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Offline-to-online shift of medical education: A multi-method study of medical teachers and students from India

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ABSTRACT

Objectives: The objective of the study is to explore undergraduate medical students' and teachers' perceptions, detailed insights and learning experiences on online medical education.

Materials and Methods: This is an institution-based multi-method study conducted at three medical institutes in India. A self-prepared semi-structured questionnaire was used to extract various perspectives of teaching and assessment through online mode. A qualitative descriptive design was applied using focused group discussion (FGD). All FGDs were audio-recorded, transcribed verbatim and analysed using thematic content analysis to identify themes and subthemes regarding perceptions of online and offline education.

Results: A total of 323 medical students out of 510 and 35 medical teachers out of 71 were included in the study. Most students and teachers agreed to the fact that they faced technical difficulties, were perceived as less connected, and felt difficulty in achieving desired competencies. In qualitative analysis, five major themes (Learning Environment, Technology, Competency, Health issues and Assessment) and multiple subthemes were identified.

Conclusion: Improvement of the online teaching methods with appropriate technical advancement may help to reduce the gap between the online and offline teaching learning modalities.

Keywords: Offline-to-online, Medical Education, Physical Presence, Multi-methods

INTRODUCTION

The COVID-19 pandemic has impacted globally in all aspects of our lives, including education.[1,2] Due to strict preventive measures, all educational institutions have experienced a sudden transition from traditional face-to-face learning to online mode.[3] United Nations Education Scientific and Cultural Organization (UNESCO) has estimated over 90% of the world's students are not currently attending schools during the COVID-19 pandemic.[4] The majority of institutions worldwide are solely relying on online/virtual mode education. Medical education has faced challenges the most, as contact with patients or subjects is an essential part of clinical learning.[5]

In India, newly implemented competency-based medical education has focused on skill development and aims to deliver competent graduates who are globally competitive and can meet

society's health needs.[6] The pandemic has disrupted the whole process, as e-learning is not a well-established mode of teaching in Indian institutions. Previous studies have shown the popularity of online education is deemed to be increasing as more flexible learning, with no geographical restrictions, less time-consuming, and allows students to learn in their own space, comfort, and opportunity to work with newer emerging technologies.[7-9]

However, there are pieces of evidence that suggest the students are missing a competitive learning environment, interpersonal communications, and peer interactions in online courses.[10] This research aims to explore students' and teachers' perceptions, detailed insights and learning experiences regarding online medical education. Thus, this study was conducted to identify various aspects of online medical education amongst medical undergraduates and teachers in three medical schools in India.

MATERIALS AND METHODS

This was an institution-based multi-method study conducted between October 2022 and May 2023. The participating institutes were All India Institute of Medical Sciences (AIIMS), Gorakhpur, Kalyani and Bathinda. Ethical approval was granted by the Institute Human Ethical Committee. (IHEC/AIIMS-GKP/BMR/10/2020).

Participants

All undergraduate students (batch 2020 and 2021) and teachers (from pre-clinical and para-clinical departments) who had been involved in online teaching–learning sessions were included.

Inclusion criteria

1. Undergraduate students enrolled at participating institutes attending online academic activity through similar platforms
2. Teachers conducting online academic activity at the institutions mentioned above.

Exclusion criteria

1. Students and teachers who did not give consent
2. Those who self-declared to have a chronic physical and mental illness or internet addiction were excluded from the study.

Tool

A pre-tested, self-prepared, semi-structured questionnaire was used. The questions were prepared after discussion with the experts, and face validity was assessed. The students were asked about various perspectives of teaching and assessment and asked to score the same on the Likert scale of zero to four. The four-point scale was developed to avoid null point bias. Zero was the lowest score, and four was the highest. The data collected in the pre-testing was removed from the analysis of the final result.

The qualitative study was conducted using focused group discussion (FGD) with an FGD questionnaire and guide, separately for students and teachers.

Data collection

Quantitative study

The questionnaires were circulated amongst the selected participants to the personal mail of participants to ensure that it was not circulated in the open group.

