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**ORIGINAL ARTICLE****Acceptability, Feasibility and Feedback Analysis of Perception for Objective Structured Practical Examination As an Assessment Tool in Undergraduate in Competency Based Medical Education**

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**Abstract:**

*Background:* There is an increasing tendency to use Objective Structured Practical examination (OSPE) as an evaluation tool of practical performance in medical education. *Aim and Objectives:* The objective of the present study was to determine the acceptability and feasibility of OSPE as an assessment tool of formative examination by feedback analysis in the microbiology subject in 2<sup>nd</sup> year MBBS undergraduate students and to discuss the pros and cons of OSPE method. *Material and Methods:* A well organized comprehensive ten OSPE stations were arranged to assess the practical skills of 2<sup>nd</sup> year MBBS students in the department of microbiology. The practical performance skill of 50 second year undergraduate MBBS students were assessed by OSPE for microbiology subject by creating 10 structured stations of OSPE. The stations were written so as to cover major important practical microbiology topics of 2<sup>nd</sup> year MBBS. The practical tasks chosen for the OSPE were mapped as per learning objectives of the course and the expected level of learning of the students. *Results:* A qualitative feedback from the examiners/ observers and the students was taken to assess acceptability feasibility of OSPE assessment. The examiners and the students were asked to rate OSPE by five point Likert scale Questionnaires. For the majority of students (92%) and examiners/ observers (100%) OSPE session was acceptable ( $p < 0.001$ ). All examiners perceived OSPE method as feasible assessment tool ( $p < 0.001$ ). Majority of the examiners and the students were in agreement or strongly in agreement in Likert scale rating for feedback analysis of OSPE session. There

was no significant statistical difference among students and examiners/observers (Chi-square:1.5184; DF:5;  $p = 0.8234$ ). *Conclusions:* The OSPE is reliable and reproducible practical assessment tool and yields dependable information about the practical performance capabilities and competence of individual student and can be used as an additional assessing tool in competency based medical education. We favor introduction of OSPE method of evaluation in our setup as it covers all domains and different aspects.

**Keywords:** Objective Structured Practical Examination, Microbiology, Acceptability, Feasibility, Likert Scale, competency based medical education

**Introduction:**

Assessment is an integral component of competency based medical education. Over a period of time the methods of student assessment in medical education have changed. We have moved from a standard of pen-and-paper tests of knowledge toward a more complex system of evaluation. The use of Objective Structured Practical Examinations (OSPEs) in the quantitative assessment of competence has become widespread in the field of undergraduate and postgraduate medical education, mainly due to the improved reliability and unbiased method of this assessment format. It offers a fairer test of candidate's practical abilities, as all the candidates

are presented to the same task. This is an assessment format in which the candidates rotate around a circuit of stations, at each of which specific tasks have to be performed, usually involving a practical skill. The marking scheme for each station is structured and determined in advance in the form of checklist. So far not many published documents are available in Indian context about use of OSPE in medical education assessment [1]. A traditional Practical examination in Microbiology focuses on the “knows” and “knows how” aspects and is inadequate in evaluating the overall performance of the students [2]. OSPE focuses on the “shows how” aspect of Miller's pyramid of competence. New assessment tools have also been designed to test new core educational objectives and OSPE is one of them. The majority of institutes still follow the conventional method of assessment [2, 3]. This study was conducted to study perception, acceptability and feasibility of OSPE as an assessment tool in the undergraduate microbiology subject by feedback analysis of examiners (observers) and students.

#### **Material & Methods:**

A well organized comprehensive ten OSPE stations were arranged to assess the practical skills of 2<sup>nd</sup> year undergraduates MBBS students of the KIMSUDU Karad, teaching hospitals. The study was approved by Protocol and Ethics committee of Krishna Institute of medical sciences Deemed University Karad. The objective of the present study was to conduct OSPE in microbiology for 2<sup>nd</sup> year MBBS undergraduate 4<sup>th</sup> semester students. To determine the acceptability and feasibility of OSPE from the feedback analysis from the examiners (observers) and the students for OSPE as an assessment tool in the microbiology and to discuss the pros and cons of

the OSPE. The practical performance skill of practical batch of fifty 2<sup>nd</sup> year undergraduate MBBS students were enrolled and assessed by OSPE were subjected to 10 structured stations of OSPE each of three minute duration.

