



ENHANCING LEARNING IN OPHTHALMOLOGY: IMPACT OF WEEKLY FORMATIVE ASSESSMENTS ON ACADEMIC PERFORMANCE AND STUDENT PERCEPTIONS

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ABSTRACT **Background:** Assessment reforms stress formative, learner-centered strategies to enhance competency-based medical education (CBME). The Graduate Medical Education Regulations (GMER) 2019 advocate continuous internal assessment (CIA), but implementation in undergraduate ophthalmology remains sparse. **Objectives:** This study evaluated the effectiveness of Weekly CIA in improving academic performance, self-awareness, and engagement among MBBS Phase III Part I students in ophthalmology. **Methods:** A prospective, single-center intervention was conducted at Tomo Riba Institute of Health and Medical Sciences from September 2023 to February 2024, involving 51 students. The intervention incorporated weekly didactic sessions, case-based MCQs, and structured feedback discussions. Academic progress was assessed using paired t-tests comparing First and Second Internal Assessment scores; the relationship between CIA and final assessment results was analyzed by Pearson correlation. Student perceptions were collected through Likert-scale surveys and open-ended feedback, analyzed thematically. **Results:** Mean scores increased significantly after the intervention (mean difference: 11.16; $P < 0.001$); females exhibited greater improvement than males. CIA scores showed a strong positive correlation with final assessment performance ($r = 0.68$; $P < 0.001$). Most students reported that weekly CIAs enhanced comprehension, motivation, and self-awareness. Time constraints and format unfamiliarity were cited as challenges. **Conclusion:** Weekly CIA is a valuable formative assessment tool in ophthalmology, significantly boosting student achievement and engagement in line with CBME objectives. Wider implementation and further research are encouraged to promote effective, learner-centred assessment across medical curricula.

KEYWORDS : Continuous Internal Assessment, formative assessment, ophthalmology education, competency-based medical education, undergraduate medical students, learner engagement, feedback

INTRODUCTION

A major factor in determining the caliber and efficacy of medical education is assessment. Reforms in recent years have focused on adopting formative, learner-centered procedures instead of summative evaluation. The National Medical Commission's Graduate Medical Education Regulations (GMER) 2019 emphasize the use of Continuous Internal Assessments (CIA) in promoting competency-based medical education (CBME), as well as in enabling real-time feedback and reflective learning settings (1).

Many medical programs still mostly rely on conventional, high-stakes end-point exams in spite of these regulatory changes. It has been demonstrated that these approaches impair long-term retention, reduce engagement, and sap student motivation (2). Particularly noticeable are the effects of assessment-centric learning in ophthalmology education, which is frequently condensed into a short rotation in undergraduate curriculum.

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Although MBBS Phase III Part I students, the study's target learners, have a foundational understanding of theory, they usually do not have access to chances for self-directed learning, continuous feedback, and flexible study techniques. These discrepancies highlight the necessity of organized formative strategies that inspire students and promote long-term involvement (4). techniques for formative evaluation, encourage greater learning and engagement when incorporated into education (6). Continuous feedback and student agency are further emphasized via assessment for learning(10).

CBME promotes a variety of evaluation methods, including multiple-

choice questions (MCQs), clinical simulations, and Objective Structured Clinical Examinations (OSCEs). However, implementation of discipline-specific, weekly CIAs remains underexplored in ophthalmology. While formative assessment models like those presented by Velan et al. have demonstrated success in biomedical science education (5), such innovations have not yet been contextualized to ophthalmic instruction or learner perception. Programmatic assessment integrates multiple low-stakes assessments to support learning (13).

In light of these challenges, the present study introduces a weekly CIA model tailored to ophthalmology, built on the principle of the "testing effect"—the cognitive theory that frequent low-stakes assessments improve knowledge retention more effectively than passive review (2). This model aligns with GMER directives advocating technology integration, varied assessment formats, and feedback loops for holistic skill development (1). Feedback must be timely, specific, and actionable to guide learning effectively (8).

By embedding weekly MCQs and structured feedback without penalization, this intervention seeks to promote motivation, comprehension, and self-awareness, thereby addressing curricular gaps in ophthalmology training. The study offers a replicable model for other medical disciplines and contributes evidence to advance CBME implementation in Indian undergraduate education.

