

**DISTINCTIVE FEATURES OF TEACHING BASED ON CLINICAL CASES IN THE
FIELD OF OPHTHALMOLOGY**

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Abstract: This comparative study evaluated the effectiveness of clinical-case-based teaching in ophthalmology among 400 fifth-year medical students from FMIOPH, ASMI, and BSMI. Students taught using real clinical scenarios demonstrated significantly higher academic performance (mean score 85.4 ± 6.1 vs. 78.2 ± 7.4 and 75.9 ± 8.2 ; $p < 0.001$), faster competency acquisition (3.2 vs. >4 weeks; $p < 0.001$), and improved engagement and satisfaction compared with traditional and mixed teaching methods. These findings support greater integration of structured case-based methodologies to enhance clinical reasoning, motivation, and preparedness for future clinical practice.

Keywords: clinical case-based learning; ophthalmology education; medical students; academic performance; clinical competence; teaching methodology

Introduction

Teaching based on clinical cases in ophthalmology is characterized by several distinctive features that enhance the educational experience for medical students. The integration of clinical cases into teaching methodologies, such as the case method, is instrumental in developing clinical thinking skills among future doctors. This approach allows students to engage with real-world scenarios, fostering critical thinking and decision-making abilities essential for clinical practice[9]. The use of simulators, such as the ICEye Model and slit lamp simulators, further augments this learning by providing hands-on experience in a controlled environment, which significantly improves students' diagnostic skills and confidence in performing ophthalmic examinations[3] [10]. Additionally, the incorporation of blended teaching models, such as the combination of Small Private Online Courses (SPOC) and Team-Based Learning (TBL), has been shown to enhance academic performance, independent learning, and student satisfaction in ophthalmology education[1]. These methods are complemented by competency-based medical education (CBME), which emphasizes the acquisition of practical skills and holistic competence over traditional knowledge retention, thereby aligning with the demands of modern medical training[4] [8]. Furthermore, the Demonstration, Observation, Assistance, and Performance (DOAP) sessions have been identified as effective in teaching visual assessment skills, making the learning process more interactive and student-centric[6]. The integration of multimodal analysis tools, such as GPT-4V, which combines text and image data, also holds promise for advancing clinical case analysis, although its current application in clinical settings remains limited[5]. Overall, teaching based on clinical cases in ophthalmology is marked by a blend of innovative educational strategies that collectively aim to produce competent and confident ophthalmologists equipped to handle the complexities of patient care.

Materials and methods

A total of 400 medical students from three institutions FMIOPH, Andijan State Medical Institute (ASMI) and Bukhara State Medical Institute (BSMI) in their 5th course year, all mentally and physically healthy, were included in the comparative teaching-method study. Students were divided equally among the three institutions (approximately 133-134 per institution). Teaching

based on clinical cases (Group A at FMIOPH) was compared with traditional lecture-based and mixed methods at ASMI and BSMI (Groups B & C).

Results

Assessment of achievement after the intervention revealed significant differences in outcome measures. Using GraphPad Prism for statistical analysis ($\alpha = 0.05$), the mean test score in the FMIOPH group (clinical-case-based teaching) was 85.4 ± 6.1 (mean \pm SD), significantly higher than ASMI (78.2 ± 7.4) and BSMI (75.9 ± 8.2) ($p < 0.001$ for both comparisons). The proportion of students achieving “excellent” (>90 points) was 37% in FMIOPH versus 18% in ASMI and 15% in BSMI (χ^2 test, $p < 0.01$). Student satisfaction ratings (on a 5-point Likert scale) were also higher in FMIOPH: mean 4.6 ± 0.5 vs 4.1 ± 0.6 (ASMI) and 4.0 ± 0.7 (BSMI), $p < 0.05$. Attendance rates and submission of assignments were similarly greater in the clinical-case group: 92% attendance (FMIOPH) versus 87% (ASMI) and 84% (BSMI), $p = 0.02$. The time to mastery (defined as achieving ≥ 80 points) averaged 3.2 weeks in FMIOPH, significantly less than 4.1 weeks (ASMI) and 4.5 weeks (BSMI) (ANOVA, $p < 0.001$).

Table 1

Assessment criteria and results by teaching method

CRITERION	FMIOPH (CASE-BASED)	ASMI (TRADITIONAL)	BSMI (MIXED)
MEAN TEST SCORE (\pm SD)	85.4 ± 6.1	78.2 ± 7.4	75.9 ± 8.2
% STUDENTS ACHIEVING “EXCELLENT” (>90 PTS)	37%	18%	15%
MEAN STUDENT SATISFACTION (5-POINT SCALE)	4.6 ± 0.5	4.1 ± 0.6	4.0 ± 0.7
ATTENDANCE RATE	92%	87%	84%
TIME TO MASTERY (WEEKS)	3.2	4.1	4.5

Overall, the data indicate that teaching based on clinical cases was associated with improved academic performance, higher satisfaction, faster learning, and better engagement among 5th-year medical students in ophthalmology.

Discussion

The present study demonstrates that implementation of a clinical-case-based teaching method in ophthalmology significantly enhanced student outcomes compared to more traditional instructional approaches at comparable institutions. The superior mean score (85.4 vs 78.2 and 75.9) suggests a meaningful pedagogical advantage. This finding aligns with the broader educational literature indicating that active, case-based learning fosters deeper processing of clinical knowledge and better retention[8].

Several factors may account for the observed improvement. First, clinical-case scenarios simulate real-world practice, thereby increasing relevance and motivation among learners: students at FMIOPH reported higher satisfaction ($4.6/5$) and more consistent attendance (92%). This suggests that the method enhances learner engagement, which is a known mediator of academic success. Second, the faster time to mastery (3.2 weeks vs >4 weeks) indicates that the structured case-based approach may accelerate conceptual consolidation and transition from theory to application. Third, the higher “excellent” achievement rate (37% vs $\sim 15-18\%$) implies that the method particularly benefits the upper-performing students, possibly by providing richer opportunities for clinical reasoning rather than rote memorization.

However, some limitations must be acknowledged. This was a comparative study across different institutions, and although all students were mentally and physically healthy and in the

same course year, institutional variables (faculty experience, resource availability, class size) may have influenced the outcomes. Also, the intervention period and exact curricular alignment were not identical across groups, which may introduce bias. Future research should consider randomized controlled designs within a single institution and longer-term follow-up to assess retention of knowledge and translation into clinical performance.

From an educational perspective, the results support the integration of case-based teaching in ophthalmology curricula, particularly in the later years of medical training when students are transitioning to clinical practice. Institutions seeking to improve performance and student satisfaction may prioritise this modality, ensure faculty training in case-facilitation, and monitor metrics such as attendance, assignment submission, and time to mastery.

Conclusion

This comparative study demonstrated that teaching based on clinical cases in ophthalmology provides significant educational advantages over traditional lecture-based and mixed instructional methods among 5th-year medical students. Students exposed to case-based learning achieved higher academic performance, acquired required competencies in a shorter period of time, and demonstrated superior engagement and motivation, as indicated by increased satisfaction and class attendance. These findings suggest that integrating real clinical scenarios into ophthalmology education enhances the development of critical clinical reasoning skills, promotes active learning, and better prepares students for future clinical practice.

While institutional differences and the non-randomized design represent limitations, the clear trend toward improved outcomes supports the broader implementation of structured case-based methodologies in ophthalmology curricula. Further longitudinal and multicenter studies are warranted to evaluate long-term knowledge retention and transfer of learning into clinical performance.

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