Qualitative study

The qualitative study was planned after the quantitative study helped us to fill the gaps and answer the reasons for the responses obtained. We conducted FGDs till the saturation point was achieved (FGD guide added as supplementary file). For FGD, a total of 18 medical students and eight medical teachers were recruited into the study. Two FGD sessions with students (in a group of nine participants each) and one FGD session with teachers (in a group of eight medical teachers) were conducted in three different settings. The duration of FGDs was 45–50 min. All FGDs were conducted in the Hindi and English language with one investigator as moderator and another two investigators taking manual notes. The whole session was audio-recorded after obtaining consent. The FGD guide was designed by the team of investigators based on related context.

Data analysis

Quantitative data

Data was compiled and transferred to a Microsoft Excel sheet. The data was cleaned, and analysis was done using Jamovi-2.3.[11] The data was represented as numbers and proportions, mean (±Standard Deviation), and median (with Interquartile Range). The differences in the results in multiple groups were analysed by the Chi-square test.

Qualitative data

The final transcripts data was read, re-read and discussed between two investigators who are conversant in both languages (Hindi and English). Confidentiality was ensured by removing participants' identifiers. The investigator team cross-checked each transcript using audio recordings and manual notes. All the transcripts were translated into the

English language. Data was analysed by an inductive thematic approach.[12] In the first step, the investigators generated initial codes by listing all ideas, keywords, and opinions used by the participants as indicators of important themes until a consensus was reached. In the second step, focused coding was done by eliminating, combining, or subdividing the initial codes, followed by a critical analysis to generate themes and sub-themes.

RESULTS

Quantitative component

A total of 323 students were approached, and 280 students were included in the study. The mean age of the participants was 20 years, and the ages ranged from 17 to 32 years. 36% of the participants were females, and the rest were male.

The majority of students agreed to the fact that they faced technical difficulties and various learning difficulties during online classes. However, students disagreed with the statement that 'online learning is more stressful than offline learning'. The detailed description of the questions asked and responses obtained are described in Figure 1. When students were asked to rate the online learning and assessment on a scale of one to four, the mean score was 2.3 (±1.28) for learning and 2.28 (±1.34) for online assessment [Figure 2].

A total of 35 teachers were approached for the study, and 30 agreed to participate. Amongst them, 10 were female, and the rest were male. The mean age of the participant teachers was 38.4 with a standard deviation of 3.9.

When teachers were asked about the efforts required, the majority agreed that more planning and less timing are required for preparation, online teaching was monotonous, hardly delivered skill competency, and difficult to get feedback. The detailed description of the questions asked and responses obtained are described in Figure 3. When teachers were asked to rate the online teaching and assessment on a scale of one to four, the mean score given to the teaching was 2.10 (±1.21), and for assessment was 2.03 (±1.27) out of five [Figure 4].

Qualitative component

After going through the individual transcripts verbatim, five broad themes were identified. The derived themes are presented in Figure 5 and explained below.

Theme-1: Learning environment

The learning environment was one of the key areas that the majority of the students and teachers focused on during the discussion. The following subthemes were identified:

Subtheme-1: Physical presence

Students described a lack of communication (both verbal and non-verbal) with teachers as a major drawback of online academic sessions. This leads to a lack of understanding of learning modules, diminished interest in academic sessions, and an increased number of absentees.

'We are learning from the teacher in the offline class, seeing their expressions and interests. We can guess the favourable time to ask doubts. Moreover, we feel hesitant to interrupt teachers in between ongoing online lectures, we cannot see the expressions or the mood of teachers'. This comment emphasised the nonverbal communication between the teacher and students, which helps students to learn better.

Some students emphasised that the act of teaching in physical class or teachers' teaching style engages them better which