AIM AND OBJECTIVES

The aim of this study was to evaluate the impact of Weekly Continuous Internal Assessments (CIA) on academic performance, self-awareness, and learner engagement among undergraduate ophthalmology students, implemented within the framework of Competency-Based Medical Education (CBME). The specific objectives were to compare student performance between the first and second internal assessments in order to quantify academic improvement; to analyse the correlation between weekly CIA scores and final internal assessment outcomes; to assess students' perceptions of the weekly formative assessment strategy using both structured Likert-scale feedback and open-ended responses; to explore thematic insights related to the perceived utility, challenges, and potential enhancements of the CIA intervention in ophthalmology education;

and to offer informed recommendations for wider curricular integration and pedagogical innovation based on the combined quantitative and qualitative findings.

MATERIALS AND METHODS

Study Design And Participants

This study was designed as a prospective, single-center, educational interventional trial conducted over a six-month period from September 2023 to February 2024. The research was carried out at Tomo Riba Institute of Health and Medical Sciences (TRIHMS), located in Naharlagun, Arunachal Pradesh. The study population consisted of MBBS Phase III Part I students currently undergoing their ophthalmology clinical posting. A total of 51 students participated in the intervention, representing the entire eligible cohort during the designated timeframe. Enrolment of every student who satisfied the inclusion requirements guaranteed full batch representation. Convenience sampling was used to choose the participants. Consistent attendance, active involvement in the First and Second Internal Assessments, and attendance at all weekly formative CIA sessions were requirements for eligibility. If students showed up for all scheduled classes, they were included. Evaluations and finished the study's feedback sections. The analysis did not include those who did not turn in the necessary feedback forms or who did not take any summative exams.

Intervention And Evaluation Design

A standardized model of Weekly Continuous Internal Assessments (CIA) was implemented as an educational intervention during the ophthalmology posting after the First Internal Assessment. A 40-minute didactic lecture was followed by ten case-based, single-best-answer multiple-choice questions (MCQs) in each CIA session. In order to reinforce learning objectives, students participated in a 10-minute feedback discussion that included peer and self-evaluation. To ensure alignment with competency-based educational goals, the MCQs were meticulously selected and validated in compliance with GMER 2019 requirements. In partnership with the Medical Education Unit, pre-validated feedback forms were created to gauge student opinions.

LCD projectors, computers, and printed handouts were among the institutional resources that helped with the CIA implementation.

PowerPoint slides were used to introduce the goal and framework of the intervention during faculty and student orientation sessions. High scorers received commendations, and low performers received targeted coaching and remediation in an effort to boost academic confidence and motivation.

The Tomo Riba Institute of Health and Medical Sciences' Institutional Ethics Committee (IEC) granted ethical approval for the project. All participants provided written informed consent prior to inclusion in the study.

The evaluation design aimed to explore the impact of weekly formative assessments on academic performance, learner engagement, and self-awareness. Quantitative data were collected in the form of scores from the First and Second Internal Assessments, as well as cumulative weekly CIA scores. Qualitative data were gathered through a structured 9-item Likert scale feedback instrument and open-ended student responses addressing perceived utility, challenges, and suggestions for enhancement.

Data were analyzed using IBM SPSS Statistics V.30. Descriptive statistical measures including mean, median, standard deviation (SD), and range were applied. The paired *t*-test was used to compare pre- and post-intervention performance, while Pearson correlation coefficients were calculated to evaluate the association between CIA scores and final internal assessment outcomes. Statistical significance was determined at a level of $P \leq 0.05$.

A mixed methods approach was adopted to triangulate findings and enhance the interpretive validity of the results. Quantitative analysis provided objective performance metrics, whereas qualitative insights enriched understanding of the learner experience and informed pedagogical recommendations.

RESULTS

1. Descriptive And Inferential Statistics

Data from both internal assessments (First and Second Internal) of 51

students were analysed using IBM SPSS Statistics V.30. Descriptive statistics-including mean, median, standard deviation, and range-were calculated, and inferential statistics included a paired *t*-test to evaluate score improvement and Pearson correlation to examine relationships between continuous internal assessments (CIA) and summative performance.

Table 1: Descriptive Statistics Of Internal Assessments

Assessment	Min Score	Max Score	Mean	Median	SD
First Internal	22.00	77.00	51.51	54.00	12.34
Second Internal	36.00	86.00	62.67	64.00	11.89
Mean Difference	—	—	11.16	—	—

The table shows the minimum, maximum, mean, median, and standard deviation of scores in both assessments. The mean score increased from 51.51 in the first internal to 62.67 in the second internal, with a mean difference of 11.16 points.

