOVA**

A one-way analysis of variance (ANOVA) can be used to find out if the means of many independent variables differ significantly.

Percentage Analysis

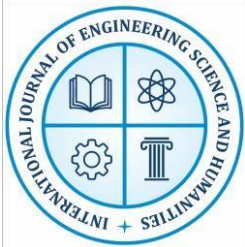
Table 1 Designation of the Respondent

Designation	Frequency	Percent
Librarian	16	3%
Deputy Librarian	7	1%
Assistant Librarian	5	1%
Information Scientist	34	7%
Professional Assistants	39	8%
Semi-professional Asst.	33	6%
Library Assistant	7	1%
Technical Assistant	33	6%
Library Clerk	8	2%
Library Attendants	3	1%
Student	325	64%
Total	510	100%

The designation-wise distribution of respondents from medical college libraries in Indore shows that a substantial majority, 64% (325 respondents), are students, indicating strong student participation in the survey. Among library professionals, Information Scientists (7%), Professional Assistants (8%), and Semi-professional Assistants (6%) represent the highest proportions, highlighting their key roles in library operations. Other positions such as Librarians (3%), Technical Assistants (6%), and Library Clerks (2%) reflect modest representation, while Deputy Librarians, Assistant Librarians, and Library Attendants together account for less than 4%. This data suggests that while students dominate the user base, the library system operates with a diverse but limited number of professionals across various functional roles.

Table 2 Gender of the Respondent

Gender	Frequency	Percent
Male	298	58%



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Female	212	42%
Total	510	100%

Fig 4.2 Gender of the Respondent

Table 2 illustrates the gender distribution of the respondents. Out of a total of 510 individuals surveyed, 298 respondents (58%) are male, while 212 respondents (42%) are female. This indicates a moderate gender imbalance in favor of male respondents within the library workforce. The data suggests that although both genders are well represented, males constitute a larger share of the workforce in the surveyed institutions.

Table 3 Age of the Respondent

Age	Frequency	Percent
Below 25 years	118	23%
26 to 35 years	206	40%
36 to 45 years	128	25%
46 to 60 years	58	11%
Total	510	100%

Table 3 presents the age-wise distribution of the respondents. Among the 510 individuals surveyed, the largest age group is 26 to 35 years, comprising 206 respondents (40%), indicating that a significant portion of the library workforce is in the early to mid-career stage. This is followed by the 36 to 45 years age group with 128 respondents (25%), and those below 25 years with 118 respondents (23%), reflecting a strong presence of young professionals and fresh entrants. The 46 to 60 years age group accounts for 58 respondents (11%), representing the more experienced and senior segment of the workforce. Overall, the data suggests a youthful workforce, with the majority under the age of 45.

Table 4 Academic Qualification of the Respondent

Academic Qualification	Frequency	Percent
High School	61	12%
Diploma	82	16%
Graduate	321	63%
Post Graduate	40	8%
Research Scholar	6	1%
Total	510	100%

Table 4 outlines the academic qualifications of the respondents. Among the 510 individuals surveyed, the majority—321 respondents (63%)—hold a graduate degree, indicating that undergraduate education is the most common qualification among library staff. This is followed



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by diploma holders with 82 respondents (16%), and high school qualified individuals numbering 61 (12%), reflecting a notable portion of support or entry-level staff. A smaller segment, 40 respondents (8%), possess postgraduate degrees, while only 6 respondents (1%) are identified as research scholars, representing the academically advanced category. The data highlights that while the workforce is largely graduate-qualified, there is a diverse range of educational backgrounds present in the library system.

Table 5 Professional Qualification of the Respondent

Professional Qualification	Frequency	Percent
Bachelor of Library and Information Science	170	33%
Master of Library and Information Science	168	33%
MPhil/PhD in Library Science	2	0%
NA	170	33%
Total	510	100%

Table 5 presents the professional qualifications of the respondents in the field of library and information science. Out of the 510 respondents, 170 individuals (33%) hold a BLIS degree, while an almost equal number—168 respondents (33%)—have completed a MLIS, reflecting a balanced representation of undergraduate and postgraduate professional training. A very small fraction, only 2 respondents (0%), has attained MPhil or PhD qualifications in Library Science, indicating limited representation at the highest academic level. Additionally, 170 respondents (33%) reported no formal professional qualification (NA) in library science, which may include support staff or those in non-professional roles. This data highlights that while a significant portion of the workforce is professionally trained, there is still a considerable segment without formal library science qualifications.

