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Original Article

Virtual Image-Based Objective Structured Practical Examination: An Innovative Method of Practical Internal Assessment for Pathology Undergraduate Students During the COVID-19 Pandemic

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Abstract

Background: The covid-19 pandemic has a huge impact on the medical education in India especially the undergraduate medical course. We follow the curriculum based medical education (CBME) as set up by the national medical council in India. Conducting the practical internal assessment for pathology undergraduate students virtually was challenging and we conducted the same using the "Virtual Image based - objective structured practical examination (OSPE)".

Objectives: To analyze the effectiveness and impact of virtual image based OSPE as a method of internal assessment for pathology undergraduate students during the covid-19 pandemic.

Methods: A total of 198 students took part in the Virtual image based –OSPE pattern of examination. Each OSPE was well structured and had image based questions for 5 marks each. A clinical history was attached with each case and included images of gross morphology and appropriate microscopic pictures. A feedback was taken from the students regarding the image based-OSPE. The feedback included 10 questions assessed on a 5 point Likert scale.

Results: The online image based OSPE was conducted with ease using the online digital software-"jssu online", successfully simulating the actual offline experience. Answer scripts were uploaded online and the correction was done using the university digital software. The feedback was given by 177 second year MBBS students. The assessment pattern being new and exciting, was received well by majority of the students.

Conclusion: Virtual image based OSPE's are a good substitute for conducting the online practical internal assessment for undergraduate pathology students during the covid-19 pandemic. Especially in universities with a good digital platform, these can be used with ease.

Keywords: Virtual; OSPE; Covid; Digital

Background

The COVID-19 pandemic had a significant impact on medical education in India, particularly the undergraduate medical course. With the suspension of regular classes, many institutes turned to virtual teaching and learning, using various available technologies for both theoretical and practical sessions. The undergraduate medical curriculum in India follows the curriculum-based medical education (CBME) pattern established by the National Medical Council (NMC). Conducting practical internal assessments for pathology undergraduate students virtually posed a challenge.

One of the practical assessment methods considered for pathology undergraduate students is objective structured practical examination (OSPE). OSPE aims to reduce subjectivity and enhance students' practical knowledge. However, it can be labor-intensive (1-3) and has also been used for formative assessment of students. During the COVID-19 pandemic, our college conducted practical internal assessments virtually using image-based OSPE.

Currently, medical colleges in India conduct practical internal sessions using gross specimens and

microscopic slides, typically involving 5-10 stations, which can be labor-intensive and time-consuming. Virtual OSPE, on the other hand, is a time-saving method that can be conducted for a large number of students simultaneously. It can also include questions related to various topics, such as hematology, blood banking, flow cytometry, special stains, immunohistochemistry, and molecular techniques in practical sessions. Therefore, it can be introduced as a regular method of internal assessment in addition to traditional methods. Furthermore, it can serve as a valuable teaching and learning tool for undergraduate medical students, contributing to the world of technology-based learning in pathology.

Objectives

The study aimed to analyze the effectiveness and impact of virtual image-based OSPE as a method of internal assessment.

Methods

A cross-sectional study was conducted to assess the effectiveness of virtual OSPE after the ethical committee approval. A total of 177 undergraduate medical students in the second year of their MBBS program participated in the virtual image-based OSPE. Convenient sampling was used as the sampling method, and the students' ages ranged from 19 to 22 years. Among the participants, 52% were females, and 48% were males. Initially, the virtual image-based OSPE was conducted as a "formative assessment-unit test" to familiarize the students with the virtual image-based OSPE format before the practical internal assessment.

Each OSPE was well-structured and had image-based questions for 5 marks each. A clinical history was attached to each case, which included images of gross morphology and appropriate microscopic pictures. OSPEs related to hematology and blood banking included images of peripheral smears, bone marrow aspiration and biopsy, histograms, and images related to special investigations such as osmotic fragility, hemoglobin electrophoresis, and Coombs test. Additionally, images related to blood grouping were also included (Figures 1, 2, 3).

