

A RANDOMIZED CROSS – SECTIONAL COMPARATIVE STUDY OF OBJECTIVE STRUCTURED PRACTICAL EXAMINATION (OSPE) AND CONVENTIONAL PRACTICAL EXAMINATION (CPE) METHOD FOR GRAM STAIN IN THE DEPARTMENT OF MICROBIOLOGY

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Abstract:

Background: It is mandatory to assess the knowledge, attitude, comprehension & practical skill of the medical students¹. The conventional practical method neglects these aspects & basically emphasizes on summative evaluation only, depicting for overall performance of the students^{1, 2}. Objective Structured Practical Examination (OSPE) tests the students for summative as well as formative evaluation indicating that OSPE is a reliable and valid tool for teaching and learning process². **Aim and Objective:** 1) To evaluate students' performance in practical exercise of Gram staining by OSPE. 2) To compare OSPE with CPE in practical exercise of Gram staining. 3) To obtain feedback from teachers & students regarding OSPE in practical exercise of Gram staining. **Material and Methods:** For the formative assessment in the subject of Microbiology OSPE was introduced for III term II M.B.B.S. students during III term end examination. Students were first evaluated by CPE & then they were subjected to OSPE. A series of 3 stations were arranged at which students worked through task developed to test various skills & were examined using pre validated checklists with the observers deputed at the stations. **Results:** The difference between the marks obtained by OSPE & CPE was statistically significant. The awareness of students and teachers reflected in the acceptability of OSPE among students & teachers. **Interpretation and Conclusion:** OSPE as an assessment tool would assist to increase the objectivity & validity while evaluating competency based skill in Microbiology. Further evaluation of OSPE is necessary to enable teachers to use this precious tool alone or along with CPE^{3, 4, 5}.

Keywords: Evaluation, CPE, Gram stain, Microbiology, OSPE.

INTRODUCTION:

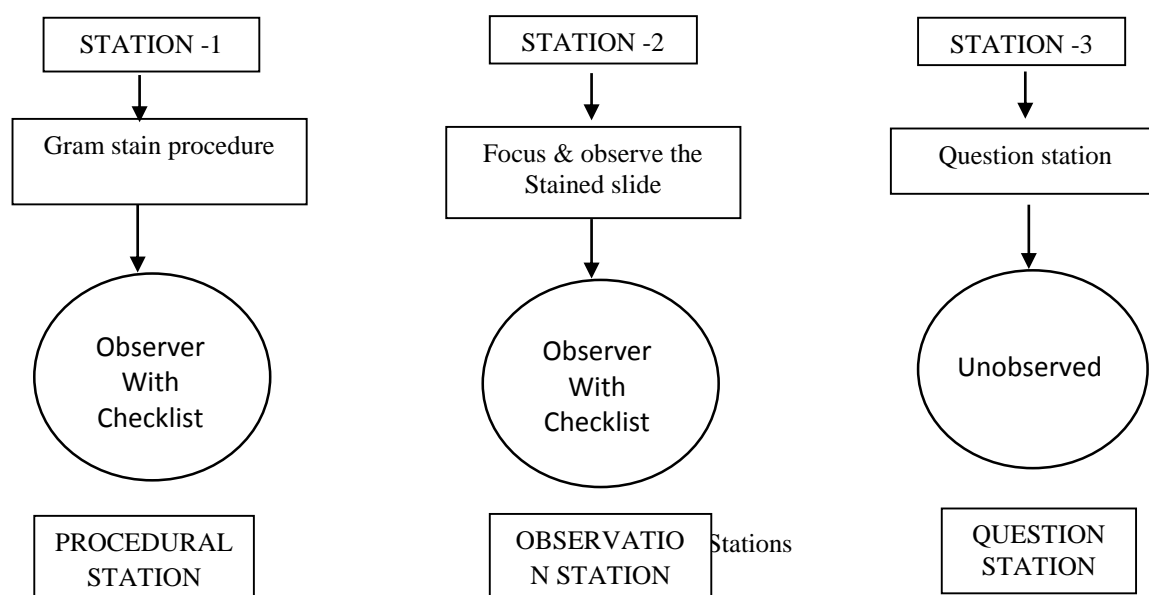
It is most important to develop a good alternative to control the drawbacks of conventional practical examination. OSPE has been proved to do so & for which the present study was designed. The drawback of conventional method of assessment of practical skills of students involves inherent problems in this method^{1, 2, 3}. A lot of bias & subjective factors may lead to incorrect evaluation of competency based skills. OSPE has emerged as a good alternative to rule out such drawbacks of CPE. However integrated efforts are required for conducting OSPE model of assessment. Therefore OSPE is not used routinely in many medical colleges and there are limitations with respect to staff position & available resources. The students & teachers are also unaware regarding OSPE model, its mode of conducting, assessment & evaluation. The conventional method of practical examination basically emphasizes on "knows" and "Knows how" aspect i.e. the lowest level of pyramid of competency based skill^{4, 5}. Thus it was felt that there is a need for i) a more objective and structural method of assessment which focuses both on summative as well as formative evaluation. ii) To obtain students' feedback. iii) To give feedback to the students to make them aware of their weaknesses & to improve their competency based skill. iv) Sensitization of students & teachers regarding a new more objective tool of assessment system – OSPE. The OSPE would reduce the examiners' variability in allotting marks to the students. OSPE has proved advantageous over CPE. The present study was planned to understand II M.B.B.S. III term students' perception regarding OSPE in comparison with CPE in the field of medical microbiology and whether it would be feasible to accept as an assessment tool^{2, 3, 4, 5}.