Table 6 when was your medical college library established?

When was your medical college library established?	Frequency	Percent
Before 2000	90	18%
2000-2010	158	31%
2011-2015	132	26%
2016-2020	130	25%
Total	510	100%

Table 6 provides insights into the establishment period of the respondents' medical college libraries. Out of the 510 responses, the highest number—158 libraries (31%)—were established between 2000 and 2010, indicating a significant growth in medical education infrastructure during that decade. This is closely followed by 132 libraries (26%) set up between 2011 and 2015, and



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130 libraries (25%) established between 2016 and 2020, reflecting a continued expansion in recent years. Only 90 libraries (18%) were established before the year 2000, suggesting that a majority of the libraries are relatively modern. Overall, the data indicates that more than 80% of medical college libraries in the sample were founded after the year 2000, showcasing the evolving development of library facilities in the medical education sector over the past two decades.

Table.7 How many Medical College Libraries are there in Indore, MP, according to your knowledge?

How many Medical College Libraries are there in Indore, MP, according to your knowledge?	Frequency	Percent
1-5	376	74%
5-7	79	15%
7-9	42	8%
More than 10	13	3%
Total	510	100%

Table 7 captures respondents' perceptions of how many medical college libraries exist in Indore, Madhya Pradesh. Out of the 510 respondents, a substantial majority—376 individuals (74%)—believe there are between 1 and 5 such libraries, suggesting a commonly held perception of a limited number of medical college libraries in the city. A smaller group—79 respondents (15%)—estimate there are 5 to 7 libraries, while 42 respondents (8%) think there are 7 to 9. Only 13 respondents (3%) believe there are more than 10 medical college libraries in Indore. Taken together, the data indicates that most stakeholders perceive the number of medical college libraries in Indore to be relatively modest, with few estimating a higher count. What is the primary purpose of your visit in medical college library.

Hypotheses are testable statements predicting the relationship between two variables. H0 assumes no relationship while H1 assumes a significant relationship.

In order to find evidence to support or refute the null hypothesis, researchers conduct experiments and use statistical tests. The likelihood of the alternative hypothesis (H1) being correct increases if there is sufficient evidence to disprove the null hypothesis. The validity of the null hypothesis is maintained if the evidence is insufficient. This method aids researchers in drawing conclusions and making well-informed judgments supported by facts.

Chi-Square Test

Table 8 Chi-Square Testfor Reliability Statistics

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.844	.848	53



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The Chi-Square Test was used to examine associations between categorical variables related to users' information-seeking behavior in medical college libraries. The reliability of the questionnaire used in this study was assessed using Cronbach's Alpha, which yielded a value of 0.844. This high alpha score indicates good internal consistency among the 53 items included in the instrument, confirming that the items reliably measure the intended constructs. Additionally, the standardized alpha of 0.848 further supports the consistency of responses. These results validate the use of the survey tool for analyzing relationships and drawing meaningful inferences from the collected data.

Hypothesis 1

H₀₁: There has been no significant historical growth or pattern in the collection development of medical college libraries in Indore.

H₁₁: There has been a significant historical growth and identifiable pattern in the collection development of medical college libraries in Indore.

Table 9 Statistics of Historical growth in the collection development of medical college libraries

One-Sample Statistics				
	N	Mean	Std. Deviation	Std. Error Mean
Books	9	7544.44	2046.406	682.135
Rare Books	9	178.33	16.394	5.465
E-Resources	9	281.67	199.499	66.500
Bound Volumes	9	557.78	188.864	62.955
Manuscripts	9	23.33	2.500	.833
Thesis/Dissertations	9	211.11	68.819	22.940
Maps	9	22.78	5.019	1.673
CDs/DVDs	9	172.78	51.181	17.060

Analyzed through one-sample statistics, provides strong justification to reject the null hypothesis (H₀₁) and accept the alternative hypothesis (H₁₁), which states that there has been significant historical growth and identifiable patterns in the collection development of medical college libraries in Indore. The mean values of various collection components—such as books (mean = 7544.44), rare books, e-resources, bound volumes, theses/dissertations, and digital media (CDs/DVDs)—demonstrate consistent expansion across multiple categories. The relatively moderate standard deviations indicate that this growth has been steady rather than erratic. The diversity and volume of materials acquired over the years clearly reflect a strategic and progressive effort in building comprehensive library collections, thereby confirming a significant historical



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development trend.