The practical tasks chosen for the OSPE was mapped onto the learning objectives of the curriculum and the candidate's level of learning. The blueprint of OSPE session was made and stations were written so as to ensure, different domains and skill can be tested. The stations were written so as to cover major important practical microbiology topics of 2<sup>nd</sup> year MBBS. The study was conducted on 10<sup>th</sup> September 2014, in the department of microbiology. The OSPE was conducted in two batches [9am to 12 pm and 1 pm to 4 pm] of 25 students each. Total ten stations were arranged for the OSPE session, according to the standard protocol [1]. The students were tested on what they have been taught, which was appropriate for MBBS undergraduate learners. The stations were written by senior faculties to cover about 60% Must Know (MK), 30% Desirable to Know (DK) and 10% Nice to Know (NK) type of questions/ tasks in subject of Microbiology. OSPE stations questionnaire/ tasks and checklist were well structured and pre validated by faculty of microbiology after discussion with necessary modification (content validity). **Blue print of OSPE session:** The venue was arranged for OSPE in the practical hall of microbiology department. All candidates were given clear instructions that, exactly what task they should perform at each of the stations. The examiners were given instructions of giving marks at the given station according to the checklist provided to them for the individual student so that the students and examiners understand their respective roles clearly and precisely during conduct of OSPE. At the beginning of the examination, attendance and

signature of all the students and examiner were taken. The required instruments and material was provided at the respective station. Of the total 10 stations 5 stations were observed for testing their technical skill (station 2, 3, 7, 8 and 10). Each station was allotted three minutes to answer and 30 seconds were given in between station. Each station was structured in to three subsets of observations/tasks / questions, carrying one mark each with additional two marks for global assessment (how students technically handle instrument, uses microscope, mount and focus slides (Table 1). All the stations were numbered one to ten on large signs to assist the candidates to follow the circuit. The OSPE was arranged so that all students could go round in a circle. (Fig. 1) Mark sheet were prepared for fifty students and distributed to all ten examiners. The loud manual bell was used for keeping timing at the stations. A questionnaire on various components of the OSPE was administered to get the feedback. After the examination of OSPE feedback form according to Likert scale (Strongly Agree, Agree, Undecided, Disagree and Strongly disagree) was distributed to students and observers (examiners) and was analyzed [4]. Feedback questionnaires included total 11 questionnaires common for both students and examiners and 12<sup>th</sup> number question was only for examiners (Table 2). The final mark sheet of the students was prepared as part of assessment. Coefficient of reliability of questions administered for OSPE stations was done by calculating Cronbach's alpha [5].

### Results:

Total fifty 2<sup>nd</sup> year MBBS students were enrolled for present study for OSPE stations feedback analysis. The mean score and standard deviation of OSPE stations of the students is shown in Table 3 and Fig.2.

The 'p' value for Analysis of variance (ANOVA) was <0.0001, F: 8.614. The station 9<sup>th</sup> had highest

and station 10<sup>th</sup> had lowest mean score. The mean standard deviation of score of individual OSPE station is shown in Table 3. The mean and standard deviation for total score of present OSPE was 36.6 ( $\pm 4.284$ ) Minimum score 31(62%), Maximum score 47(94%).

Total 16 (32%) students were in 31-35, 25(50%) students in 36-40, 6(12%) students in 41-45 and 3(6%) students had  $\geq 46$  score. (Fig. 3)

Coefficient of reliability of questions administered was done by calculating Cronbach's alpha. The OSPE stations variances is shown in Table 4.

Cronbach's alpha of the questions administered at stations showed to be having high internal consistency Cronbach's alpha ( $r$ )=0.8063. OSPE was reliable assessment method with high internal consistency (Table 5 and Fig. 4).

Feedback analysis of perception for OSPE from the examiners (observers/ faculties) and student was done. Examiners and students were asked to rate the OSPE on Likert's scale, as an assessment tool in competency based curriculum. As per Likert scale rating majority of students 41 (82%) and examiners 8 (80%) were agree for the acceptability, reliability Cronbach's alpha score ( $r$ )=0.814 and feasibility of OSPE session in the form of their individual perception ( $p < 0.001$ ). Total 5 (10%) students and 2 (20%) examiners were strongly agreed for using OSPE as an assessment tool. Total 2 (4%) students were undecided and disagree on Likert scale rating each. (Fig.5) Majority of examiners and students were either agree or strongly agree in Likert scale rating for feedback analysis of OSPE session with no significant statistical difference among student and examiners (Chi-square: 1.5184;  $p = 0.8234$ ). All examiners were agreed for feasibility of OSPE in terms of resources and time was at par to the conventional method of practical examination.