The **paired *t*-test** showed a statistically significant improvement in scores: $t(50) = 5.42$, $P < 0.001$, indicating a strong effect of the intervention.

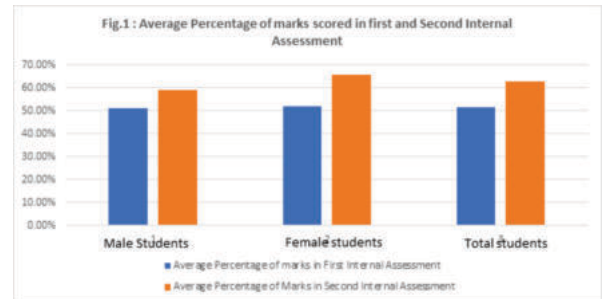


Figure 1 : Bar diagram showing average percentage scores for male and female students in both assessments

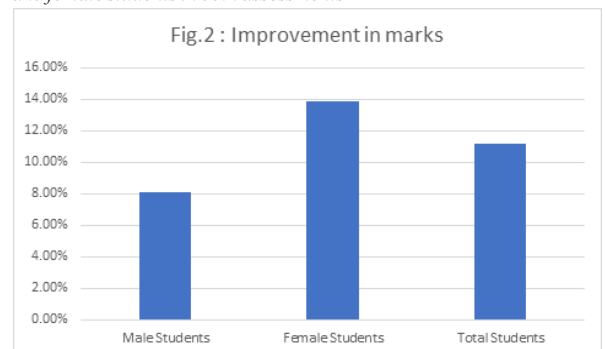


Figure 2 : Bar diagram highlighting score improvement between assessments

2. Gender-Based Performance Comparison

Table 2: Average Percentage Comparison By Gender

Group	N	First Internal (%)	Second Internal (%)	Improve ment (%)	P- value	Pearson r (P)
Male Students	24	51.04	59.16	8.12	—	—
Female Students	27	51.92	65.77	13.85	—	—
Total	51	51.50	62.66	11.16	.000	.308 (.028)

The table summarizes average percentage scores for male and female students, with females showing greater improvement (13.85%) than males (8.12%).

Although the P-value for the gender-based comparison is not specified, the Pearson correlation coefficient and significance level are included. This reinforces gender as a potential factor influencing performance improvement.

Correlation Between Weekly CIA And Final Assessment

A Pearson correlation coefficient of 0.68 ($P < 0.001$) was observed between weekly CIA scores and second internal assessment scores, indicating a strong positive relationship.

Table 3: Correlation Between Weekly CIA Scores and Final Assessment

Variable 1	Variable 2	Pearson r	P-value
Weekly CIA Scores	Second Internal	0.68	<0.001

4. Student Feedback On The Intervention

Feedback was obtained through a 9-item Likert scale and open-ended questions following the intervention.

Table 4: Summary Of Closed-ended Feedback

Item	Strongly Agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly Disagree (%)
1. Clarity of Instructions	72.54	25.49	1.96	0	0
2. Application of Knowledge	58.82	37.25	3.92	0	0
3. Time Allotment	47.05	43.13	9.80	0	0
4. Content Relevance & Engagement	41.17	52.94	5.88	0	0
5. Participation & Motivation	43.13	45.09	11.76	0	0
6. Self-Awareness	49.01	43.13	7.84	0	0
7. Evaluation Capability	35.29	54.90	9.80	0	0
8. Assessment Frequency Support	66.66	27.45	5.88	0	0
9. Inclusion of Scores in Internal Assessment	37.25	31.37	13.72	17.64	—

This table presents the distribution of student responses, showing most students “Strongly Agreed” or “Agreed” with statements regarding clarity, relevance, motivation, and usefulness of weekly CIAs.