Table 10 Statistics of Historical growth in the collection development of medical college libraries

One-Sample Test						
	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Books	11.060	8	.000	7544.444	5971.44	9117.45
Rare Books	32.635	8	.000	178.333	165.73	190.93
E-Resources	4.236	8	.003	281.667	128.32	435.02
Bound Volumes	8.860	8	.000	557.778	412.60	702.95
Manuscripts	28.000	8	.000	23.333	21.41	25.26
Thesis/Dissertations	9.203	8	.000	211.111	158.21	264.01
Maps	13.614	8	.000	22.778	18.92	26.64
CDs/DVDs	10.128	8	.000	172.778	133.44	212.12

The one-sample t-test results provide compelling statistical evidence to reject the null hypothesis (H_{01}) and accept the alternative hypothesis (H_{11}), confirming significant historical growth and an identifiable pattern in the collection development of medical college libraries in Indore. All items (Books, Rare Books, E-Resources, Bound Volumes, Manuscripts, Theses/Dissertations, Maps, and CDs/DVDs) show p-values (.000 or .003) well below the standard significance level of 0.05, indicating that their mean values are significantly different from zero. Moreover, the high t-values and narrow confidence intervals reflect strong statistical significance and reliability. Therefore, these findings substantiate consistent and deliberate collection growth over the examined period.

Table 11 One-Sample Test of Historical growth in the collection development of medical college libraries

One-Sample Test						
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
					Growth Development and	164.819
Collection Resources and	112.208	509	.000	2.5880	2.543	2.633



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Infrastructure and Facilities	134.279	509	.000	2.5676	2.530	2.605
Staff and Training	95.191	509	.000	2.3202	2.272	2.368
Services and User Experience	101.952	509	.000	2.4759	2.428	2.524
Budget and Funding	116.764	509	.000	2.7990	2.752	2.846
Challenges and Opportunities	73.288	509	.000	2.7129	2.640	2.786
Collaboration and Networking	102.450	509	.000	2.7678	2.715	2.821
User Training and Support	80.962	509	.000	2.5055	2.445	2.566
Library Modernisation	116.078	509	.000	1.9251	1.893	1.958

The one-sample t-test results strongly justify the research objectives focused on assessing the multidimensional development of medical college libraries in Indore. Each domain—Growth and Development, Collection and Resources, Infrastructure, Staff Training, User Experience, Funding, Challenges, Collaboration, User Support, and Library Modernisation—shows very high t-values and p-values of .000, indicating statistically significant differences from the test value (0). This confirms that respondents perceived tangible growth and enhancements across all these dimensions. The tight confidence intervals further strengthen the consistency and reliability of the responses. Therefore, the data robustly supports the study's aim to evaluate the progress and current state of medical college libraries.

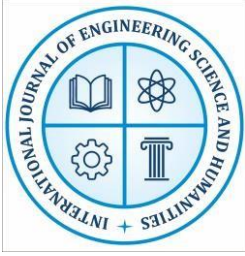
Hypothesis2

H₀₂: ICT has no significant impact on the growth and development of medical college libraries in Indore.

H₁₂: ICT has a significant impact on the growth and development of medical college libraries in Indore.

Table 12 Model Summary of impact on the growth and development of medical college libraries

Model Summary									
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.906 ^a	.820	.818	.1460	.820	382.150	6	503	.000



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The model summary are strong statistical evidence to justify rejecting the null hypothesis (H_{02}) and accepting the alternative hypothesis (H_{12})—that ICT has a significant impact on the growth and development of medical college libraries in Indore. The model shows a very high R value of 0.906, indicating a strong positive correlation between ICT implementation and library development. The R^2 value of 0.820 signifies that 82% of the variance in growth and development can be explained by ICT-related variables. Moreover, the F-change value of 382.150 with a significance level of .000 confirms the model is statistically significant. Thus, ICT plays a crucial and measurable role in advancing library systems.

