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Original Article

Bridging the Research Competency Gap in Optometry Education: Knowledge, Attitudes, and Barriers Among Undergraduate Students in Kerala.

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ABSTRACT

Background: Research plays a vital role in evidence-based healthcare and contributes to the development of critical thinking and professional competence among healthcare students.

Objective: To assess the knowledge, attitudes, and perceived barriers toward research among undergraduate optometry students in Kerala.

Methods: A multicenter cross-sectional survey was conducted among undergraduate optometry students enrolled in Kerala University of Health Sciences-affiliated institutions. Data were collected using a pre-validated online questionnaire comprising demographic details, research knowledge, attitudes, and perceived barriers. Knowledge was categorized as poor, intermediate, or high based on predefined scoring criteria. Descriptive statistics and Chi-square tests were used for data analysis.

Results: A total of 269 students participated in the study. Most participants demonstrated intermediate research knowledge (62.4%), while only 7.8% exhibited high knowledge levels. Positive attitudes toward research were observed, with 89% agreeing that research is useful for healthcare professionals and 87% believing it would benefit their future careers. However, 73% reported difficulty understanding research concepts, and 64% experienced anxiety regarding research data analysis. The most commonly reported barriers were lack of funding (16.0%), inadequate infrastructure (14.0%), and academic workload (12.2%). A significant association was found between year of study and research knowledge ($p = 0.003$).

Conclusion: Undergraduate optometry students in Kerala possess positive attitudes toward research but demonstrate predominantly moderate knowledge levels. Strengthening research training, mentorship, and institutional support may enhance research competency and participation.

Keywords: Research, Optometry Students, Knowledge, Attitude, Barriers, Evidence-Based Practice.

Introduction:

Research is derived from the French word recherche, meaning “to seek,” and can be defined as the systematic scientific process of generating, validating, and expanding knowledge through the collection, analysis, and interpretation of information [1]. Research serves as the cornerstone of evidence-based healthcare and contributes significantly to the advancement of medical science and patient care [1,2]. Research training is an essential component of healthcare education because it promotes critical thinking, analytical reasoning, problem-solving abilities, and scientific inquiry among students [2]. Participation in research activities enables students to identify research questions, formulate hypotheses, conduct literature reviews, design studies, collect and analyze data, and disseminate findings through publications and presentations [3].

The growing emphasis on evidence-based practice has increased the need for healthcare professionals to understand and apply research findings effectively. Undergraduate exposure to research has been associated with improved scientific literacy, enhanced academic performance, and greater interest in pursuing research-oriented careers [4,5]. Moreover, research experience during undergraduate education facilitates lifelong learning and promotes the integration of scientific evidence into clinical decision-making [6]. India has emerged as a preferred destination for healthcare research because of its large patient population, qualified healthcare professionals, and cost-effective research environment [7]. Despite these advantages, undergraduate participation in research remains relatively limited. Several barriers such as inadequate research training, lack of mentorship, insufficient funding opportunities, and academic workload have been identified as major obstacles to student engagement in research activities [8,9]. Optometry is a rapidly evolving healthcare profession that increasingly relies on evidence-based clinical practice. Therefore, research competency is crucial for future optometrists to critically evaluate scientific evidence and contribute to advancements in eye care. Although studies have examined research perceptions among medical and allied health students in India, evidence specifically addressing undergraduate optometry students in Kerala remains scarce. Understanding students’ knowledge, attitudes, and perceived barriers toward research is essential for developing targeted educational interventions. Therefore, the present study aimed to assess the knowledge, attitudes, and perceived barriers toward research among undergraduate optometry students in Kerala, India.

Materials and Methods:

Study Design and Setting

This multicenter cross-sectional survey was conducted among undergraduate optometry students enrolled in institutions affiliated with the Kerala University of Health Sciences. The study aimed to assess students' knowledge, attitudes, and perceived barriers toward research activities. A cross-sectional design was chosen as it enables the assessment of research-related perceptions and awareness levels among students at a single point in time across multiple institutions. The study was carried out through online data collection to ensure wider participation and accessibility among students from different academic years and geographical locations within Kerala.