Figure 1: An OSPE created on Tuberculosis

A 40 year old male with history of alcohol abuse had increasing abdominal girth for the past one year. On examination he had yellowish discoloration of his eyes.

A cut section of the liver parenchyma is shown.

a) Describe the gross morphological features seen (1 mark).
b) Describe the microscopic features seen (1 mark).

Figure 1 & Figure 2 are microscopic pictures of special stains used in the diagnosis of this disease.

c) Name the special stains used as seen in Figure 1 and Figure 2 (0.5+0.5marks).
d) What is the biochemical molecule that has accumulated within the liver? (1 Mark)
e) Mention any four causes for this pathological change. (1 mark)

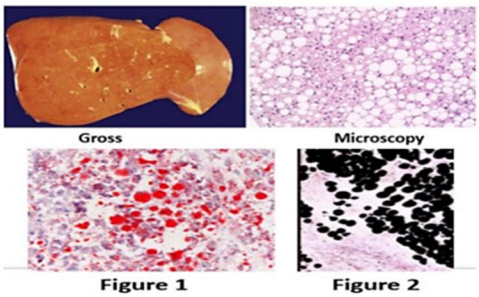

Figure 2: An OSPE created on Fatty change

For each OSPE, students were required to answer approximately 5 to 6 questions based on the provided history and images.

The implementation of the virtual image-based OSPE as an assessment method for the internal evaluation of pathology undergraduate students was facilitated through our university's digital software, "jssu.online." Each image-based OSPE was uploaded to the digital content section of our university's website, where an internal assessment was created. Students were provided with a total of 7 image-based OSPEs to complete, with a time limit of 10 min allocated for each OSPE. Additionally, a timed PowerPoint presentation of the OSPE was prepared as a backup in case students encountered login issues.

To participate, students were required to log in through the university's website portal and access the internal assessment. Students scanned their answer scripts and uploaded them online. The grading process was also conducted using the university's digital software (Figure 4). Furthermore, students were asked to complete a pre-validated questionnaire, which had been assessed and approved by the medical education unit for virtual image-based OSPE.

A 9 year old child presents with pallor, jaundice and splenomegaly with a family history of jaundice.

a.Describe the peripheral smear findings(2marks)
b.What is the diagnosis? Give two points in favour of your diagnosis(2marks)
c.What is the underlying molecular defect?(2marks)
d.What type of hemolysis do you see in this condition?(1marks)
e.Identify the test in the photograph.(1mark)
f.What are the other confirmatory tests to diagnose this condition.(2marks)

