

## Original Research Article

# The role of formative objective structured clinical examinations on students' performance in clinical years

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### ABSTRACT

**Background:** Objective structured clinical examinations are the gold standard of modern medical assessment for students. The aim of our study was to determine the effect of formative OSCEs on students' performance in summative OSCEs in final year medical exams.

**Methods:** This observational study was conducted at surgical B Unit, MTI, Khyber teaching hospital, Peshawar from January to December 2019. A total of 297 consecutive students of final year MBBS, studying in Khyber medical college were included in the study. Students who had repeated the year were excluded. Examination scores of formative OSCEs taken in the ward and the subsequent summative OSCEs taken in the subject of surgery were analyzed to determine the effect on summative OSCE performance. Data was analyzed using SPSS 23. Chi square test was used and  $p > 0.05$  was taken as statistically significant.

**Results:** Out of 297 students, 188 (63.3%) were males and 109 (36.7%) were females. Of these, 243 (81.8%) students appeared in the formative OSCEs whereas 54 (18.2%) students did not appear in the formative OSCEs. The result of the subsequent summative OSCEs showed that those students who appeared in formative OSCEs showed a better performance in summative OSCEs ( $p < 0.001$ ) with majority of students (53.5%) having scores above 80%.

**Conclusions:** Formative OSCEs enhance students' performance in summative OSCEs. Repetitive formative OSCE sessions along with regular feedback should be incorporated in the medical curriculum for better performance of medical students in their final year undergraduate exams.

**Keywords:** Formative OSCEs, Summative OSCEs, Performance in final year medical exams

### INTRODUCTION

Objective structured clinical examinations (OSCEs) were first introduced in 1975 as a modern method of assessing undergraduate medical students in their clinical skills. The exam basically consists of a series of stations around which students rotate in a given time performing a variety of tasks at each station as they move along.<sup>1</sup> Unlike the traditional methods of teaching which was fraught with problems like examiner bias and poor reliability,<sup>2</sup> OSCEs have provided clinicians with a more structured, standardized and objective approach for assessment of students.<sup>3</sup> Furthermore, they have become quite popular

among students as well, who strongly support the format.<sup>4</sup> Studies have shown that OSCEs are reliable, feasible and valid in both the summative and formative assessment of students and are thus considered the 'gold standard' of clinical competence assessment.<sup>5,6</sup>

Formative OSCEs are non-mandatory exams conducted primarily for learning purposes and to make the student familiar with the concept of OSCEs. Summative OSCEs are mandatory exams that formally assess clinical skills and knowledge, and are part of the final examinations required for graduation.<sup>8</sup> It has been shown that with increased exposure to formative OSCEs, students

perform better in their final OSCEs.<sup>6,9</sup> According to a study conducted in Peshawar, majority of students (94%) were of the view that formative OSCEs help in students' preparation for final exams.<sup>10</sup> In Pakistan, there is limited data about the effect of formative OSCEs on a medical student's final exam performance. Hence, we conducted this study with the aim to see the effect of formative OSCEs taken in the ward on students' performance in summative OSCEs in final year medical examinations.

**METHODS**

After obtaining approval from the institutional ethics board this observational study was conducted in surgical B unit of MTI, Khyber teaching hospital, Peshawar for a period of one year from January to December 2019. A total of 297 consecutive students of final year MBBS, studying in Khyber medical college were included in the study. Students who had repeated the year were excluded. The study was done while maintaining anonymity of the participants. All records were de-identified prior to analysis.