**Table 1: OSPE Stations Task and Checklist in Microbiology for UG Students**

Task for the students	Checklist for the Examiners
<b>Station 1:</b>	
1. Identify the given device used in serology. 2. Name the serological technique in which it is used? 3. Give two clinical applications of this test?	1. ELISA microtitre plate 2. Enzyme Linked Immunosorbant Assay (ELISA) 3. To detect antigen/antibody HIV and Hepatitis B
<b>Station 2: [Observed station]</b>	
1. Mount and focus slide with write microscopic findings 2. What is the likely organism? 3. What is the stain used?	1. Mount under 40 × [high power] Budding yeast surrounded by a large capsule 2. Cryptococcus neoformans 3. India Ink preparation
<b>Station 3: [Observed station]</b>	
1. Mount the slide, focus and give the microscopic finding. 2. Write two characteristic features of the egg seen 3. Mention one complication caused by parasite	1. Mount under 40 × [high power], Egg of Hookworm 2. Thin egg shell with segmented ovum 3. Iron deficiency anaemia
<b>Station 4:</b>	
1. Identify the given test. 2. What is the medium used? 3. Name the antibiotic which are showing sensitivity zone	1. Antibiotic susceptibility testing by Kirby-Bauer disc diffusion method 2. Mueller Hinton Agar 3. Amikacin (AK), Ofloxacin (OF)
<b>Station 5:</b>	
1. Identify the biochemical test. 2. Mention the indicator used 3. Name 2 organisms which are positive for this test?	1. Citrate test 2. Bromothymol blue 3. Pseudomonas, Citrobacter
<b>Station 6:</b>	
1. Identify the instrument. 2. Mention its use 3. Name two organisms that require anaerobic environment for growth	1. Anaerobic jar 2. Used for anaerobiosis 3. Clostridium, Bacteriodes
<b>Station 7: [Observed station]</b>	
1. Mount the slide technically and give the microscopic findings 2. Name the organism with characters 3. What should be done to confirm the diagnosis?	1. Under oil immersion, ZN stain shows Acid Fast Bacilli as bright pink rods 2. Mycobacterium tuberculosis 3. Culture on Lowenstein Jensen (LJ) medium
<b>Station 8: [Observed station]</b>	
1. Mount and focus the slide and give the morphology and arrangement of the bacteria of focused slide 2. If on Blood agar culture the organism yields golden yellow colonies, what is organism? 3. Test to perform to confirm the organism?	1. Under oil immersion, gram staining, Gram positive cocci in grape like clusters 2. Staphylococcus aureus 3. Coagulase test
<b>Station 9:</b>	
1. Identify the given medium. 2. Which dye is added to this medium? 3. What is the use of this medium?	1. Lowenstein Jensen Medium 2. Malachite Green 3. Growth of Mycobacteria
<b>Station 10: [Observed station]</b>	
1. Hold the instrument technically and name the instrument. 2. Mention the method of sterilization 3. What is the use of this instrument?	1. Hold like Pencil, Inoculating loop 2. Flaming to red hot 3. Inoculation of samples on culture media