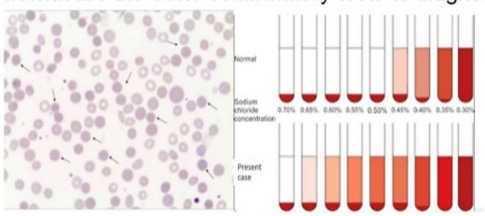

Figure 3: An OSPE created on Hereditary spherocytosis

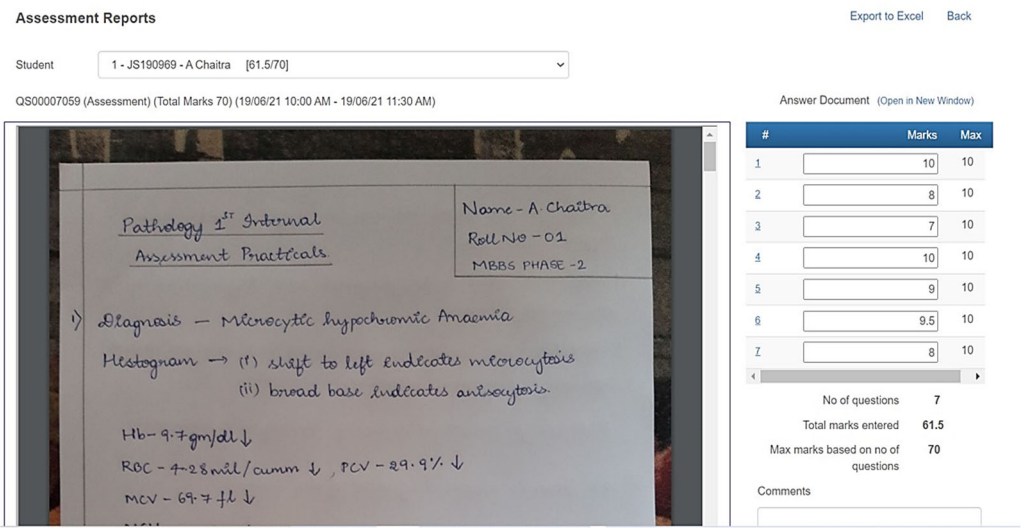

Figure 4: This figure shows assessment of answer scripts with evaluated marks on the right hand side.

This questionnaire included 10 questions and used a 5-point Likert scale for evaluation.

Results

The virtual image-based OSPE was smoothly conducted through the virtual digital software "jssu online," effectively replicating the experience of offline assessments. Feedback on the OSPE was obtained from 177 second-year MBBS students who participated in this novel and engaging assessment method. The students responded positively to the assessment pattern.

The majority (96.1%) of students agreed that the image-based OSPE was well-structured and logically sequenced. Additionally, 91.5% of students recognized that relevant questions were posed for each image-based OSPE, and 87% felt that these image-based OSPEs were comprehensive and conceptually sound (Figure 5).

More than 75% of students indicated that all the objectives of laboratory teaching were adequately assessed, and sufficient time was given to answer each image-based OSPE. Furthermore, over 85% of students expressed that OSPE in hematology stimulated their analytical skills (Figure 6).

More than 90% of students believed that image-based OSPEs contributed to improving their clinical knowledge and motivation to learn effectively.

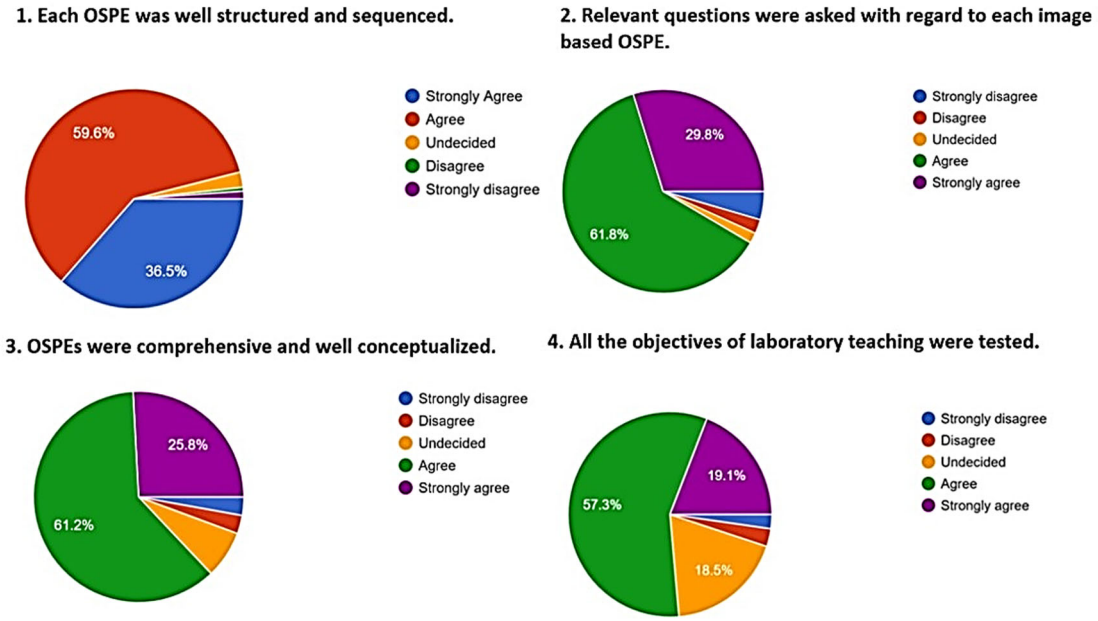

Figure 5: Pie chart showing students opinion for question numbers 1 to 4.

