

Original Research Article

# Modified Formative Assessment and Its Impact on Undergraduate Medical Learning

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## ABSTRACT

**Context (Background):** Assessment tools can be judged based on criteria like reliability, educational impact, acceptability and cost. Summative tests are useful in promotion and certification but could not assess student's learning. Formative assessments facilitates learning through consistent involvement, still it is not implemented in many medical schools.

**Aim/Objective:** So, we conducted a study to evaluate the impact of modified formative assessment on undergraduate medical teaching- learning. Students perception on formative assessment was also analysed by collecting feedback from the participating students.

**Methods and Materials:** Hundred MBBS students were randomly divided into 2 groups i.e. Group A and Group B based on their 1<sup>st</sup> Mid semester marks .Fifty students in Group-A underwent formative assessments after 1<sup>st</sup> Mid semester, 1<sup>st</sup> Semester and 2<sup>nd</sup> Mid Semester examinations with feed back to the students and rest 50 students (Group-B) were treated as control.

**Results:** There was statistically significant ( $p < 0.05$ ), consistent improvement in the performance of the students in group A, when 1<sup>st</sup> professional mark is compared with 1<sup>st</sup> Mid Semester. Group B students showed an improving tendency in 1<sup>st</sup> Semester but there is a decline in 2<sup>nd</sup> Mid Semester (which was not seen in the intervention group i.e. Group A) with slight increase in 1<sup>st</sup> Professional examination. There is significant difference in the increase of marks between the groups ( $p < 0.017$ ). Assessment of students' perception of the formative assessment revealed that most of the students preferred formative assessment as a better evaluation modality suggesting its popularity.

**Conclusions:** Modified formative assessment with well designed constructive feedback and proper remedial measures could promote learning of medical students.

**Key Words:** Educational impact, Summative tests, constructive feedback, remedial measures

## INTRODUCTION

The conventional academic curriculum assesses the MBBS students on summative tests that overall gives judgement about the competence and the qualification to proceed to next level of responsibility. <sup>[1]</sup> In this the progress of the

students' learning could not be assessed. Formative assessments focus on the learning and improvement of the learner by providing them opportunities to recognize their weakness and enables teachers to identify areas where students need support. <sup>[2]</sup> Progressive institutes that believe in

innovative teaching learning methodologies, implement formative assessment as a fleeting part of medical curriculum by adopting various methods of assessment that may or may not include feedback to the learners. Barts and the London School of Medicine and Dentistry introduced formative assessments using different assessment instruments. [3] The New Castle University and Durham University follow progressive assessment of three essential domains i.e. Skill, Knowledge and Professionalism. [4] The highlight of formative assessment is providing timely feedback on performance and suggestions for improvement that intend to enhance student's learning. [5] Providing diagnostic and remedial feedback act as the most potential influence on student learning outcome. [6] Web based formative assessments provide immediate feedback that motivates students and improves interactivity. [7] However online formative assessments i.e. Quizzes and self evaluation examinations may lack educational effectiveness [8] the available data are contradictory and inconclusive. [9,10] Paper based formative assessments, though it is cost effective and feasible, it has many limitations i.e. students gathering, invigilation and individualized feedback, all this needs dedicated time and manpower. [11] Nevertheless formative assessments have gained popularity among clinical medical students, still its role as an effective prediction tool to summative assessment is not clear. There is a need to design an innovative assessment module that could be challenging as well as interesting learning experience for medical undergraduates. So, we took up a study to evaluate the impact of modified formative assessment on undergraduate medical teaching- learning. Students perception on formative assessment was also analysed by collecting feedback from the participating students on its effectiveness.

## **MATERIALS AND METHODS**

This study was conducted in the Department of Biochemistry from August 2014 to July 2015. Hundred MBBS students within the age group of 17-23 years were enrolled in this study. After first Mid - semester examination, these 100 students based on their marks were randomly divided into 2 groups i.e. Group A and Group B, so that the mean marks of both the groups are matched. Fifty students in Group-A underwent formative assessments at regular intervals and rest 50 (Group B) treated as control and they did not appear formative assessment.

Formative assessment per course was conducted, intended to cover topics discussed throughout that course and included wide variety of question types i.e. True /False, Multiple choice question, one word answer as well as short answer structured assays. All assessments were peer reviewed by subject experts. Such formative assessments were held after 1<sup>st</sup> Mid semester, 1<sup>st</sup> Semester and 2<sup>nd</sup> Mid Semester examinations.