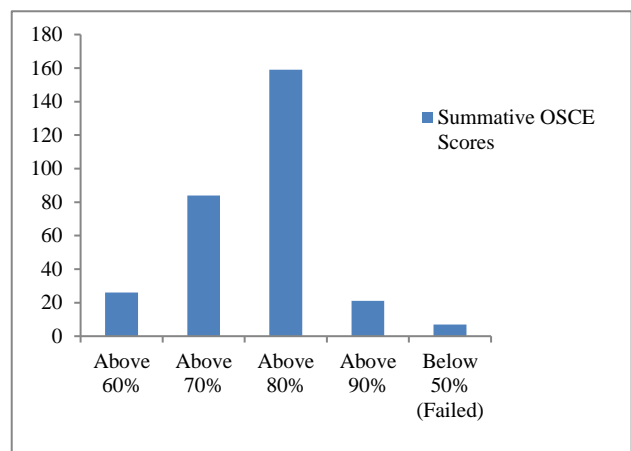
Final year medical students of Khyber medical college are grouped into 18-19 batches each consisting of 15 students and every batch gets 10 days to spend in a single unit. During the 10 days in surgical B unit, students were taught about history taking, examination and various surgical instruments and procedures. On the last day, each successive batch would undertake a non-mandatory formative OSCE. The formative OSCEs taken in Surgical B Unit had a total of 10 stations with a maximum score of 10 for each station. There were 5 static stations and 5 interactive stations. Students were provided with 5 minutes for each station and the marking was done according to a standardized marking sheet. Before each test the students were given a small briefing about the examination process and at the end of the exam, they were provided with an hour's worth feedback session so that they could review the correct answers and procedures and gain guidance for their final exams. Examiners, usually senior surgical residents would remain the same throughout each set of formative OSCEs to avoid bias in marking. The exam was conducted under strict examination conditions.

At the end of the academic year, all the students sat the summative OSCE exam in the subject of surgery. These consisted of a total of 7 interactive stations and 5 static stations. They were organized and taken by the examination department of Khyber medical university, Peshawar. The summative exam data was obtained after permission from the In-charge of examination section of Khyber medical university (KMU) after the result had been announced. Performance was measured in terms of marks obtained (in percentage) in OSCEs in the final examinations. Out of a maximum score of 120, the pass percentage was 50% (i.e. 60 marks) in accordance with the guidelines provided by KMU examination department. Examination scores of the formative OSCEs

were compared with scores in respective summative exams and analyzed using SPSS-23 to determine the effect on summative OSCE performance. Chi-square test was employed to assess the statistical difference with a p value <0.05 taken as statistically significant.

**RESULTS**

The study consisted of 297 students enrolled in final year MBBS out of which 188 (63.3%) were males and 109 (36.7%) were females. Of these, 243 (81.8%) students appeared in the formative OSCEs and all attained passing marks (50% and above) whereas 54 (18.2%) students did not appear in the formative OSCEs. Summative OSCE scores showed that 290 (97.6%) students passed the exam while 7 (2.4%) failed the summative OSCEs. Scores obtained in summative OSCEs are shown in (Figure 1).



**Figure 1: Summative OSCE scores.**

**Table 1: Summative OSCEs scores vs. attendances in formative OSCEs and gender.**

Parameters	Summative OSCE Scores		P value	
	Passed (above 50%)	Failed (below 50%)		
Attendance in formative OSCEs	Present in formative OSCEs	243	0	<0.001
	Absent in formative OSCEs	47	7	
	Total	290	7	
Gender	Males	182	6	0.21
	Females	108	1	
	Total	290	7	

\*Statistical test applied: Chi square analysis, p<0.05 is taken as statistically significant.

Comparison between summative exam scores and gender showed no difference (p>0.05) (Table1). Comparison between attendances in formative OSCEs with passing

percentage in summative OSCEs showed that of the 243 (81.8%) students, who appeared in the formative OSCEs all of them (100%) subsequently passed the summative OSCEs. Of the 54 (18.2%) students who did not attend the formative OSCEs, 47 (75.9%) subsequently passed the summative OSCEs while 7 (2.4%) failed the summative OSCEs. This gave a positive predictive value (PPV) of 100% for attending the formative OSCE as a predictor of passing the summative OSCE, and a negative predictive value (NPV) of 13% for not attending the formative OSCE as a predictor of failing the summative OSCE (Table 1).

**Table 2: Performance (%) of students in formative and summative exams.**

Parameters	Performance in Summative OSCEs		P value	
	Above 70%	Below 70%		
Performance in formative OSCEs	Above 70%	190	6	<0.001
	Below 70%	68	33	
<b>Total</b>		258	39	

\*Statistical test applied: Chi square analysis,  $p < 0.05$  is taken as statistically significant.