Study Population

The study population comprised undergraduate optometry students ranging from first-year students to final-year students studying in KUHS-affiliated institutions. Students who expressed willingness to participate and provided informed consent were considered eligible for inclusion. The survey sought to obtain responses from students at various stages of their academic training to provide a comprehensive understanding of their research knowledge and attitudes throughout the undergraduate curriculum.

Sample Size Calculation

The sample size was calculated using the single population proportion formula, assuming a prevalence of 50%, a 95% confidence interval, and a margin of error of 5%. [$n = (Z^2*p*q) / d^2$), Where n = required sample size, Z = 1.96 at 95% confidence level, p = 0.5, q = 1 − p, and d = 0.05]. The calculated minimum sample size was 384 participants. Due to the limited number of eligible undergraduate optometry students and voluntary participation, a total of 269 completed responses were obtained and included in the final analysis.

Inclusion and Exclusion Criteria

Participants were included in the study if they were currently enrolled as undergraduate optometry students in a KUHS-affiliated institution and were willing to provide informed consent for participation. Students who submitted incomplete questionnaire responses were excluded from the final analysis to maintain data quality and accuracy. Additionally, students who declined participation or did not provide consent were excluded from the study. Written informed consent was obtained electronically from all participants before they accessed and completed the survey questionnaire.

Data Collection Tool and Procedure

Data were collected using a pre-validated structured questionnaire adapted from previously published literature. The questionnaire was designed to evaluate participants' knowledge of research, attitudes toward research activities, and perceived barriers affecting research participation. To facilitate convenient and broad participation, the questionnaire was distributed electronically through online platforms, including institutional communication channels and student networks. The questionnaire consisted of 27 items, including 8 demographic questions, 5 knowledge questions, 13 attitude-related questions, and 1 question assessing perceived barriers toward research. The questionnaire consisted of four sections.

The first section gathered demographic information, including age, gender, institution, place of residence, and year of study. These variables were collected to describe the study population and to explore potential associations between demographic characteristics and research knowledge levels. The second section assessed participants' knowledge regarding research methodology and basic research concepts. This section included five multiple-choice questions covering fundamental aspects of research. Each correct response was awarded one point, while incorrect responses and "I don't know" responses received zero points. The total knowledge score ranged from 0 to 5. Based on the cumulative score, participants were categorized into three knowledge levels: poor knowledge (score less than 2), intermediate knowledge (score 2–3), and high knowledge (score greater than 3).

The third section evaluated students' attitudes toward research using thirteen statements related to research participation, importance of research, career prospects in research, and perceptions regarding research activities. Participants responded to each statement by selecting one of three options: agree, disagree, or uncertain/no opinion. These responses were used to assess overall attitudes toward research among undergraduate optometry students.

The fourth section focused on identifying perceived barriers that may limit students' involvement in research activities. Participants were asked to select one or more factors that they believed hindered their participation in research. Common barriers explored included lack of time, inadequate research training, insufficient mentorship, limited funding opportunities, lack of institutional support, and difficulty in understanding research methodology.

Statistical Analysis: The collected data were entered into Microsoft Excel and subsequently analyzed using the Statistical Package for the Social Sciences (SPSS) software. Descriptive statistical methods were employed to summarize the data, with categorical variables presented as frequencies and percentages. Knowledge scores were categorized into poor, intermediate, and high levels based on predefined scoring criteria. Associations between demographic characteristics and knowledge levels were evaluated using the Chi-square test. A p-value of less than 0.05 was considered statistically significant for all analyses. The findings were presented in tabular and graphical formats where appropriate to facilitate interpretation and comparison of results.

RESULTS:

Demographic Characteristics

A total of 269 undergraduate optometry students from institutions affiliated with the Kerala University of Health Sciences participated in the study. Participants were recruited from various districts and regions across Kerala. The highest proportion of respondents were from Palakkad (20.8%, n = 56), followed by Kozhikode (17.8%, n = 48) and Angamaly (15.6%, n = 42). Ernakulam accounted for 12.3% (n = 33) of participants, while Thiruvananthapuram contributed 8.6% (n = 23).

