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Original Research Article

Comparative Analysis of Mini-Clinical Evaluation Exercise and Traditional Practical Examination in Pediatrics Undergraduate Assessment

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ABSTRACT

Background: The Mini-Clinical Evaluation Exercise (Mini-CEX) is a valuable formative assessment tool in medical education. It involves direct observation of a student's clinical skills by a faculty member, followed by immediate constructive feedback. There is limited data available on the utility of Mini-CEX for undergraduate assessment. The aim of this study was to compare the effectiveness and reception of Mini-CEX and traditional practical assessments in Pediatrics among medical students and faculty members.
Materials and Methods: This prospective educational comparative study was conducted over six months, from April 2021 to September 2021, involving undergraduate medical students of Phase-3, Part-2. The students were randomly divided into four groups (A, B, C, and D). In the first encounter, two groups participated in a traditional practical examination, while the other two groups underwent a Mini-Clinical Evaluation Exercise (Mini-CEX) assessment. For the second encounter, the assessment methods were swapped between the two groups. Systematic feedback was provided to each student following the Mini-CEX assessment. Additionally, feedback was collected from both, students and faculty members, regarding their experiences and opinions on the assessment methods.
Results: This study found that Mini-CEX scores were significantly higher than TPE scores (P=0.006489). There was also significant inter-examiner variability in Mini-CEX marks ($p < 0.00001$). Both students and faculty members provided positive feedback regarding the Mini-CEX. Despite its benefits, the time required to conduct the examination is a major limitation for undergraduate assessment.
Conclusions: Mini-CEX is a valuable tool in undergraduate medical education for assessing and improving clinical skills. By providing structured, real-time feedback, it helps students develop into competent and confident clinicians. The time required to conduct the examination is a major limitation for undergraduate assessment.

Keywords: Assessment, Feedback, Formative assessment, Mini-CEX, Objective assessment, Skill assessment, Viva

INTRODUCTION

The Mini-Clinical Evaluation Exercise (Mini-CEX) is a formative assessment tool used in postgraduate & undergraduate medical training, to evaluate clinical skills and competencies. It was first designed to conduct workplace-based assessment and to provide structured feedback to students on their performance in 1995.[1] Mini-CEX is predominantly utilized for postgraduate medical assessment.[2] Its application as a formative assessment tool for undergraduate medical students is explored in fewer studies.[3-5]

Mini-CEX assessment involves direct observation of clinical skills, followed by immediate feedback and a rating on specific competencies.[6] In undergraduate settings, the Mini-CEX helps bridge the gap between theoretical knowledge and clinical practice, promoting reflective learning, encouraging self-assessment, and aiding in the development of clinical reasoning and communication skills. However, implementing the Mini-CEX in undergraduate programs presents challenges, including logistical issues such as the availability of faculty members for direct observation, time constraints, and the need for consistent and standardized evaluation criteria. Further

studies are necessary to comprehensively grasp the impact of Mini-CEX and to refine its integration into undergraduate programs. This motivated us to conduct this study to contribute essential insights into how Mini-CEX can be effectively utilized in undergraduate assessment in Pediatrics. Primary objective of this study was to determine the strengths and weaknesses of Mini-CEX and TPE in Pediatrics assessments, as well as to gather feedback from students and faculty members on their experiences with both assessment methods. Secondary objective of this study was to enhance clinical competence in undergraduate medical education by evaluating and comparing student performance in history taking, physical examination, communication skills, professionalism, clinical judgment, treatment planning, and overall organization and efficiency through the Mini-Clinical Evaluation Exercise (Mini-CEX).

METHODOLOGY

This prospective comparative study was conducted in the Department of Pediatrics of a teaching hospital of Western Gujarat, over a six-month period from April 2021 to September 2021. Following approval from the Institutional Ethics Committee, training sessions for Mini-CEX were arranged for the faculty members of Pediatrics Department. Students were also briefed about Mini-CEX before the assessment was conducted.

Out of 150 students of Phase-3 Part-2, 135 students gave consent for enrollment in the study. The students were randomly divided into four groups (A, B, C, and D). Two faculty members conducted traditional practical assessments for two groups, while the other two conducted Mini-CEX assessments. A case of severe acute malnutrition (a core area) was selected for the assessments. In the second encounter, the groups were swapped for assessment methods, ensuring all students have an equal opportunity to be assessed by both methods. Each Mini-CEX and TPE session lasted for 20 minutes. In Mini-CEX, students were evaluated for history taking, physical examination, communication skills, including parent counseling, professionalism, clinical judgment or probable diagnosis, treatment plan and finally organization & efficiency. Systematic feedback was given to each student at the end of the Mini-CEX assessment. Feedback was completed in 5-6 minutes and documented in the Mini-CEX form. Scores for the seven skills assessed in the Mini-CEX were given on a 9-point scale: 1-3 (unsatisfactory), 4-6 (satisfactory), and 7-9 (highly satisfactory). The maximum score was 63, and the minimum was 7. Feedback of students regarding Mini-CEX assessment method was taken by using a Likert scale from 1 to 9. Feedback of faculty members was also taken by focused group discussion method. Statistical analysis was done using SPSS version 24. Chi-Square test for categorical variable, Pearson correlation coefficient & independence one-tailed t test for continuous variable were done. Significance was defined as p value < 0.05.