Each time the answers were discussed in the next tutorial class and feedbacks were provided to the students as tutor assessment format. The feedback format was designed to provide clear, specific and timely response focussed upon the attainable aspects in an encouraging way emphasizing the need to improve the weaker sections.

Students found to be below the expected level in the first semester were counselled by the subject experts and proper remedial measures were taken to encourage them.

Students' feedback and perception of value of written formative assessment as well as usefulness in developing concepts, understanding the concept and improving the educational process were sought for and data analysed statistically.

The marks obtained in all the formative assessments and summative assessments were recorded and statistically analysed. The results of first Mid semester marks were treated as the pre-intervention

value and results of rest of the examination were compared to it. The data were analysed statistically using SPSS 21<sup>st</sup> Version. The values of continuous variables were expressed as mean±SD. Differences in variables were compared by using Paired “t” test. Analysis of Variance (ANOVA) with post-hoc Tukey’s test. p value <0.05 was considered as statistically significant.

**RESULTS**

The general characteristics of the study groups (Table-1) showed that the subjects enrolled in both the groups were age matched with a slight male preponderance in both Group A and Group B. The marks obtained (mean ±S D) in the 1<sup>st</sup> Mid Semester is more or less same in both Group A and Group B (Table - 2) pointing towards the fact that there is homogenous group of students enrolled in both the groups.

**TABLE-1 : General Characteristics of the study population**

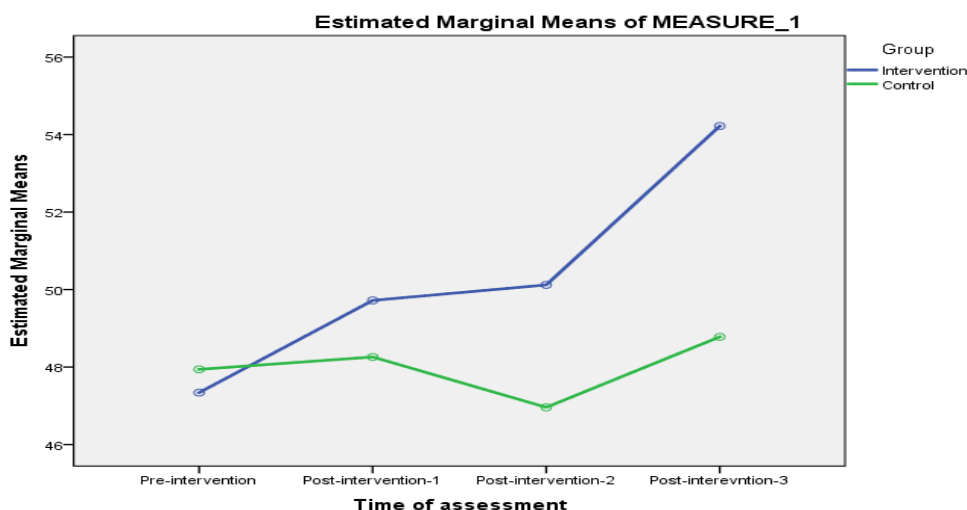
Sl. no.	Parameters	Group A (n = 50)	Group B (n = 50)
1	Age	17.12 ± 2.23	16.82 ± 2.52
2	Sex Male	28	30
	Female	22	20

There is continuous improvement in the performance of the students in group A (Table-2, Figure -1) which was found statistically significant (p<0.05) when 1<sup>st</sup> professional mark is compared with 1<sup>st</sup> Mid Semester. Group B students showed an improving tendency in 1<sup>st</sup> Semester but there is a decline in 2<sup>nd</sup> Mid Semester with slight increase in 1<sup>st</sup> Professional which is statistically not significant (table-2). Mean marks of both groups showed an increase over time, with group- B (control) having a lowest dip in the marks of 2<sup>nd</sup> Mid semester examination (Figure -1) which was not seen in the intervention group (Group A). Split Plot ANOVA showed significant increase in the overall marks (p<0.001) as well as significant difference in the increase of marks between the groups (p<0.017) (Figure-1).