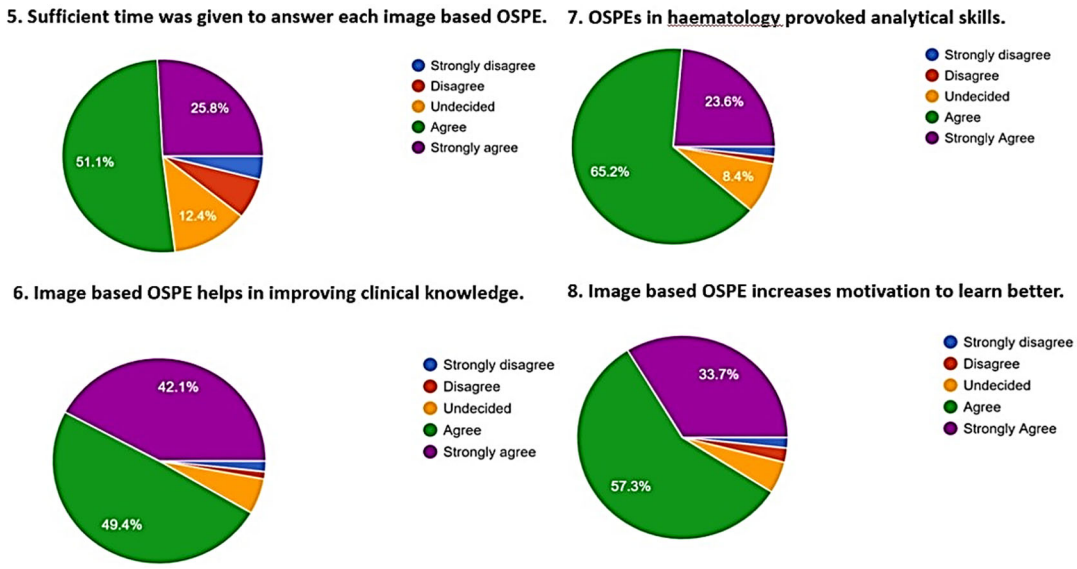

Figure 6: Pie chart showing students opinions for questions numbers 5 to 8

Approximately 70% of students found image-based OSPEs to be less stressful and free from assessment bias. Specifically, 70.8% of students agreed that image-based OSPEs were less stressful and eliminated bias in assessment (Figure 7).

Discussion

The concept of OSPE was introduced in 1975 and later expanded to encompass practical examinations, undergoing modifications by Harden and Gleeson (1, 2). OSPE proves to be a reliable assessment tool capable of distinguishing between various categories of students effectively. Students can apply their knowledge to solve practical case scenarios, making it superior in these aspects compared to traditional practical examinations. Furthermore, OSPE can be structured to comprehensively assess all the objectives of laboratory teaching, assigning appropriate weightage to each aspect (3-5).

OSPE focuses on the "shows how" aspect of Miller's pyramid of competence, concentrating on evaluating the performance of specific skills in a controlled setting. This focus enhances reliability and validity, making it an impartial method of assessment, as all candidates are presented with the same task.

While the examination of pathology slides through a microscope and the observation of gross morphology with the naked eye remain irreplaceable, there are circumstances, such as the COVID-19 pandemic, where virtual image-based OSPEs can serve as a viable substitute for practical internal assessments (4, 5). Despite this potential, no studies have investigated virtual image-based OSPEs in pathology during the COVID-19 pandemic.