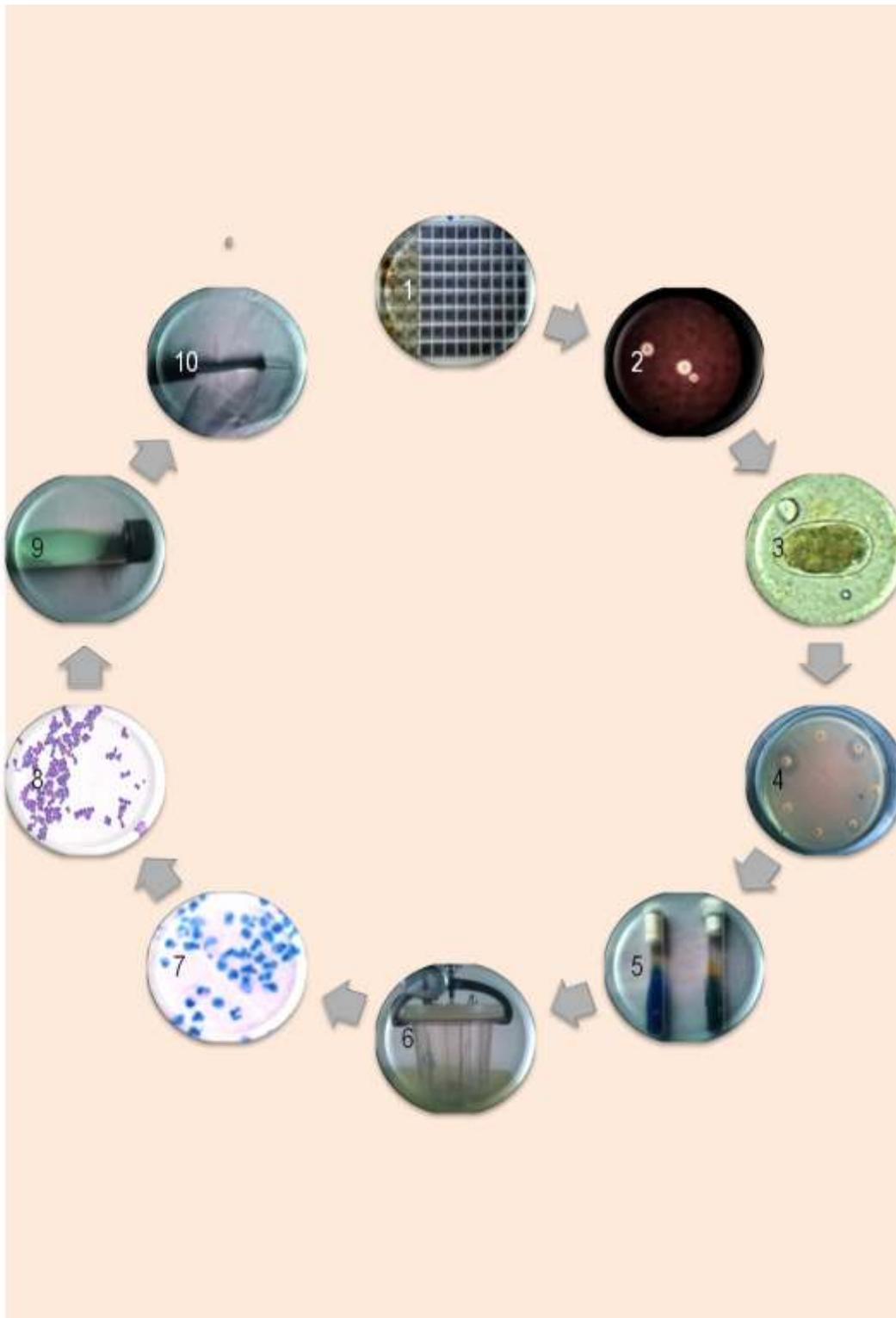


Fig. 1: Schematic Practical Arrangement of Stations [1-10] for OSPE

**Table 2: Feedback Questionnaires of OSPE Session for Students and Examiner/ Observers [Likert Scale]**

No	Questionnaires	SA	A	Ud	Da	SD
1	Orientation of OSPE session was adequate					
2	OSPE stations were well organized and comfortable					
3	OSPE stations were organized to cover topic taught/syllabus covered					
4	Sufficient time was given for each station					
5	Questions given in the stations were clear, comprehensible and transparent					
6	Stations were both observed and unobserved objective type					
7	OSPE is unbiased and better than traditional method of practical examination					
8	OSPE stations were objective and better for assessing cognitive and psychomotor domains					
9	OSPE helps in scoring better than traditional assessment methods an less stressful					
10	OSPE helps in learning as well as assessment in CBME					
11	OSPE should be introduced in microbiology as an assessment tool for both formative and summative assessment					
12	Feasibility of OSPE in terms of resources and time were at par to the conventional method of practical examination [for examiners/faculty]					

(**Abbreviations:** SA: strongly agree, A: agree, Ud: undecided, Da: disagree, SA: strongly disagree)

**Table 3: Mean, Standard Deviation of Score for Individual Station**

Station	St-1	St-2	St-3	St-4	St-5	St-6	St-7	St-8	St-9	St-10
Mean	3.76	3.72	3.68	3.84	3.7	3.56	3.72	3.34	4.06	2.98
SD	0.4314	0.7295	0.5126	0.650275	0.7889	0.7866	0.92670	0.55732	0.8668	0.6848