Lower participation was observed from Kottayam, Idukki, and Wayanad, each contributing less than 1% of the total sample. The demographic profile revealed a diverse representation across different age groups and years of study, providing a comprehensive overview of research-related perceptions among undergraduate optometry students in Kerala.

The majority of participants belonged to the 21–25 years age group, accounting for 62.8% (n = 169) of the study population. Students aged 15–20 years constituted 34.2% (n = 92), while only 3.0% (n = 8) were between 26 and 30 years of age. This distribution indicates that most respondents were in the typical age range for undergraduate professional education.

Female students represented the majority of participants, accounting for 79.9% (n = 215) of the sample, whereas male students constituted 20.1% (n = 54). This finding reflects the gender distribution commonly observed in optometry and allied health science programs, where female enrollment often exceeds male enrollment. Students from all academic years participated in the survey.

Third-year students formed the largest group, representing 39.0% (n = 105) of respondents. Second-year students accounted for 28.6% (n = 77), followed by first-year students at 19.7% (n = 53). Final-year students comprised 12.6% (n = 34) of the study population. The inclusion of students from different academic levels allowed for comparison of research knowledge and attitudes across stages of professional education (Table-1&2).

Variable	Category	Frequency (n)	Percentage (%)
Age Group (Years)	15–20	92	34.2
	21–25	169	62.8
	26–30	8	3.0
Gender	Female	215	79.9
	Male	54	20.1
Year of Study	First Year	53	19.7
	Second Year	77	28.6
	Third Year	105	39.0
	Final Year	34	12.6

Table 1. Demographic Characteristics of the Participants (N = 269)

Place/District	Frequency (n)	Percentage (%)
Palakkad	56	20.8
Kozhikode	48	17.8
Angamaly	42	15.6
Ernakulam	33	12.3
Thiruvananthapuram	23	8.6
Thrissur	18	6.7
Kollam	16	5.9
Malappuram	13	4.8
Alappuzha	6	2.2
Kannur	4	1.5
Pathanamthitta	4	1.5
Kottayam	2	0.7
Idukki	2	0.7
Wayanad	2	0.7
Total	**269**	**100.0**

Table 2. Distribution of Participants According to Place of Residence

Knowledge Toward Research

Assessment of research knowledge revealed that the majority of participants possessed an intermediate level of understanding regarding research concepts. Among the 269 respondents, 168 students (62.4%) demonstrated intermediate knowledge, while 80 students (29.7%) exhibited poor knowledge. Only 21 students (7.8%) achieved high knowledge scores.

Analysis of individual knowledge questions demonstrated considerable variation in response accuracy. The highest proportion of correct responses (63%) was observed for the question related to the Vancouver referencing style, indicating relatively good awareness of citation practices among students. Conversely, the lowest correct response rate (8%) was observed for questions related to cohort studies and sample loss, suggesting limited understanding of epidemiological research designs and methodological concepts. These findings indicate that while students possess basic awareness of research procedures, significant gaps remain in their understanding of research methodology and study design (Table-3).

Knowledge Level	Frequency (n)	Percentage (%)
High	21	7.8
Intermediate	168	62.4
Poor	80	29.7
Total	**269**	**100.0**

Table 3. Distribution of Research Knowledge Levels Among Participants

Attitude Toward Research

Overall, participants demonstrated highly positive attitudes toward research and its role in healthcare practice. A substantial majority of students acknowledged the importance of research in professional development and evidence-based healthcare. Approximately 89% of respondents agreed that research is useful for healthcare professionals, highlighting widespread recognition of its contribution to clinical decision-making and patient care. Similarly, 87% believed that involvement in research would be beneficial for their future careers, reflecting an appreciation of research as an important component of professional growth. Furthermore, 81% agreed that research education should be incorporated into the curriculum of all healthcare-related programs, indicating strong support for formal research training during undergraduate education. Despite these positive perceptions, several students reported challenges related to research participation. Nearly 73% indicated difficulty in understanding research concepts and methodology, while 64% reported anxiety associated with research data analysis and statistical interpretation. These findings suggest that although students value research and recognize its significance, many lack confidence in their ability to conduct and interpret research independently (Table-4).