**TABLE-2: Marks obtained in different summative examinations**

Sl no	Examination	Group A (n=50)	Group B (n=50)
1	1st Mid Semester	47.34 ± 7.7	47.94 ± 8.03
2	1 <sup>st</sup> Semester	49.72 ± 5.98	48.26 ± 5.61
3	2 <sup>nd</sup> Mid Semester	50.12 ± 8.28	46.96 ± 6.32
4	1 <sup>st</sup> Professional	54.22 ± 7.46 **	48.78 ± 8.79

\*\* indicates p <0.05 (As compared with 1st Mid Semester)



**Figure-1: Pattern of Difference in mean marks in Intervention and Control group**

Comparison in the mean marks of 1<sup>st</sup> Professional examination in both the groups (Figure -2) showed a significant difference, group A students securing better than group B, suggesting that continuous formative

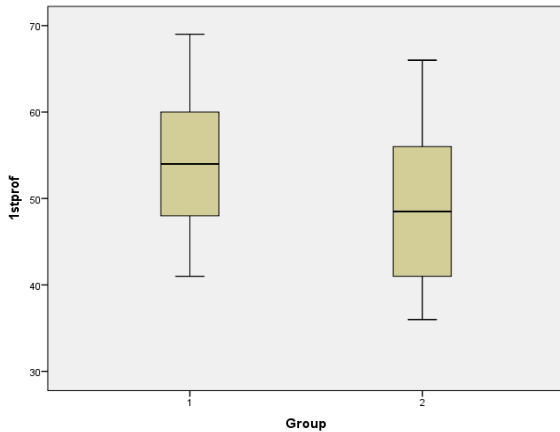
assessment with proper feedback and remediation encouraged and guided them to achieve better academic outcome. On further analysis it was seen that male students (21/50) have improved in their

performance more as compared to female students (19/50) in group A (Table-3). In group B majority of the students did not

perform well, however 19 students have improved out of which female students outnumbered male students (Table-3).

**Table – 3: Student performance in the first professional in the study groups**

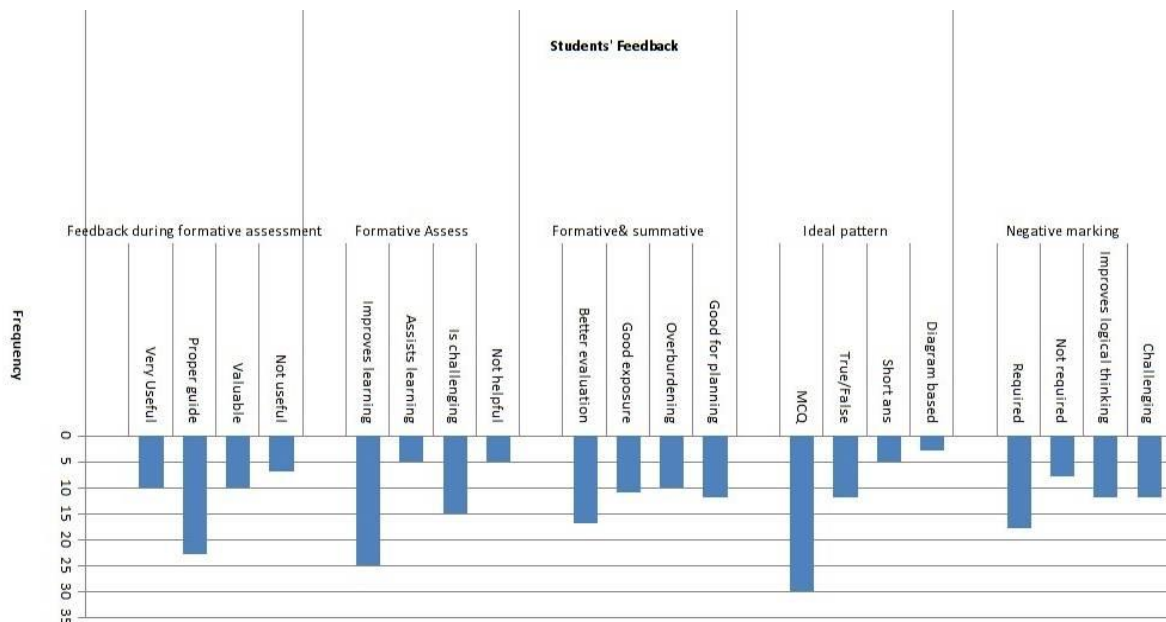
Group	Increase in marks	No change in marks	Decrease in marks
Group A Male	21	03	04
(n=50) Female	19	01	02
Total	40	04	06
Group B Male	09	03	18
(n=50) Female	10	03	07
Total	19	06	25