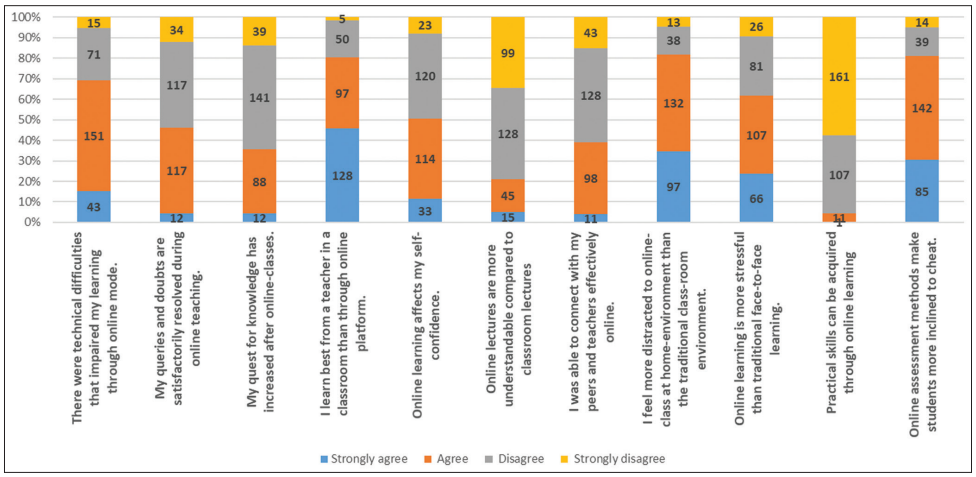

Figure 1: Percentage distribution of Likert scale rating by students on various aspects of online teaching and assessment.

facilitates learning. One participant commented: 'A teacher in a physical class just draws a simple diagram on board, we can grasp more (than online teaching)'.

One student reported negative views on doubt clearance.

'Teachers are available after the class (offline), so we can clarify our doubts personally. Now we have to ask doubts by email, which will be discussed in the next class only'.

This feeling of missing the physical presence of the teacher was echoed by the teachers also. One teacher said, 'I do not get interested in teaching (online), it seems like speaking to a wall'.

They also felt feedback through verbal and non-verbal communication makes offline classes livelier. 'Non-verbal expressions, body language is not communicated (in online sessions), teaching is not like news. we are acting like news anchors', one teacher said.

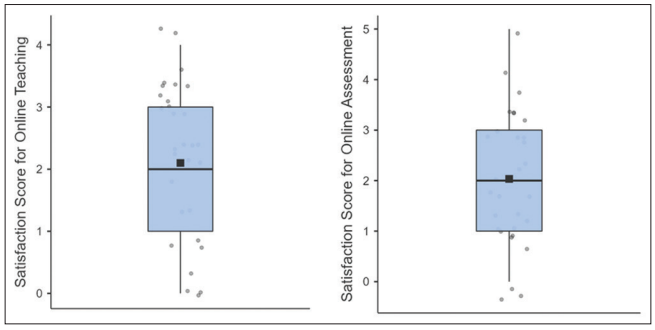

Figure 2: Satisfaction Scores of Online learning and assessment among students (Dots representing individual scores and Box representing IQR).

One student identified the positive aspect of online teaching, i.e. multitasking during the class, which is impossible in offline teaching. 'I feel the classroom environment is monotonous… online sessions can be attended with home comfort…along with food and others'.

Subtheme-2: Distractors

Participants were asked about their experience of learning at home in online media. Some students have reported a lack of 'attention' in the home environment creates difficulty in understanding critical concepts. They get more distracted by the presence of other family members. For example:

'I cannot hold attention throughout the lecture, feel distracted and sleepy as no learning environment has been generated'.

According to one student, 'There are other family members at home doing household work (home distractions). I am not alone at home. I have asked all to keep quiet when switching my mike on'.

Subtheme-3: Peer interactions and competitive environment

Participants also mentioned the lack of peer interaction as another major issue that hinders motivation and competitiveness. One student commented, 'In hostels or at the dissection hall, we used to have lots of discussions (peer interaction) and get prepared for the classes, but in online (academic session), alone in the home, we miss that part… brings lack of seriousness in studies'. According to another student, 'There was a healthy competition when we were together, even during the class (offline). When someone is asking doubts, I feel, I also must study and ask my doubts'.