Attitude Statement	Agree (%)
Research is useful for healthcare professionals	89.0
Research will benefit my future career	87.0
Research should be taught to all healthcare students	81.0
Difficulty understanding research concepts	73.0
Anxiety regarding research data analysis	64.0

Table 4. Participants' Attitudes Toward Research

Perceived Barriers Toward Research

Participants identified multiple factors that hinder their involvement in research activities. The most commonly reported barrier was lack of funding, cited by 16.0% of respondents. Financial limitations may restrict access to resources, data collection opportunities, and research dissemination activities.

Inadequate infrastructure and insufficient equipment were reported by 14.0% of participants, highlighting the need for better institutional support and research facilities. Academic workload and time constraints emerged as another major barrier, reported by 12.2% of students. This finding suggests that balancing academic responsibilities with research activities remains challenging for undergraduate students. Other frequently reported barriers included lack of departmental cooperation (9.5%), lack of personal interest in research (8.2%), and inadequate statistical skills (7.0%). These findings demonstrate that barriers to research participation are multifactorial and involve institutional, educational, and individual-level factors (Table-5).

Barrier	Percentage (%)
Lack of funding	16.0
Inadequate infrastructure/equipment	14.0
Academic workload/time constraints	12.2
Lack of departmental cooperation	9.5
Lack of interest	8.2
Lack of statistical skills	7.0

Table 5. Perceived Barriers to Research Participation

Factors Associated with Research Knowledge: The relationship between demographic variables and research knowledge levels was examined using the Chi-square test. Analysis revealed no statistically significant association between gender and research knowledge level ($\chi^2 = 0.751$, $p = 0.687$), indicating that research knowledge was comparable between male and female students. However, a statistically significant association was observed between year of study and research knowledge level ($\chi^2 = 19.65$, $p = 0.003$).

Students in senior academic years demonstrated higher levels of research knowledge compared to those in junior years. This finding suggests that continued exposure to academic coursework, clinical training, research assignments, and evidence-based practice throughout the curriculum contributes to improved understanding of research concepts (Table-6& 7).

Variable	χ^2 Value	p-value	Interpretation
Gender vs. Research Knowledge	0.751	0.687	Not statistically significant

Table 6. Association Between Gender and Research Knowledge Level

Variable	χ^2 Value	p-value	Interpretation
Year of Study vs. Research Knowledge	19.65	0.003	Statistically significant

Table 7. Association Between Year of Study and Research Knowledge Level

DISCUSSION

The present study investigated the knowledge, attitudes, and perceived barriers toward research among undergraduate optometry students in Kerala. The findings provide valuable insight into the current status of research awareness and engagement among future eye care professionals. Overall, the study revealed that students possess positive attitudes toward research and recognize its importance in healthcare, although their actual knowledge of research methodology remains largely moderate. The majority of participants demonstrated intermediate levels of research knowledge, while only a small proportion achieved high knowledge scores. These findings indicate that although students are exposed to research concepts during their academic training, comprehensive understanding of research methodology, epidemiology, and statistical principles remains limited. Similar observations were reported by Pant and Khan, who found that optometry students generally possessed favorable perceptions regarding research but exhibited deficiencies in methodological knowledge and research skills [1].