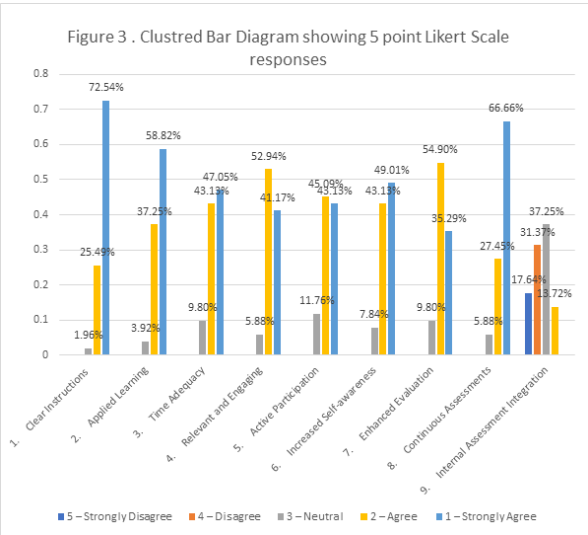


Figure 3: Clustered Bar Diagram Showing 5-Point Likert Scale Responses

5. Qualitative Themes from Open-Ended Feedback

Thematic analysis of open-ended feedback yielded valuable qualitative insights.

Table 5: Thematic Summary Of Student Feedback

Theme	Representative Comments
1. Utility of Weekly CIAs	Improved comprehension, motivation, and time management
2. Suggestions for Improvement	Add image-based MCQs, peer-generated questions, longer sessions
3. Most Appreciated Aspects	Better topic understanding, exam readiness, and self-awareness
4. Challenges Faced	Time constraints, anxiety, unfamiliarity with format
5. Mitigation Strategies	Faculty support, flexible schedules, WhatsApp-based material sharing

Themes included the utility of weekly CIAs, suggestions for

improvement (e.g., image-based MCQs), most appreciated aspects, challenges faced, and recommended mitigation strategies.

DISCUSSION

The present study evaluated the effectiveness of Continuous Internal Assessments (CIA) in enhancing academic performance among undergraduate ophthalmology students. A statistically significant improvement in scores between the first and second internal assessments (Table 1) supports the utility of structured, formative feedback cycles. These findings are visually reinforced in Figure 1 and Figure 2, which depict overall performance trends and score improvements, respectively. This aligns with the Competency-Based Medical Education (CBME) framework that emphasizes regular monitoring of cognitive and self-regulatory competencies (11).

The gender-based analysis (Table 2) revealed that female students demonstrated greater improvement in average scores compared to their male counterparts, potentially due to differences in learning strategies or engagement levels. Although further investigation is needed, the Pearson correlation result presented in Table 3 ($r = 0.68$, $P < 0.001$) and discussed in section 3 confirms a strong positive correlation between weekly CIA scores and final internal assessments, substantiating the predictive role of formative assessments (9). These results resonate with meta-analytic findings on formative assessment's academic benefits (15).

Student feedback (Table 4) highlighted clarity of instructions, relevance of content, and increased self-awareness as key strengths of the intervention. This is further illustrated by Figure 4, which shows the distribution of responses to the 5-point Likert scale across various feedback items. These quantitative insights were enriched by thematic analysis (Table 5), revealing enhanced comprehension and motivation, while also identifying practical challenges like time constraints and format unfamiliarity. These results demonstrate the formative assessment's emotional and motivating benefits(16).

All things considered, the triangulation of qualitative feedback and quantitative results highlights the effectiveness of formative interventions such as weekly CIAs. Customized tests improve student readiness, encourage introspection, and support lifetime learning objectives (12). Feedback systems further assist self-regulated learning, which is encouraged by reflective tools like portfolios (14). Furthermore, one of the key ways that formative assessments affect academic performance is still through providing effective feedback (7).

CONCLUSION

Weekly Continuous Internal Assessments (CIA) have been shown to be an effective teaching tool in undergraduate ophthalmology courses, producing significant enhancements in the engagement and performance of students (15, 25, 35). This formative method is in line with the fundamental tenets of Competency-Based Medical Education (CBME) by encouraging motivation, improving self-awareness, and clarifying learning objectives(1,13,22).

Its long-lasting effects point to a positive trend toward learner-centered assessment techniques. Future research should investigate multi-institutional application, evaluate long-term academic and professional outcomes, and incorporate technological solutions for scalable and adaptable learning across several medical disciplines in order to build on these insights (16, 21, 34).

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Overall, the triangulation of quantitative outcomes and qualitative feedback underscores the efficacy of formative interventions like weekly CIAs. Tailored assessments enhance student preparedness, promote reflection, and align with the goals of lifelong learning (12). Self-regulated learning, as promoted through reflective tools such as portfolios, is further supported by feedback mechanisms (14). Moreover, **effective feedback** remains a central mechanism through which formative assessments exert their influence on academic achievement (7).

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Ethical Approval

The approval from Institutional Ethical Committee, TRIHMS, Naharlagun, was obtained

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