RESULTS

A comparison of the scores between the mini-Clinical Evaluation Exercise (mini-CEX) and traditional practical examination (TPE) was done. In mini-CEX group, the mean score was 60.78 with a standard deviation of 19.77. In contrast, the TPE group had a mean score of 52.79 with a standard deviation of 4.47. The range of scores for the mini-CEX group was between 30.15% and 87.30%, while the range for the TPE group was narrower, between 45% and 67.5% (Table-1). These findings suggest that mini-CEX exhibits greater variability in the scores. This could imply a more nuanced assessment of clinical competencies by the mini-CEX. The results are statistically significant, with a t-value of 24.25 and a p-value of less than 0.00001, indicating a strong difference between the two assessment methods (Table-1). Pearson correlation coefficient between the scores of the two evaluation methods was found to be R = - 0.2332 with a p-value of 0.006489, indicating a weak but statistically significant negative correlation between the Mini-CEX and TPE scores (Table-1).

Table-1: Comparison of the scores of Mini-CEX and TPE

Mini-CEX (n=135)	TPE (n=135)	
60.78 ± 19.77*	52.79 ± 4.47*	t = 24.25 p < 0.00001
30.15 - 87.30 % #	45-67.5% #	
Pearson Correlation coefficient		R = - 0.2332 P = 0.006489

*Mean ± SD, #Range of scores in %

The mini-CEX scores fluctuated widely, so we can discriminate between strong and weak students (30.15-87.30 %). In contrast, the TPE scores remained more consistent. The graphical representation in Figure-1 supports the statistical data, highlighting that mini-CEX provides a more varied assessment of participants' performance compared to the TPE.

Inter-examiner variability in mini-CEX marks occurred between four different examiners. Examiners 1 & 2 had given average marks of 58.17 & 59.02 respectively, while examiners 3 had given the highest mark 69.8. In contrast, Examiner 4 gave the lowest mark of 48.18. This data highlights the differences in scoring tendencies among the four examiners, which may be due to different teaching experience. The p-value of less than 0.00001 indicates that the variability in marks among the faculty members is statistically significant (Figure-2). In the students' feedback on the mini-CEX, 56 students gave a score of 9 on the Likert scale (1 = Low, 9 = High). A total of 72 students provided scores ranging from 6 to 8. Only 5 students rated their experience with a score of 5, and just 2 students gave scores between 3 and 4. Thus, the majority of students (128) expressed positive feedback about the mini-CEX method (Figure-3).