Those who appeared in formative OSCEs showed a better overall performance in summative OSCEs ( $p < 0.001$ ) with 28.3% students having scores above 70%, 53.5% students having scores above 80% and 7.1% students having scores above 90% (Figure 1). Furthermore, students who scored more than 70% in the formative exams scored more than 70% in the finals as well ( $p < 0.001$ ) (Table 2).

## DISCUSSION

In the rapidly evolving world of modern medical education, OSCEs; well known for their concept and originality, have become the standard of clinical assessment for medical students and postgraduate trainees alike.

They have widened a clinician’s horizon of knowledge by providing insight to new areas of patient care like problem solving, communication skills and decision making.<sup>11</sup> In a nine-year study by Duerson et al it was noted that OSCEs assert a positive influence on students by giving them confidence of interacting with real patients and improves their overall performance.<sup>12</sup> In this context, formative OSCEs aim to familiarize students and guide them before they take summative OSCEs. The uniqueness of formative assessment is that it takes into account a student’s feedback of the examination process.<sup>13</sup>

In our study it was observed that those students who undertook formative OSCEs were more prepared and familiar with the concept as evident by their passing the subsequent summative OSCEs. Similarly those who missed the formative OSCEs did not do well in the finals. A relevant study done in the UK reported a PPV of 92.5% compared to PPV of 100% in our study. They also showed that formative OSCE had a poor NPV of 21.5%, which was higher than our reported figure (NPV of 13%) which meant that students who fail a formative OSCE are equally likely to pass the summative OSCE just like students who passed the formative OSCE. Unlike our study, they reported that the formative exam did not affect the overall pass rate in summative exams but contributed to better experience of students in individual stations.<sup>8</sup>

Townsend et al showed that the mean scores of students in the two OSCEs showed that the use of formative OSCEs facilitated students in learning of clinical skills and there was significant improvement in all subsequent summative OSCE stations ( $p < 0.001$ ).<sup>14</sup> Similarly our study showed that formative OSCEs were beneficial for students as those who scored more than 70% in the formative OSCE went on to score better (more than 70%) in the summative exam as well ( $p < 0.001$ ). Lien et al showed that there was a gradual increase in the mean learning curve of students in serial formative OSCEs as well as a significant improvement in performance in summative OSCEs ( $p = 0.02$ ).<sup>15</sup> They also noted that unfamiliarity with the OSCE concept led to decreased performance. Even though our study involved only one set of formative OSCE, it was evident that familiarity with the concept did enhance student performance. In contrast to our study, a randomized controlled trial done in 2016 showed that a single formative OSCE may not necessarily be the cause of better performance in subsequent summative OSCE ( $p < 0.05$ ) however it did improve the students mean score in the intervention group when compared with formative-OSCE mean. Also summative exam performance is not dependent on the availability of a formative OSCE rather on the quality of the feedback provided to the students which is the main driving force for them to perform better in their final exams.<sup>16</sup>

It has been proven that mock OSCEs are the building blocks of integrated medical education as they provide students with regular, constructive feedback.<sup>17</sup> Our formative OSCE though not entirely similar to the summative OSCE still did benefit students as they got a chance to get accustomed with the method and perform it in real time under similar conditions. A one-time survey of three hundred and fifty students reported that the majority (over 70%) perceived that OSCE assisted them in identifying potential areas worth improving in their practical and clinical skills.<sup>18</sup> In this regard, the role of formative OSCEs becomes even more defined.

### Limitations

Limitations of current study were; it did not compare performance of individual stations in both formative and summative OSCEs. More research is needed in the form of RCTs in order to properly highlight the effect of formative exams.

### CONCLUSION

It was concluded that formative OSCEs have a positive role in improving the performance of medical students in their final exam OSCEs. We need to introduce serial OSCE sessions along with regular feedback in the medical curriculum for better performance of students.

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