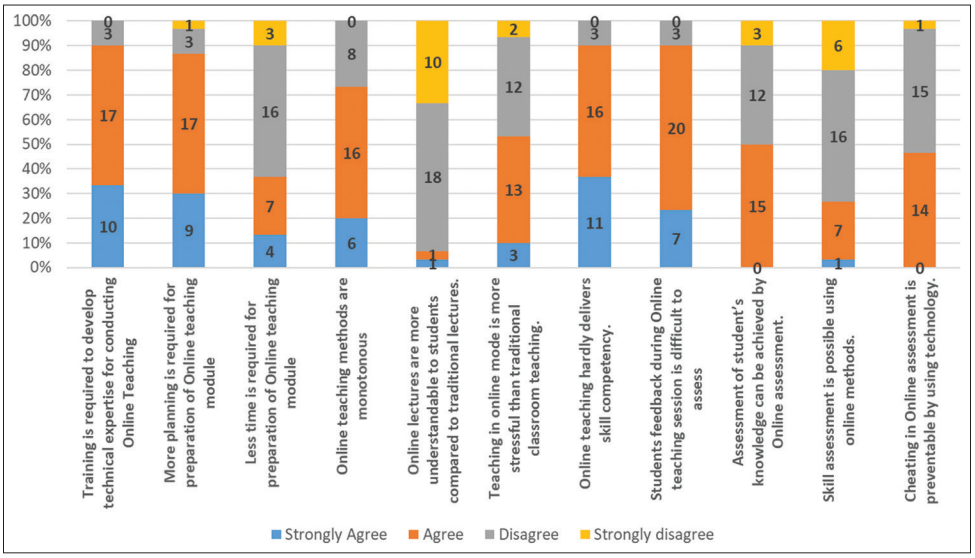

Figure 3: Percentage distribution of Likert scale rating by teachers on various aspects of online teaching and assessment.

Theme-2: Technology

In education, specifically in medical education, the role of technology has been recognised recently after the pandemic. Students have discussed both positive and negative points on this theme. The theme was subdivided into the following subthemes.

Subtheme 1: Technical factors

Students emphasise the importance of online classes in reducing the burden of the classical system of teaching.

'A few morning classes are missed as we wake up late in the morning… that is not happening (in online sessions). Even if feeling sick, we can attend the class' a student said. Another student said, 'I usually miss 8–9 am class more frequently. Now we can even enter (join online) at 8:30 am'. A student said, 'The burden of writing all the class notes is less as we can take screenshots'.

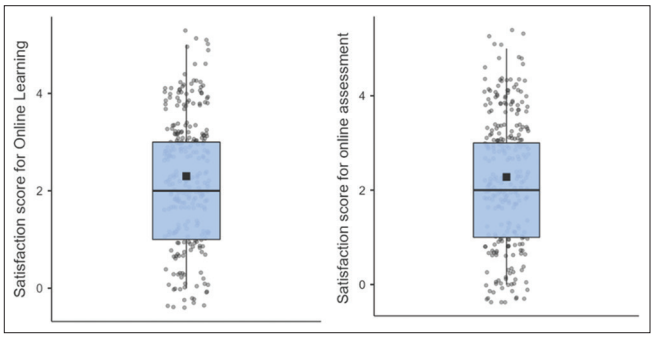

Figure 4: Satisfaction Scores of Online learning and assessment among teachers (Dots representing individual scores and Box representing IQR).

Students also mentioned the issues related to the quality of the internet.

'Our anatomy dissection classes and clinical postings are affected the most. I cannot understand much; online videos are blurry. Head and neck dissections are affected. Practical is not effective (online mode teaching)'. Teachers also have a similar view. Technology was poorly used during the class. One teacher said: 'The option for chat is not effective (for communication). Hardly one or two students have ever communicated'.

Few teachers emphasised that there was a serious lack of training in the use of technology.

'Training for faculty, as well as students, is lacking (regarding online platforms) to deal with technical issues'.

Subtheme 2: Financial factor

Few students and teachers have emphasised the financial issues associated with technology. One student described, 'Often, we are running out of data, sometimes video streaming is there in class… I sometimes prefer to stay at the hostel as it is (internet) free'.

Theme-3: Health issues

Online sessions promote a sedentary lifestyle and other health effects related to increased screen time. A student described, 'Online sessions lead to a sedentary lifestyle. What happened to me is that I cannot sleep well at night, but during offline sessions, I usually get tired attending sessions and getting good sleep. Some insomnia I faced at home'.