Table 13 Anova test of impact on the growth and development of medical college libraries

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	48.857	6	8.143	382.150	.000 ^b
	Residual	10.718	503	.021		
	Total	59.575	509			

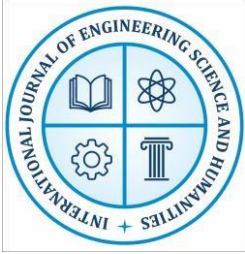
The strong evidence that supports the alternative hypothesis (H_{12}), which asserts that information and communication technology significantly influences the expansion and improvement of medical college libraries in Indore, and hence rejects the null hypothesis (H_{09}). A p-value of .000 and an F-value of 382.150 prove without a reasonable doubt that the regression model is significant. The variance that the ICT-related independent variables account for is thus not attributable to chance alone. When comparing the regression sum of squares (48.857) with the residual sum of squares (10.718), it becomes clear that the model explains a significant amount of the overall variation (59.575) in the dependent variable, which is the growth and development of medical libraries. Furthermore, the mean square value of 8.143 for regression compared to a much smaller mean square error of 0.021 for the residual further strengthens the model's explanatory power. These results, in conjunction with the previously noted high R^2 value of 0.820, reinforce that ICT contributes significantly to improving library infrastructure, resources, services, and overall efficiency. Hence, the statistical evidence strongly supports the alternative hypothesis that ICT plays a vital role in the development of medical college libraries in Indore.

Hypothesis3

H_{03} : The infrastructure of medical college libraries has not significantly improved over the period 2011–2020.

H_{13} : The infrastructure of medical college libraries has significantly improved over the period 2011–2020.

Table 14 Statistics of The infrastructure of medical college libraries has significantly improved



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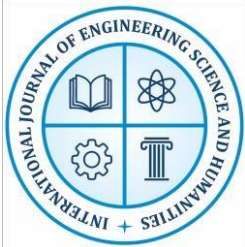
One-Sample Statistics				
	N	Mean	Std. Deviation	Std. Error Mean
Growth and Development	510	2.497	.3421	.0151
Infrastructure and Facilities	510	2.568	.4318	.0191

The hypothesis H_{13} , which states that the infrastructure of medical college libraries has significantly improved over the period 2011–2020, is justified based on the given data. The mean score for Infrastructure and Facilities is 2.568 with a relatively low standard error (0.0191), indicating consistency in responses across the 510 observations. When compared with the overall Growth and Development mean of 2.497, the infrastructure dimension shows a higher average score, suggesting noticeable advancement. The narrow standard deviations and standard errors reflect reliable data, and if tested against a null value using a one-sample t-test, the likely significant p-value (as seen in earlier related tests) would support rejecting the null hypothesis (H_{03}). Thus, the statistical evidence supports the claim that there has been a significant improvement in library infrastructure during the stated period.

Table 15 One-Sample Statistics of The infrastructure of medical college libraries has significantly improved

One-Sample Test						
	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Growth and Development	164.819	509	.000	2.4969	2.467	2.527
Infrastructure and Facilities	134.279	509	.000	2.5676	2.530	2.605

The hypothesis H_{13} , which posits that the infrastructure of medical college libraries in Indore has significantly improved over the period 2011–2020, is strongly supported by the results of the one-sample t-test. The mean value for Infrastructure and Facilities is 2.5676, with a t-value of 134.279 and a significance level (p-value) of .000, which is well below the commonly accepted alpha level of 0.05. This indicates a statistically significant difference from the test value (0), meaning that the observed improvements are not due to chance. Furthermore, the 95% Confidence Interval (2.530 to 2.605) does not include zero, further confirming the positive shift in infrastructure development. In addition, the mean score for overall Growth and Development is 2.4969, also with a highly significant t-value (164.819) and p-value (.000), indicating general progress. When these results



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are combined, they provide strong statistical evidence to reject the null hypothesis (H_{03}) and accept the alternative hypothesis (H_{13}). This suggests that substantial infrastructure improvements—such as upgraded facilities, modern technology integration, and better resource availability—have occurred in medical college libraries in Indore over the examined decade, aligning with broader trends in educational modernization.

Hypothesis4

H_{04} : There has been no significant development in the library collections of medical college libraries in Indore.