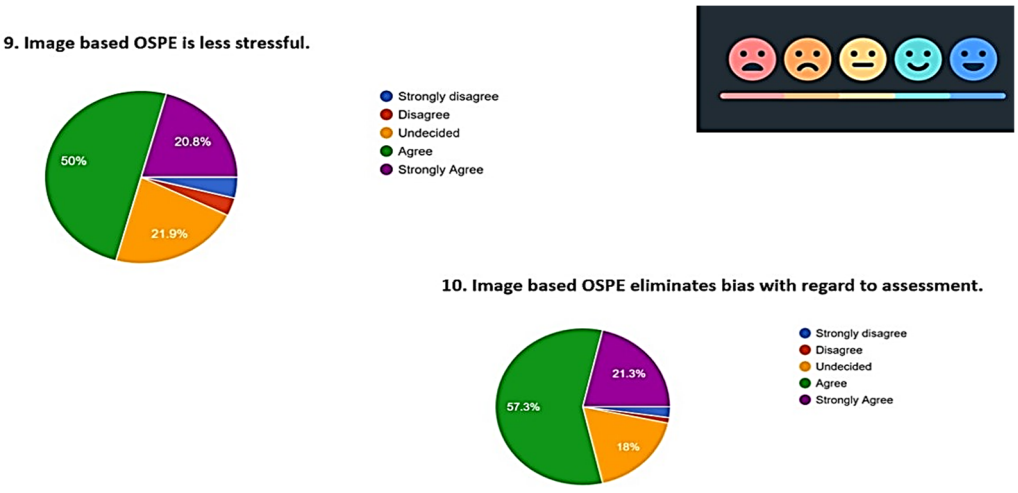

Figure 7: Pie chart showing students opinions for questions number 9 and 10.

Vishwanathan K et al conducted a study evaluating the perception of medical undergraduate students regarding electronic OSPEs in orthopedics during the COVID-19 pandemic (1). Their study received a positive response from students, similar to the findings of the present study, establishing a favorable perception of the new examination technique employed in orthopedics during the COVID-19 pandemic (1).

The ease of conducting electronic OSPE in pathology can be attributed to the digitalization of entire microscopic slides. Creating image-based questions related to gross morphology, including pictures of routine hematoxylin and eosin staining microscopy, as well as special stains, can be done with ease. Additionally, images of peripheral blood smears, bone marrow aspiration and biopsy, immunohistochemistry, certain molecular techniques (eg, fluorescence in situ hybridization [FISH]), and special tests (eg, Coombs test and sickling test) can prove highly useful in formulating OSPE questions.

Some studies have used a combination of Google Classroom with a Google Form-based online assessment system to develop electronic OSPEs. Dutta, Atanu Kumar et al designed a single Google sheet linked to all stations, allowing for time limits at each station and proceeding to the next station only after submission of answers for the present station. The entire process was also monitored using Google Classroom's live stream during the examination (5-7).

The COVID-19 pandemic has significantly tested our technology skills. On a positive note, it has prompted the adoption of numerous innovative online teaching and learning methodologies, with virtual image-based OSPE being one of them. Many institutes in India struggled to conduct practical internal assessments in a structured manner during the COVID-19 pandemic (8, 9). However, virtual image-based OSPE can be easily implemented in institutes with good technology infrastructure, even during the non-COVID era. Virtual simulation is another newly emerging interactive pedagogical strategy in the field of undergraduate medical education (9, 10).

Nevertheless, certain drawbacks are associated with monitoring students during virtual examinations. These issues can be mitigated by using technology-based applications like Zoom or Google Classroom. A video link can be sent to students along with the internal assessment to monitor their activities. However, this approach may be labor-intensive, especially when dealing with large batches of students numbering over 100. It could be challenging for faculty members to virtually monitor such a large group of students simultaneously.

Conclusion

Virtual image-based OSPEs proved to be a suitable alternative for conducting virtual practical internal assessments for undergraduate pathology students during the COVID-19 pandemic. This approach can continue to be valuable, particularly in universities with robust digital platforms, even beyond the COVID era. Creating timed PowerPoint presentations for these image-based OSPEs and administering them through various digital platforms is a feasible option.