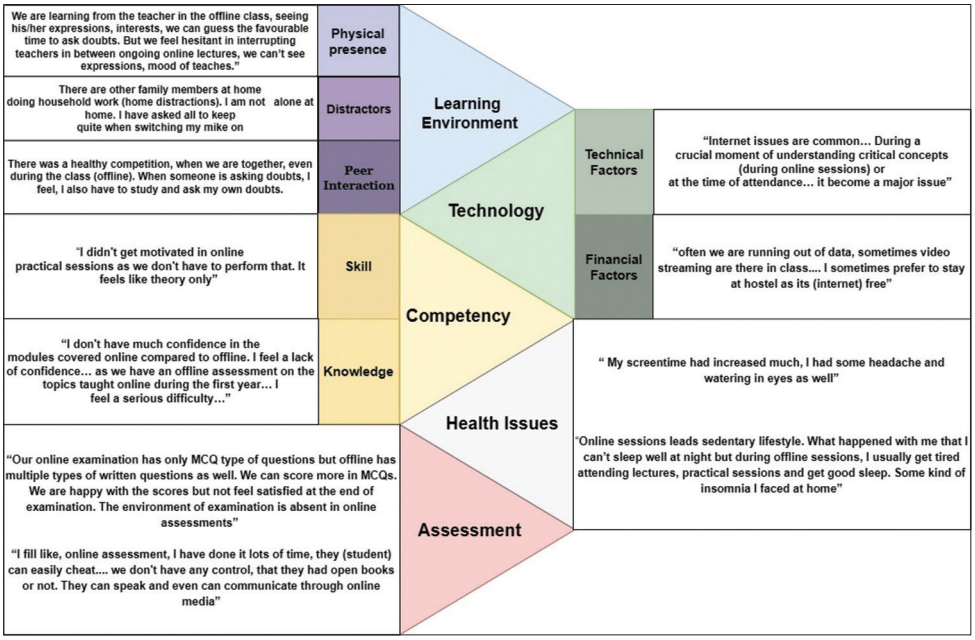

Figure 5: Various themes and subthemes derived from the qualitative interviews. MCQ: Multiple choice question.

Theme-4: Competency

Another crucial point highlighted by the students was their concern about the lack of skill development in practical sessions, and lack of confidence in the modules taught online. Two important subthemes arose within the theme.

Subtheme 1-Skill

All students discussed the difficulty of learning practical skills in an online learning format. According to one student, 'I did not get motivated in online practical sessions, as we do not have to perform that. It feels like theory only'. Like the students, teachers are also sceptical about the skill and knowledge development of students. One teacher said: 'I must take classes, I am paid for that...I will put more effort so that the final output is good, but in online classes, I knew (have experience) the output will not be good, even if I put in my full efforts'. This shows less confidence in teachers in online classes.

Subtheme 2: Knowledge

The poor confidence in knowledge amongst the students was reflected in the following sentence.

'I do not have much confidence in the modules covered online compared to offline. I feel a lack of confidence… as we have an offline assessment on the topics taught online during the 1st year… I feel a serious difficulty…' This shows the lack of confidence in the students in the topics covered in online sessions.

Theme-5: Assessment

Few students have raised issues related to online assessments and parents' concerns about online sessions. In offline examinations, students feel motivated to perform and feel satisfied with their grades. However, in online assessment, this was lacking. The 'seriousness' of the examination is somewhere missing.

'Our online examination has only MCQ-type of questions, but offline has multiple types of written questions. We can score more in MCQs. We are happy with the scores but do not feel satisfied at the end of the examination. The environment of examination is absent in online assessments.'

Teachers have pointed out another factor regarding the validity of the online assessment. 'I feel like online assessment, I have done it lots of time, they (students) can easily cheat. we do not have any control over whether they had open books or not. They can speak and even can communicate through online media (during examinations)'.

DISCUSSION

This is an institution-based multi-method study conducted in three medical teaching institutes in India. The study compared various dimensions of online and offline teaching amongst medical undergraduates, both teachers and students, at the selected medical schools.

In this study, most students agreed that classroom teaching was better than online teaching. Similar findings were also reported by most of the studies.[13-18] However, in the study by Hattar *et al*. in Jordan, the majority of the participants preferred online teaching.[19] Which can be due to the technical expertise of students. Most students were not able to connect to the teacher (61.1%) and understand concepts (78.6%). Similar results were also reported by other studies.[20] The reason for the same can be explained by the results obtained in the qualitative part of the study. The most notable finding was the differences in the learning environment between the offline and online methods. Many participants emphasised that teachers' physical presence, peer interactions, and competitive environment in the classroom are the biggest advantages of offline learning. Students attending online sessions at home have pointed out several household distractions and home comfort as major disadvantages of online sessions. Without peer interactions, healthy group discussions and online sessions become monotonous, which leads to a lack of motivation to study. Lack of face-to-face interaction might have also affected the quality of teaching. Teachers mentioned that they feel the same. Studies in the past have also demonstrated that the most challenging part of online education is to create an environment of 'social presence' so that the teachers and students feel as part of the teaching–learning community.[21] The term 'social presence' is defined as the degree to which a person is perceived as a 'real person' in any mediated communication.[22] The sense of social presence supports cognitive and affective learning objectives by making group interactions appealing, engaging and rewarding.[23] Students or teachers may feel isolated and distracted, which in turn decreases effective learning.[24] These findings are also evident from this study. Rodgers described the presence of teachers as defined by the three most useful dimensions, namely observation, analysis and reflexive change in the way the teaching is progressing.[25,26] It is the teacher's involvement with the student that makes the whole process addictive for both student and teacher which they miss during online teaching.