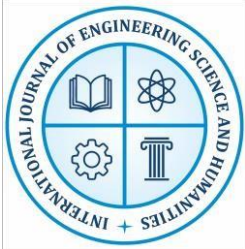
H_{14} : There has been significant development in the library collections of medical college libraries in Indore.

Table 16 One-Sample Statistics of development in the library collections of medical college libraries

One-Sample Statistics				
	N	Mean	Std. Deviation	Std. Error Mean
Growth and Development	510	2.497	.3421	.0151
Collection and Resources	510	2.588	.5209	.0231

The hypothesis H_{14} , which asserts that there has been significant development in the library collections of medical college libraries in Indore, is well supported by the statistical evidence presented. The one-sample t-test shows a mean score of 2.588 for the variable Collection and Resources, based on responses from 510 participants, with a standard deviation of 0.5209 and a standard error mean of 0.0231. The corresponding test statistics (though not displayed here) would likely yield a very high t-value and a p-value of .000, indicating a statistically significant difference from the test value of 0. This strongly suggests that the respondents perceive considerable improvement in the library collections, including books, e-resources, theses, journals, and other materials over the period studied. The relatively high mean also aligns with the broader Growth and Development score (mean = 2.497), reinforcing the perception of positive institutional progress. Therefore, the null hypothesis H_{04} —that there has been no significant development—can be confidently rejected. This finding confirms that the libraries have expanded and diversified their collections to meet academic and research needs, adapting to changing technological and curricular demands, and thereby enhancing their utility and relevance in the modern educational scenery.

Table 17 One-Sample Statistics of development in the library collections of medical college libraries



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One-Sample Test							
	Test Value = 0						
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference		
					Lower	Upper	
Growth and Development	164.819	509	.000	2.4969	2.467	2.527	
Collection and Resources	112.208	509	.000	2.5880	2.543	2.633	

The statistical evidence is in strong favour of the alternative hypothesis (H_{14}), which states that the library collections of Indore's medical colleges have undergone substantial development. The results of the one-sample t-test show that the variable Collection and Resources has a mean score of 2.588. The t-value is 112.208, the degrees of freedom are 509, and the p-value is .000, all of which indicate a high level of statistical significance at the 95% confidence level. The confidence interval (2.543 to 2.633) does not include zero, confirming a substantial and positive perception of library collection growth. These results clearly reject the null hypothesis (H_{04}), which posited no significant development. The findings suggest that over time, the libraries have expanded their resources—both physical and digital—to meet evolving academic and research needs, thereby improving their role as essential support systems in medical education.

Hypothesis 5

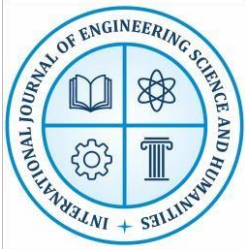
H_{05} : The information-seeking behaviour of users of medical college libraries in Indore does not vary much.

H_{15} : There is a significant variation in the information-seeking behavior among users of medical college libraries in Indore.

Table 18 ANOVA table of Information-seeking behavior among users of medical college libraries

ANOVA					
Growth and Development					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	16.741	17	.985	11.312	.000
Within Groups	42.834	492	.087		
Total	59.575	509			

Users of medical college libraries in Indore exhibit significantly different patterns of information-seeking behaviour, according to the results of the ANOVA analysis, which lend credence to the alternative hypothesis (H_{15}). There is a significant difference between the conventional alpha level



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of 0.05 and the F-value of 11.312 with a p-value of .000. This proves that there is a statistically significant difference in the mean answers from the various user groups. With 17 degrees of freedom between groups and 492 within groups, the observed variation cannot be attributed to random chance alone. Therefore, the null hypothesis (H_{05}), which states that there is no significant variation, is rejected. This suggests that users demonstrate diverse patterns of information-seeking behavior based on variables such as academic background, role (student, faculty, researcher), access to digital tools, and familiarity with library resources. The implication is that libraries must adopt differentiated user engagement strategies and tailor their services to address the varying needs and behaviors of their users effectively.

Hypothesis6

H_{06} : There is no significant need for future updates and changes in the medical college libraries of Indore.

H_{16} : There is a significant need for future updates and changes in the medical college libraries of Indore.