MATERIALS & METHODS:

This study was carried out in the Department of Microbiology D.Y.Patil Medical College, Kolhapur. 150 students of II M.B.B.S. III Term participated in the study during their III term end examination. The competency based ability with respect to performance of Gram stain was being assessed by both methods OSPE & CPE. The Gram stain was selected as exercise for being quick, simple, and its routine use as microscopic diagnostic tool in various infectious diseases⁶.

The objective of the study include a) To experience whether OSPE can be substituted for CPE for Gram stain? b) To assess teachers' & students' feedback regarding OSPE for Gram stain. c) To know whether the students' stress was decreased during OSPE or not.

150 students of II M.B.B.S. III Term were provided with fixed smear for staining by Gram stain method. Initially they were assessed by conventional practical examination format. Later they were informed to perform the exercise with respect to OSPE format during their third term end examination. Three stations were designed for OSPE format of assessment as follows^{4, 5, 6} –



STATION: 1 Procedure station checklist – **Total Marks for station 1 = 3½** .Student stains the given smear.

Table 1: Checklist of Station No.1:

1 Proper staining technique –	Follows procedure Correctly Tick ✓	Total Marks Allotted for Station 3½
i. Identifies the side of the slide where smear is present.		
ii. Keeps the smear slide on staining rack		
iii. Pours the primary stain Crystal violet and waits for 1 min.		
iv. Wash the smear with gentle tap water		
v. Pours Gram's iodine		
vi. Washes the slide with gentle tap water		
vii. Pours decolouriser 95% Alcohol		
viii. And wait for 30 sec.		
ix. Pours counterstain Safranin and wait for 30 sec. to 1 min.		
x. Washes the slide with gentle tap water		
2. Hand not getting stained		
3. Proper cleaning of work table after procedure		
4. Discards the waste		
5. Questions related to principle of staining & procedure		
What is the utility of Gram stain?		
Name the primary stain used?		
What do you mean by Mordant?		
Name the chemical that is used as Mordant in Gram stain?		

What is the function of the mordant?		
Name the counter stain used in the Gram staining?		
Why do the Gram +ve organism retain the colour of the primary stain?		
Why do the Gram –ve organisms loose the colour of the primary stain & take the colour of the counter stain?		
What are the precautions to be taken during Gram staining?		
Total marks scored at station no.1		

STATION: 2 Observation Station checklists - Total Marks for Station 2 = 3½

Student observes a focused field under oil – immersion objective of compound light microscope and records his / her observation^{4,5,6}

Table 2: Check List for Station 2:

Observation station	Follows procedure Correctly Tick ✓	Total Marks Allotted For Station 3½
Properly adjusts the mirror (Uses plane mirror)		
Adjusts and rack the condenser		
Opens the iris diaphragm completely		
Adjusts the light initially under low power objective		
Focuses the smear by putting a drop of oil under oil – immersion objective		
Time taken to focus the smear under oil immersion objective		
Proper and even staining		
Draws the diagram and records the observation		
Questions related to microscopy, particularly oil – immersion		
i. Define resolution		
ii. What is the resolution of oil – immersion lens?		
iii. What is the purpose of using oil between the objective lens and the smear?		
iv. Name the different oils that are used for this purpose		
v. What is the focal length of oil – immersion lens?		
vi. What is the total magnification with oil – immersion lens?		
vii. Define magnification		
Total marks scored at Station No.2		

STATION: 3 – Question station – Total Marks for station 3 = 03

A prevalidated questionnaire answered by the student at this station

- Who invented this staining technique?
- What type of staining technique is this? Simple or Differential?
- What are the different theories of Gram stain?
- Why the smear is heat fixed?
- What are the modifications of Gram staining?
- Write merits and demerits of Gram staining technique?

Total marks scored at station No.3 =

Table 3 : Total Marks For 3 Stations:

Station No.	Total Marks Obtained
Station 1 (3½)	
Station 2 (3½)	
Station 3 (3)	
Total (10)	

Feedback from students and teachers was obtained.