**Figure-2: Comparison in the mean marks of 1<sup>st</sup> Professional examination in both the groups**

in group A (40/50) had better performance than group B (19/50) suggesting that formative assessment could be used as a predictive tool of summative assessment. Assessment of students’ perception (Figure-3) of the formative assessment revealed that most of the students preferred formative assessment as a better evaluation modality. There is uniformly favourable response that formative assessment improves learning and is a useful guide to enhance performance. Multiple Choice Questions (MCQ) pattern with negative marking was the preferred modality of evaluation (Figure-3).

Though both the groups had shown academic improvement, most of the students



**Figure-3: Feedback of the Students on effectiveness of the Modified Formative Assessment**

**DISCUSSION**

Globally it is accepted that the assessment in medical education should not be simply based on evaluation on pre-set

criteria and make a judgement but also to facilitate learning through consistent involvement and timely feedback, providing an opportunity to improve. [12] This resulted

in a shift of focus from the end of the course assessment to continuous formative assessments. Our study registered a consistent improvement in the performance of students those were undergoing formative assessment. Students enrolled in the formative assessments, obtained feedback about their performance and probably this facilitated their greater involvement in the learning process. Similar encouraging results were registered in many previous studies. [13,14] and our study substantially extend their observations. Studies also recommended that formative assessment can be used as an effective predictive tool of summative performance in medical schools. [15]

Our findings also contrast with previous studies [16,17] that concluded that formative assessment with objective type items have no effect on student learning outcome. Online formative assessments could have significant positive effect on learning if timely feedback is provided

informing the progress of the students. [18] Online formative quizzes found no effect on Summative examination results. [19] Randomized control trial of online formative assessments for medical students found no positive effect on learning, [17] as these studies did not include provision of feedback to the study participants.

As feedback to the learners is an integral part of formative assessment, timely remedial measures should be taken to strengthen students' weaknesses. Most of the new entrants in the medical school (Figure -4) belong to different corners of the country with different language and cultural background, there is a need of more faculty -student interaction to address the difficulties students might be facing in adjusting themselves in a new study curriculum. Formative assessment with feedback, along with timely remedial measures encourages students to achieve better academic outcome.

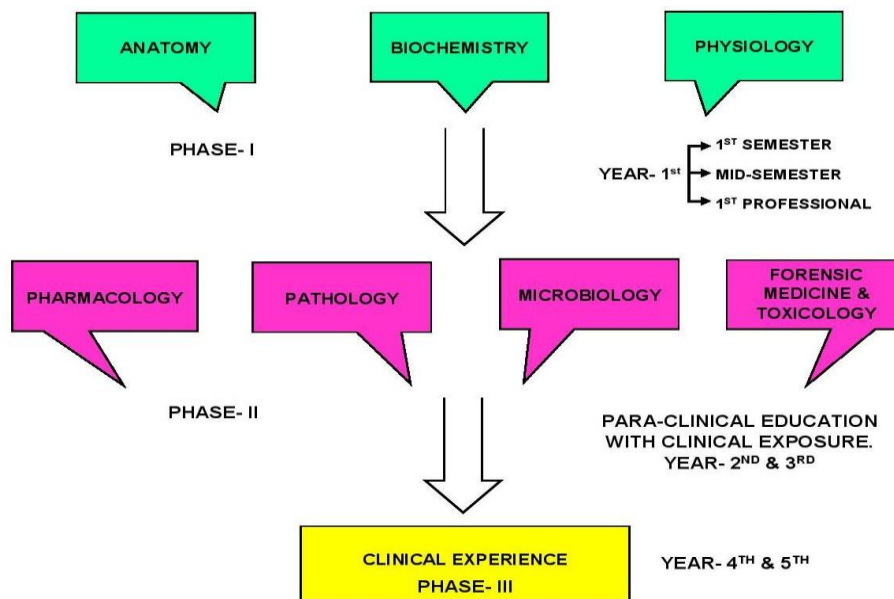


Figure-4: Phases of Medical education:

## CONCLUSION

Modified formative assessment with well designed constructive feedback and proper remedial measures promote learning of students. Further studies to establish the causal relationship between participation in

formative assessment and end of course achievements need to be conducted.

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