The relatively low performance on questions related to cohort studies and sample attrition further emphasizes the need for enhanced education in research methodology and study design. The present study also demonstrated overwhelmingly positive attitudes toward research. Most students agreed that research plays an important role in healthcare practice and believed that participation in research would contribute positively to their future careers. These findings are consistent with previous studies conducted among medical, nursing, and allied health science students, which reported widespread recognition of research as an essential component of evidence-based healthcare and professional development [3,6,7]. Positive attitudes toward research are encouraging because they represent a foundation upon which future research engagement and scholarly productivity can be built. Despite recognizing the importance of research, many students reported difficulties in understanding research concepts and expressed anxiety regarding statistical analysis. This discrepancy between positive attitudes and limited confidence suggests that students appreciate the value of research but may lack adequate training and practical exposure to conduct research independently. Similar findings have been reported in studies involving healthcare students worldwide, where positive perceptions coexist with low confidence in research methodology, biostatistics, and scientific writing [3,9]. Such findings highlight the importance of incorporating practical research experiences, workshops, and mentorship opportunities into undergraduate curricula.

The identification of perceived barriers provides additional insight into factors limiting student participation in research activities. Lack of funding emerged as the most commonly reported obstacle, followed by inadequate infrastructure and academic workload. These barriers have been consistently documented in studies conducted among healthcare students in India and other developing countries [2,5,9]. Financial constraints often limit opportunities for conducting projects, presenting findings at conferences, and publishing scientific work. Similarly, inadequate laboratory facilities, limited access to research resources, and insufficient institutional support can discourage student participation in research activities. Time constraints associated with academic workload represent another important challenge. Undergraduate healthcare curricula are often intensive, leaving students with limited opportunities to engage in extracurricular research activities.

Structured research programs integrated into the curriculum may help address this challenge by providing protected time for research participation without compromising academic responsibilities. The significant association between year of study and research knowledge observed in the present study indicates that research competency improves with academic progression. Senior students likely benefit from greater exposure to evidence-based practice, research assignments, journal presentations, and clinical decision-making processes. Similar findings were reported by Zehra et al., who demonstrated better research knowledge and practices among senior students compared with junior students [4]. This finding underscores the importance of introducing research education early in the curriculum and reinforcing research concepts throughout undergraduate training. Early exposure may enhance students' confidence, improve methodological understanding, and encourage long-term engagement in scholarly activities. Collectively, the findings suggest that undergraduate optometry students possess the motivation and positive outlook necessary for research participation; however, educational and institutional barriers continue to limit the development of research competence. Strengthening research training through curriculum enhancement, mentorship programs, statistical workshops, and research funding opportunities may help bridge the gap between positive attitudes and practical research involvement.

LIMITATIONS

Several limitations should be considered while interpreting the findings of this study. First, the cross-sectional nature of the study limits the ability to establish causal relationships between demographic variables and research knowledge or attitudes. Second, data were collected through self-reported questionnaires, making the results susceptible to reporting bias and social desirability bias. Third, the study was conducted exclusively among undergraduate optometry students in Kerala, which may limit the generalizability of the findings to students from other regions, universities, or allied health disciplines. Finally, the questionnaire primarily assessed perceived knowledge and attitudes rather than objectively evaluating practical research skills and competencies.

RECOMMENDATIONS

Research methodology should be introduced early in the undergraduate curriculum. Regular workshops on biostatistics, scientific writing, literature searching, and reference management software should be organized. Structured mentorship and financial support should be provided to encourage student participation in research activities.

CONCLUSION

The present study demonstrates that undergraduate optometry students in Kerala possess generally positive attitudes toward research and recognize its importance in evidence-based healthcare practice and professional development. Nevertheless, research knowledge remains predominantly at an intermediate level, and only a small proportion of students demonstrate advanced understanding of research methodology. Significant barriers, including lack of funding, inadequate infrastructure, academic workload, and limited statistical competence, continue to impede active participation in research activities. The significant association between year of study and research knowledge suggests that research competency improves with increased academic exposure and experience. Therefore, integrating research methodology training early within the undergraduate curriculum, providing structured mentorship programs, enhancing statistical education, and strengthening institutional support mechanisms may substantially improve research literacy and participation among optometry students. Promoting a research-oriented academic environment will not only enhance students' scientific competencies but also contribute to the development of future optometrists capable of practicing evidence-based healthcare and advancing the profession through meaningful scholarly contributions.

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