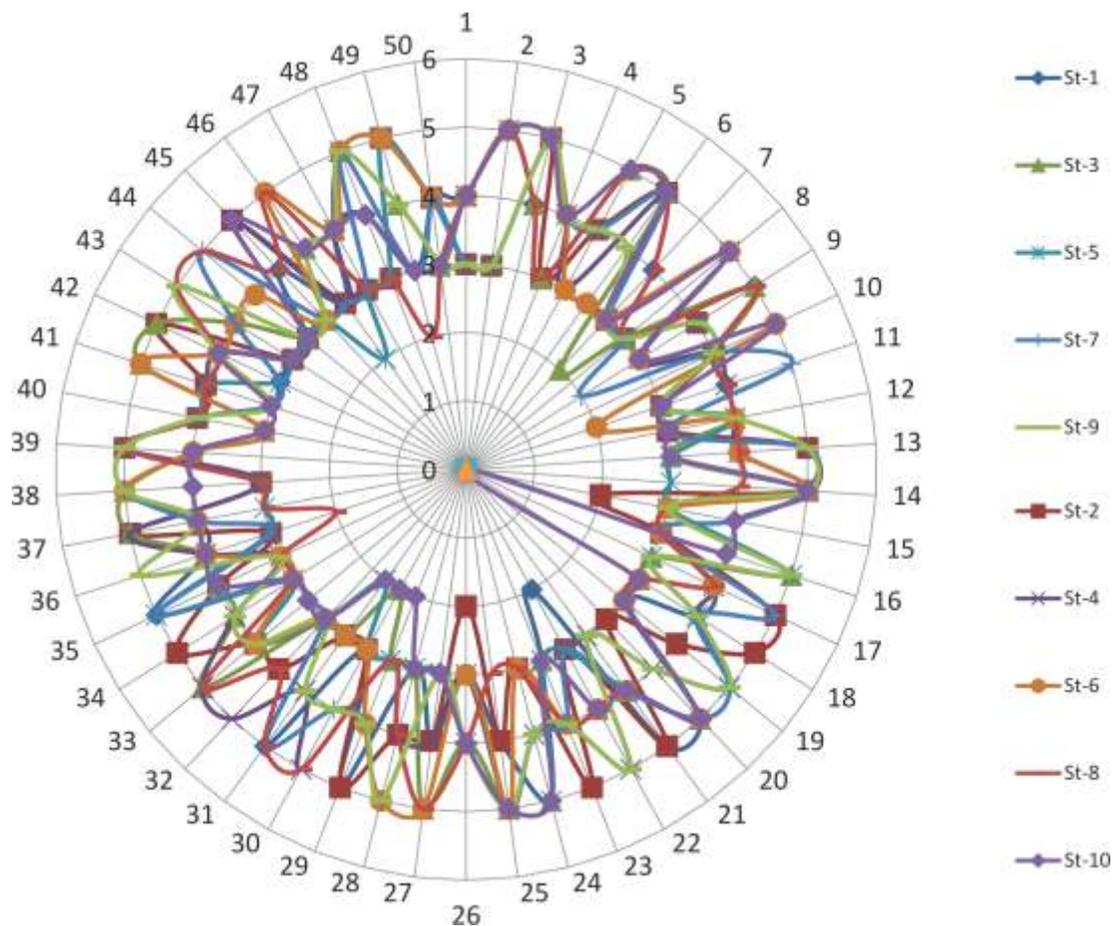


Fig. 2: OSPE Score of 50 Students of 2<sup>nd</sup> year MBBS

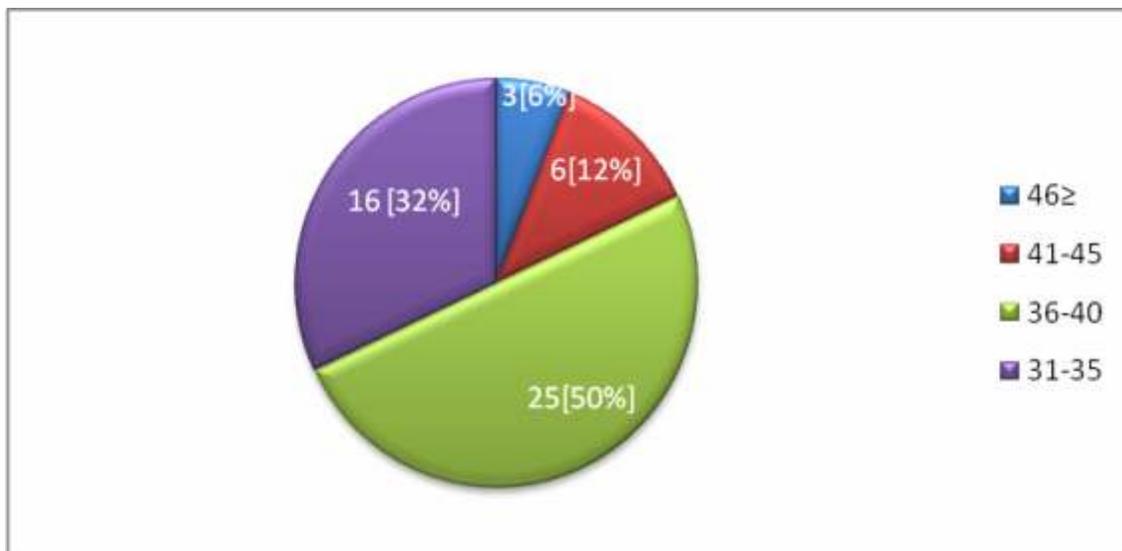


Fig. 3: Frequency Distribution of OSPE Score

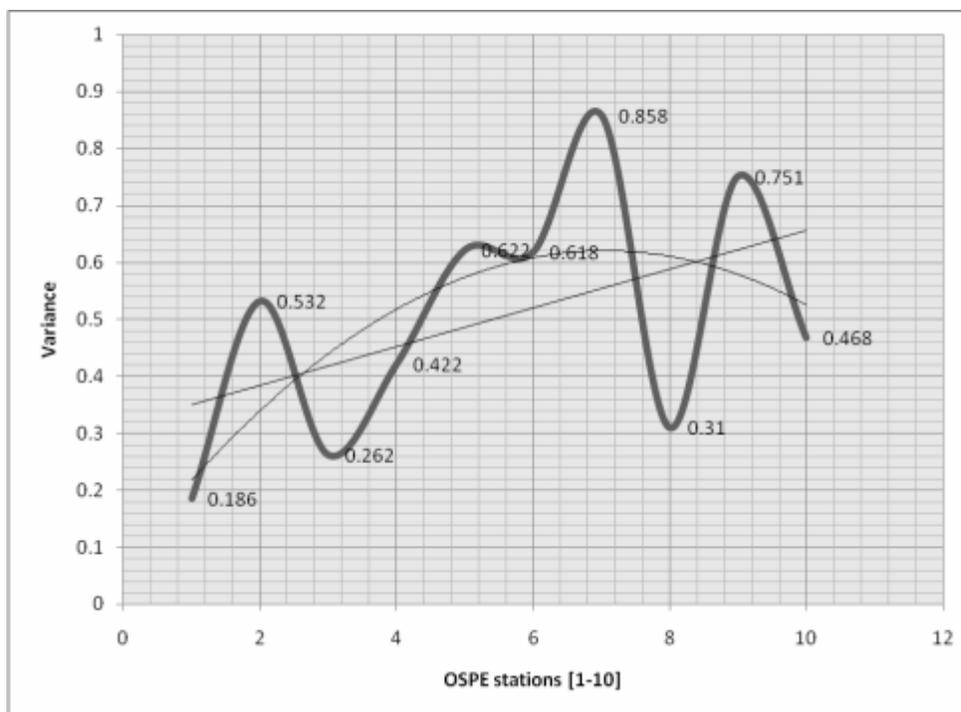
**Table 4: Stations variances in Cronbach's alpha analysis for the stations**

Station	St-1	St-2	St-3	St-4	St-5	St-6	St-7	St-8	St-9	St-10
Stations variances	0.186	0.532	0.262	0.422	0.622	0.618	0.858	0.310	0.751	0.468