The OSPEs effectively replicated practical exercises, and although students could not physically perform the experiments, the questions were designed around the underlying concepts and principles. This approach greatly contributed to enhancing their clinical knowledge and understanding of applications. It can be integrated as an additional exercise alongside routine undergraduate practical classes, even after the COVID-19 pandemic, especially for exercises that can be learned without actually performing them.

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Ethical approval: The study was approved by the Ethical committee, JSS Medical College.

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References

1. Vishwanathan K, Joshi AN, Patel MJ. Perception of Medical Undergraduate Students about an Electronic Practical Examination in Orthopaedics During the COVID-19 Pandemic. Indian J Orthop. 2021 Nov 29;56(4):689-98. doi: 10.1007/s43465-021-00578-0. [PMID: 34866651] [PMCID: PMC8628820]
2. Malhotra SD, Shah KN, Patel VJ. Objective structured practical examination as a tool for the formative assessment of practical skills of undergraduate students in pharmacology. J Educ Health Promot. 2013 Sep 30:2:53. doi: 10.4103/2277-9531.119040. [PMID: 24251289] [PMCID: PMC3826029]
3. Saurabh MK, Patel T, Khatun S, Chaudhri J, Patel P. Implementation of Objective Structured Practical Examination in Formative Assessment for Undergraduate Practical Pharmacology. Maedica (Bucur). 2021 Mar;16(1):64-74. doi: 10.26574/maedica.2020.16.1.64. [PMID: 34221158] [PMCID: PMC8224721]
4. Mard SA, Ghafouri S. Objective Structured Practical Examination in Experimental Physiology Increased Satisfaction of Medical

Students. Adv Med Educ Pract. 2020 Sep 29:11: 651-659. doi: 10.2147/AMEP.S264120. [PMID: 33061735] [PMCID: PMC7532885]

5. Rajani M, Ghewade B. Comparison of student performance by assessment through Objective Structured Practical Examination versus the Conventional Method for second year MBBS students in Microbiology. J Adv Med Educ Prof. 2020 Jul;8(3): 121-126. doi: 10.30476/jamp.2020.86029.1210. [PMID: 32802905] [PMCID: PMC7395198]
6. Vishwakarma K, Sharma M, Matreja PS, Giri VP. Introducing objective structured practical examination as a method of learning and evaluation for undergraduate pharmacology. Indian J Pharmacol. 2016 Oct;48(Suppl 1): S47-S51. doi: 10.4103/0253-7613.193317. [PMID: 28031608] [PMCID: PMC5178055]
7. Dutta AK, Goswami K, Murugaiyan S, Sahoo S, Pal A, Paul Ch, et al. The transition from objectively structured practical examination (OSPE) to electronic OSPE in the era of COVID-19. Biochem Mol Biol Educ. 2020 Sep; 48(5): 488-489. doi: 10.1002/bmb.21410. [PMID: 32652639] [PMCID: PMC7404751]
8. Khan AM, Patra S, Gupta P, Sharma AK, Jain AK. Rapid transition to online teaching program during COVID-19 lockdown: Experience from a medical college of India. J Educ Health Promot. 2021 Mar 31:10:99. doi: 10.4103/jehp.jehp_606_20. [PMID: 34084846] [PMCID: PMC8150086]
9. Iyengar KP, Jain VK, Vaishya R. Virtual postgraduate orthopaedic practical examination: a pilot model. Postgrad Med J. 2021 Oct;97(1152):650-4. doi: 10.1136/postgradmedj-2020-138726. [PMID: 33011681] [PMCID: PMC10016873]
10. Alsafi Z, Abbas AR, Hassan A, Ali MA. The coronavirus (COVID-19) pandemic: Adaptations in medical education. Int J Surg. 2020 Jun:78:64-5. doi: 10.1016/j.ijsu.2020.03.083. [PMID: 32304892] [PMCID: PMC7156945]