OBSERVATIONS AND RESULTS:**Table No. 1: Comparison of marks by CPE vs. OSPE**

Sr. No.	Marks Obtained	CPE Format	OSPE Format
1	10 marks	00 (00%)	84 (56%)
2	> 8 marks	19 (12.67%)	142 (94.67%)
3	> 6 marks	45 (30%)	148 (98.67%)
4	5 marks	48 (32%)	2 (1.33%)
5	< 5 marks	38 (25.33%)	00 (00%)

Source of Data: II M.B.B.S.III term end examination result compilation in Dept. of Microbiology D.Y.Patil Medical College, Kolhapur

Whole batch of II M.B.B.S.III – Term students secured good marks in Gram stain exercise assessed by OSPE. In all 84 students (56%) out of 150 got 10 marks (100%). Total 142 participants (94.67%) scored more than 8 marks. Moreover 148 students (98.67%) got more than 6 marks. Only 2 students (1.33%) scored 5 marks. No one had scored less than 5 marks^{7,8}.

On the other hand when these students were subjected to CPE for Gram stain exercise, prior to OSPE, none of the student could score 10 marks. About 19 students (12.67%) got more than 8 marks. Around 45 students (30%) secured more than 6 marks. Moreover 48 students (32%) could score 5 marks and 38 students (25.33%) got less than 5 marks^{9,10}.

Feedback from the students

Sr.No.	Questions	Yes	Somewhat	No
1	Were you prior sensitized about OSPE	114 (76%)	28 (18.67)	08 (05.33%)
2	Was the exam stressful	134 (89.33%)	12 (08%)	04 (02.67%)
3	Was OSPE well structured, relevant & uniform	137 (91.33%)	00 (00%)	13 (08.67%)
4	Was time given at each station sufficient	135 (90%)	00 (00%)	15 (10%)
5	Did the questions cover the appropriate knowledge area	145 (96.67%)	04 (2.67%)	01 (0.67%)
6	Should OSPE be included in future as a method of assessment in practical	141 (94%)	07 (4.67%)	02 (1.33%)
7	OSPE encourages to pay more attention to practical examination	116 (77.33%)	26 (17.33)	8 (5.33%)
8	Checklist were fair & unbiased	142 (94.67%)	5 (3.33%)	3 (2%)
9	Instructions were clear & adequate	116 (77.33%)	26 (17.33%)	8 (5.33%)
10	OSPE is more satisfying than CPE	120 (80%)	24 (16%)	6 (4%)
11	OSPE highlights the area of weaknesses in the subject	120 (80%)	24 (16%)	6 (4%)
12	OSPE reduces elements of luck in the examination	104 (69.33%)	34 (22.67%)	12 (8%)
13	CPE has more interaction compared to OSPE	12 (08%)	16 (10.67%)	122 (81.33%)

DISCUSSION:

The efficacy, applicability and influence of pursuit with respect to their objectives are comprehensively and rationally decided by the evaluation process. Hence it is mandatory that the evaluation should judge the cognitive, psychomotor and affective domains^{1,2,3}. Conventional Practical Examination (CPE) method is inherited with many drawbacks. In addition to the performance of the students, myriads of other factors such as experiment inherent factors, status & working condition of the instruments, status of reagents and stains & examiner's bias play a significant role in the scoring of the marks. CPE takes into consideration only the final summative result, but an individual competency based practical skill is not evaluated to allot marks. This drawback of CPE leads to incomplete, prejudiced, & biased assessment. The students are judged only for knowledge & comprehension i.e. cognitive domain^{3,4,5}. Psychomotor & affective domains are not evaluated in the conventional practical examination. Thus there is a need to develop a new method of assessment which would assess the students equally for cognitive, psychomotor & affective domains. The objective structured practical examination (OSPE) serves to be the most promising method. OSPE was described by Harden & his group in 1975^{10,11,12}. The check list for the procedural, observational and unobserved stations and evaluated marks of the questions were provided to the students. The students were satisfied for what they achieved and identified where they are weak and where is the scope for improvement. Majority of the students (137 – 91.33%) appreciated towards the structure, relevance and uniformity of the evaluation process. About 145 students (96.67%) opined about the knowledge, comprehension, competency based skill and affective domain being judged in this method^{3,4}. 120 (80%) students liked about the feedback they got after completion of Gram stain exercise as they came to know their weaknesses and the scope for improvement. OSPE was acceptable to the students and they indicated in favor of OSPE. The feedback, we received from students enlightened us about the scope for improvement. This study highlighted the importance of students' role in development & refinement of the new evaluation method. All the faculty members gave positive feedback regarding OSPE as a better tool for practical assessment of the students & moreover they also expressed that it should be carried out frequently in the department. This feedback was consistent with other studies which revealed OSPE as better method for practical assessment of students^{3,4,5,6}. Objective Structured Practical Examination (OSPE) is a better

tool for the formative assessment of competency based practical skills of the undergraduate students as compared to Conventional Practical Examination (CPE).

CONCLUSION:

To conclude we feel that OSPE is a better, rational and relevant tool for formative assessment. It has so many advantages. It is difficult to conduct OSPE. But we can make efforts to include it as a tool for evaluation with respect to internal assessment. If conducted frequently both teachers & students will be accustomed and benefited^{3, 4, 5}.

ISSUE OF CONFLICT ANY:

No any conflict as the analysis of feedback carried out after prior consent from the students.

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