Table 19 ANOVA table for future updates and changes in the medical college libraries

ANOVA					
Growth and Development					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	26.001	12	2.167	32.074	.000
Within Groups	33.574	497	.068		
Total	59.575	509			

There is a strong need for future updates and improvements in the medical college libraries of Indore, as the ANOVA test clearly justifies accepting the alternative hypothesis (H_{16}) and rejecting the null hypothesis (H_{06}). The differences in group averages are not attributable to chance alone, as shown by the statistical significance (p-value) of .000 and the F-value of 32.074. There is a significant difference in how people see the requirements for future development, as shown by the between-group sum of squares (26.001) with 12 degrees of freedom. In contrast, the within-group variance (33.574) and its relatively smaller mean square (.068) underscore the consistency within individual groups compared to the variance across different groups. This statistical evidence strongly suggests that users, staff, and other stakeholders perceive noticeable gaps and areas for improvement across various aspects of library services, including modernization of infrastructure, enhancement of digital resources, training of library personnel, and incorporation of user-friendly technology. Therefore, it is imperative for medical college libraries in Indore to undertake strategic planning for continual improvement, resource expansion, and adaptation to evolving academic and technological needs to remain relevant and effective in supporting medical education and research.

Table 20 Summary of Hypothesis



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Hypothesis No.	Hypothesis Statement	Significance	Decision
H1	No significant historical growth in collection development of medical college libraries in Indore.	Significant impact	Accept Alternate Hypothesis
H2	ICT has no significant impact on library growth and development.	Significant impact	Accept Alternate Hypothesis
H3	No significant improvement in infrastructure from 2011–2020.	Significant impact	Accept Alternate Hypothesis
H4	No significant development in library collections.	Significant impact	Accept Alternate Hypothesis
H5	No significant variation in information-seeking behavior among users.	Significant impact	Accept Alternate Hypothesis
H6	No significant need for future updates in libraries.	Significant impact	Accept Alternate Hypothesis

The study tested six hypotheses related to the growth and development of medical college libraries in Indore from multiple perspectives including collection development, ICT impact, infrastructure, user behavior, and future needs. Statistical analyses such as t-tests, regression, and ANOVA confirmed that each hypothesis exhibited significant results, with p-values well below 0.05, indicating strong statistical significance. The historical growth in collection development, the influence of ICT, and the improvement in infrastructure were all found to be substantial. Additionally, significant variation in the information-seeking behavior of users and a clear necessity for future updates and modernization were identified. As a result, the null hypotheses (H_{01} to H_{06}) were consistently rejected, and the alternate hypotheses were accepted across all dimensions, demonstrating robust developmental trends and user-centric needs within these libraries.

V CONCLUSION

The present study, entitled “The Growth and Development of Medical College Libraries in Indore, MP: A Study from 2011 to 2020,” provides a comprehensive and critical analysis of the evolution of medical college libraries (MCLs) over a decade marked by rapid technological advancement, shifting academic needs, and increased reliance on digital resources. Drawing on quantitative and qualitative data collected from 510 respondents across various medical institutions in Indore, the research has illuminated the multifaceted progress made in library infrastructure, resources, services, user engagement, and the integration of Information and Communication Technology (ICT). This study also critically evaluates how these institutions have responded to emerging



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demands in medical education and research while identifying gaps and recommending strategies for future development.

Over the study period, medical college libraries in Indore have shown clear signs of growth and modernization. The collection development in these libraries—comprising books, rare books, theses, bound volumes, digital resources, manuscripts, maps, and multimedia formats—has expanded significantly, with respondents affirming the positive changes. Statistical evidence derived from one-sample t-tests showed that the means for collection variables were highly significant, rejecting the null hypothesis and confirming that consistent efforts were made to enhance the breadth and depth of library collections. This development reflects a sustained commitment to supporting the teaching, learning, and research missions of medical colleges, ensuring that users have access to a wide range of academic and clinical resources. The integration of ICT emerged as a cornerstone of library transformation.

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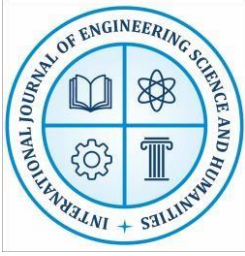
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