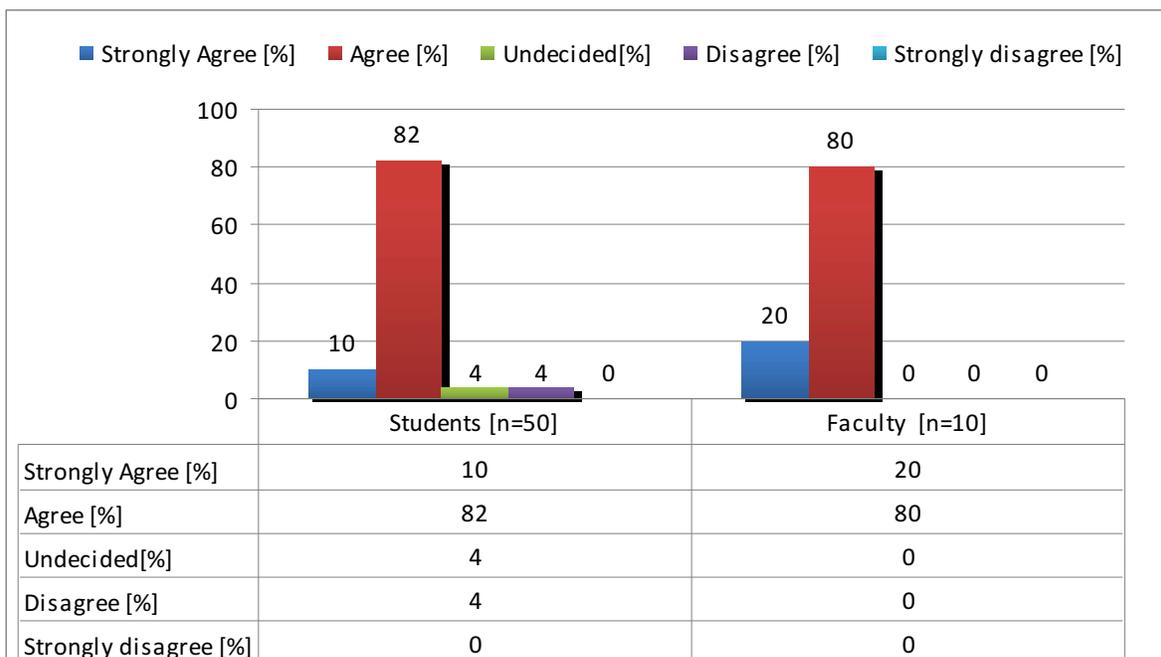
**Table 5: Analysis of Cronbach's alpha (r)**

Statistics for persons		Sum of stations variance	7.175
Mean persons	36.367	SEM [Standard Error of Measurement]	1.885
SD persons	4.285	SEM (alternative formula)	2.365
Variance persons	18.358	SEM	2.244
<i>Cronbach's alpha (r) = 0.806 [significant]</i>			

[Note: Cronbach's alpha, a reliability coefficient of 0.80 or higher is considered as "acceptable"]



**Fig. 4: Stations Variances in Cronbach's alpha**



**Fig.5: Feedback Analysis of Examiners/ Observers and Student by Likert's Scale**

**Discussion:**

The conventional practical examinations format as an assessment tool has its own drawbacks. Conventional/ traditional marking depends on student variability, practical task variability and examiner variability which significantly affect scoring. The marks awarded also reflect only the global performance of the candidate and are not based on demonstration of individual competencies. Attitudes are usually not tested at all by the conventional examination. An earlier innovation in this regard is the Objective Structured Clinical Examination (OSCE) later extended to the practical examination (OSPE) described in 1975 and in greater detail in 1979 by Harden. This method with some modifications has largely overcome the problems of the conventional clinical examinations. Main features of OSCE/OSPE are that, both the methods give importance to individual competencies [1]. Assessment of students in medicine has always

remained debatable. It is seen as the single strongest determinant of what students actually learn (as opposed to what they are taught), and is considered to be uniquely powerful as a tool for manipulating the whole education process. There are continuous attempts to make assessment more objective and reliable rather than subjective. Traditional, age-old methods like essay type questions, which suffer from lack of objectivity, are giving way to newer objective methods of assessment in the form of multiple choice questions, short answer questions, and such other tools, for assessment of cognitive domain. As far as skills assessment is concerned the conventional methods are not only subjective in nature, but also lack scope for direct observation of the performance of skills by the assessor. Moreover the coverage of contents may be limited. Hence, attempts have been made to introduce methods that can overcome the above-mentioned limitations. For assessment in preclinical and