Students also highlighted the issues related to distraction and lack of attentiveness during online learning. Similar results were also reported by other authors.[7,27] More than 60% of students in the current study reported that online learning is more stressful than offline similar to that reported by Ansari *et al*. in Egypt.[28]

The technical aspects of online academics have both positive and negative perspectives. Participants explained that time flexibility, such as saving commuting time, less missed

class, easy attendance and less burden of taking class notes can be regarded as positive points that support online learning. The negative points as explained, include technical problems such as internet interruptions, system errors, and the cost of the internet. Lack of technical skills and handling knowledge was another negative factor mentioned by the teachers. Law *et al*. reported that students who are used to smartphones and internet use are more likely to accept online learning.[29] Reports on the education of children in COVID-19, published by United Nations Children s Education Fund (UNICEF) show the difficulty in learning amongst the disadvantaged population was due to lack of personal gadgets, poor technology infrastructure and inadequate skills for remote learning.[30] The Indian report of the same suggests that only 54% of the urban and 32% of the rural population have internet access.[31]

The majority of the teachers believed that online teaching was easier. This was opposite to that reported by Elshami *et al*. in Sharjah and Song *et al*. in China.[15,18] This may be due to more expertise of teachers on online platforms a priori and their lower mean age. The difference in the timing of the study may be one of the factors. The current study was conducted in early 2021, and by that time teachers were more acquainted with the technology.

Students reported health issues linked with day-long use of digital screens such as insomnia, headache, eye-straining and eye-watering which may be one of the reasons for the negative preference for online learning amongst students. Similar results were also reported by many authors.[32-34]

The development of competency on the subject was a major concern amongst teachers and students. The majority of students feel a lack of confidence, as well as in clinical skill and competency development. Teachers also put forward their negative views on their output on achieving competencies amongst students. Similar findings were also reported from the quantitative part. Studies by Dahiya *et al*. in India, Motte-Signoret *et al*. in France and BąCzek *et al*. in Poland also supported the finding.[7,20,35] Few studies conducted amongst nursing students and teachers found the same.[14,24,25,36] However, students in China and Taiwan, as reported by Cheng *et al*., preferred online more than offline teaching.[37] This may be due to the wider availability of laboratory networks in the country.

Two major concerns were highlighted in conducting the online assessment. First, the satisfaction and engagement of students are lacking in online examinations, and second, the validity or reliability of online examinations due to cheating amongst students. Few authors also reported assessment of skills and group tasks;the gradual unfolding of case studies is the most effective way of assessing the students' skills in online assessment.[13,38]

The study described the important aspects of online and offline teaching, the study is limited by the fact that the study was completed in a limited number of study sites. However, this can be one of the initial studies to indicate the same from India. Similarly, the study is also limited by the fact that the sample size is not calculated for the quantitative study. The quantitative study is a supportive part of the qualitative study and the whole sampling frame was approached for the study. The multi-method study is the strength of the study.

CONCLUSION

Online medical education has many gaps as compared to its offline counterpart, which can be related to the learning environment, use of technology and imparting competency. It also has some health hazards and feasibility issues related to assessments. With improved interactive teaching and learning technology, the gaps between offline and online learning can be addressed. Thus, we suggest using appropriately structured blended learning, including the online and offline methods. However, physical practical classes are essential for skill development.

Ethical approval

The research/study approved by the Institutional Review Board at All India Institute of Medical Sciences, Gorakhpur, number IHEC/AIIMS-GKP/BMR/10/2020, dated 25/09/2020.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Conflicts of interest

There are no conflicts of interest.

Use of artificial intelligence (AI)-assisted technology for manuscript preparation

The authors confirm that there was no use of artificial intelligence (AI)-assisted technology for assisting in the writing or editing of the manuscript and no images were manipulated using AI.

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