para-clinical subjects, a modified version of the OSCE, the OSPE has been introduced. In India, the use of OSPE for assessment of skills has been reported from some institutes [2]. OSPE assessments have been a core element of assessment in competency based medical education. OSPE enable assessment of theoretical, practical and problem-solving skills at multiple stations. A single assessment tool does not fulfill all the functions of assessment. As we know every evaluation tool has its own advantages and drawbacks, same is true about OSPE. Despite a radical shift in assessment methodologies over the last decade, the majority of medical colleges still follow the Traditional Practical Examination (TPE). TPE raises concerns about examiner variability, standardization, and uniformity of assessment [6]. Despite its usefulness, awareness and motivation to use the OSPE, still needs to be probed. Similar to our study Ananthkrishnan *et al*, Al-Mously *et al*, Abraham *et al* and Nayar *et al* reported the acceptability of OSPE [1,7-9]. Undergraduate medical education is currently undergoing extensive re-evaluation with new core educational objectives being defined. Consequently, new exam systems have also been designed to test the objectives [10]. In the present study, by five point Likert scale rating majority of students (82%) and examiners/ observers (80%) were strongly in agreement for the acceptability, reliability and feasibility of OSPE session in the form of their respective individual perception ( $p < 0.001$ ). Total 80% students and 82% examiners were in agreement for using OSPE and 10% students and 20% examiners were strongly agree for OSPE as an assessment tool. Similarly Ibrahim *et al* in their study of perception of medical students and interns about different assessment formats using 3 points Likert scale found that, OSCE (74.1%) and

OSPE (70.6%) were good tools for assessing clinical competencies [11]. In present study two stations were arranged for staining (Gram and Acid Fast Bacilli) and the overall feedback from examiners and students were encouraging for conducting OSPE, which cover psychomotor and cognitive domains. Ashok *et al* compared the conventional method of assessment with OSPE to assess skill competency to perform Gram stain in 25 undergraduate students and observed a significant improvement in the scores obtained by the students in OSPE in comparison to the conventional method ( $p < 0.001$ ) [12]. In our study out of total 10 examiners three were Professors, three were Associate Professors, one was Lecturer and three were tutors or postgraduate students with fairly comparable at par scores with reliability. Similarly, Wani *et al* concluded that, OSPE is an objective, structured, unbiased assessment method that can be incorporated with less experienced examiners for assessment of the students [13]. Similar to our observations, Nasir *et al* studied applied Sciences student's feedback for OSPE in the basic medical sciences in 100 students from different courses of public health, nursing and dental technology and concluded that, the OSPE is an effective/unbiased and authentic mode of assessment [14]. In present study, in five point Likert scale rating, 82% of students and 80% of examiners/ observers in agreement and 10% students and 20% examiners were strongly in agreement for the reliability and feasibility of OSPE assessment. Similarly Malhotra *et al* analyzed students' perceptions for five-station OSPE in pharmacology and, found that, 73% thought that OSPE could partially or completely replace conventional practical examination. Use of OSPE is feasible for formative assessment in the undergraduate pharmacology curriculum [2]. Similar to our study Jaswal *et al* and Feroze *et al*

reported that, OSPE was more objective, measured practical skills better, had a wide discrimination index and eliminated examiner bias with high acceptance rate for OSPE[6, 10]. Feedback from students and examiners/ observers indicated that they endorsed OSPE. In present study Likert feedback analysis showed that OSPE tested objectivity, measured practical skills better, and eliminated examiner bias to a greater extent, similarly Kundu *et al* concluded OSPE as a method of assessment of practical skills and learning and to determine student satisfaction regarding the OSPE [3]. Abraham *et al* studied feedback analysis of students and found that they favored OSPE compared with the Traditional Practical Examination (TPE).[8] Rehman *et al* stated that, OSPE as an easy, uniform, fair, un-stressful and un-biased method of examination for practical examination[15]. Rahman *et al*, Yaqinuddin *et al* and Dandannavar *et al* quoted that, OSPE is a better choice as an assessment [16-18]. OSPE is a reliable device with good capacity to differentiate between different categories of students. It is uniform and a fair method of assessment as there is uniformity of questions. For performance discrimination OSPE is important as individual competencies are tested (practical skills and attitudes), improving the quality of student performance in laboratory exercises. OSPE provides careful specifications of contents (validity), observation of wide sample of activities (reliability), can be conducted within the available

resources and time (feasibility) and each student has to perform same task (uniformity). Present study yielded promising feedback from students and examiners to endorse OSPE as an assessment tool in subject of microbiology.

#### **Conclusions:**

Present study concludes that, OSPE is well acceptable, reliable and feasible method of assessing practical skill of undergraduate students perceived by examiners and students. The OSPE is reliable and reproducible practical assessment tool and yields dependable information about the practical performance capabilities and competence of individual student and can be used as an additional assessing tool in competency based medical education. The practical task used for the present study was valid and reliable. Subjectivity and inter-examiner bias was minimal in this assessment method. Present study favors to introduce OSPE method of evaluation in our setup. Presently, the Indian experiences with OSPE are limited and there is a need to sensitize faculty and students.

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