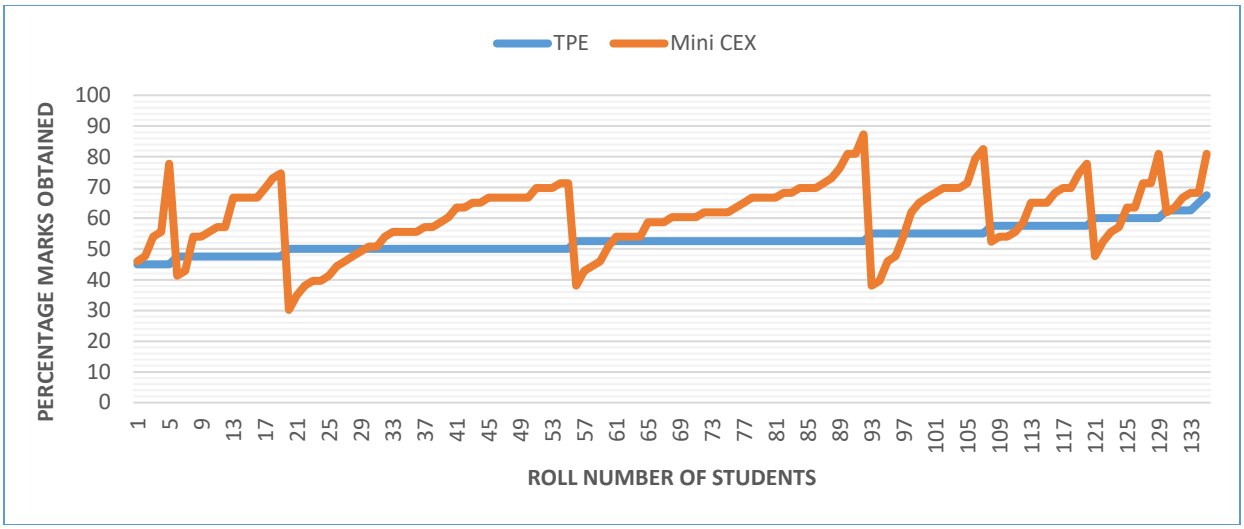

Figure-1: Inter-examiner variability of marks by TPE & Mini-CEX

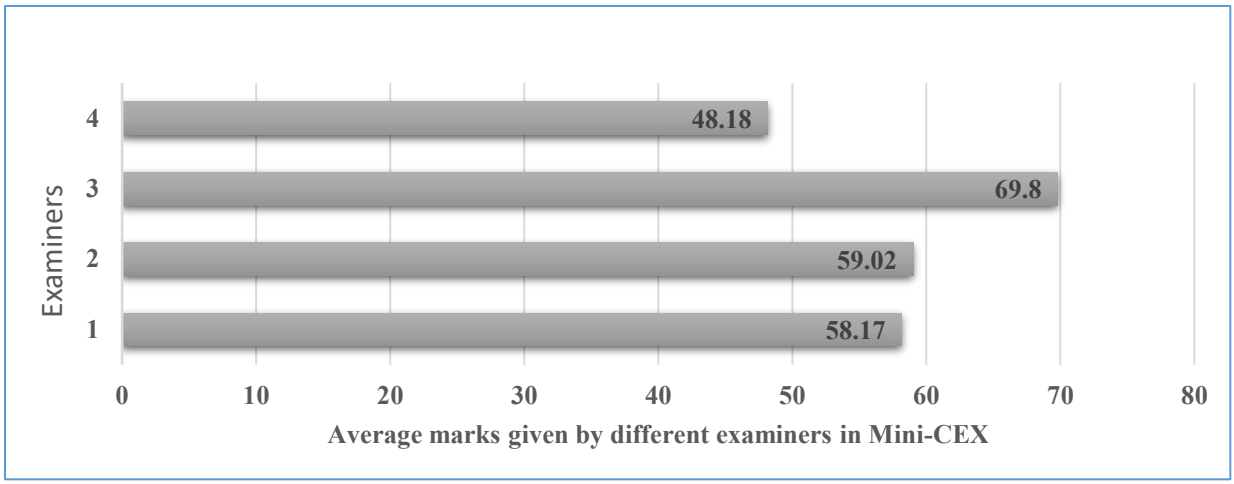

Figure-2: Inter-examiner (examiners 1 to 4) variability in mini-CEX marks

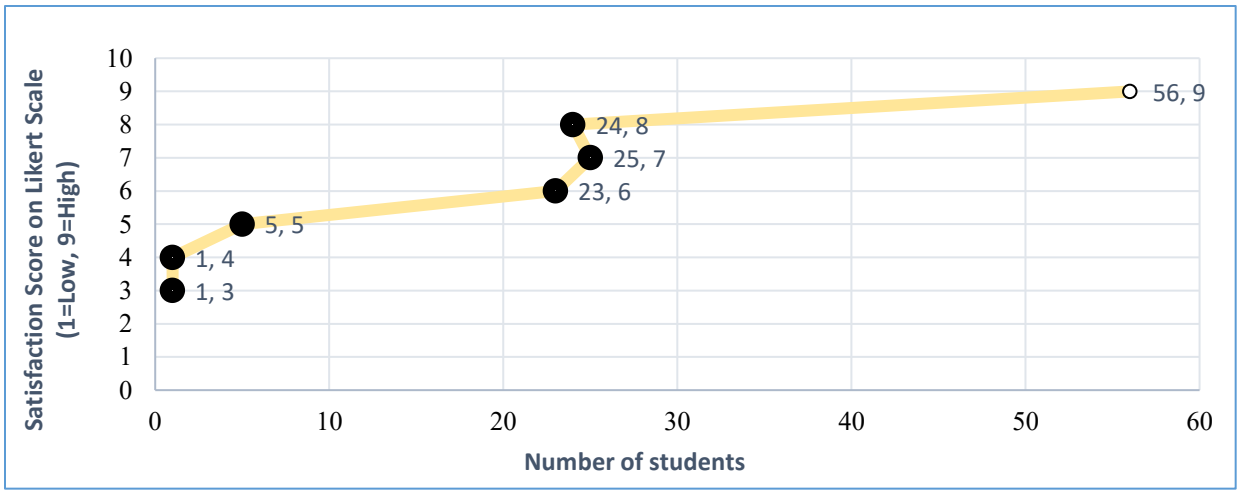

Figure-3: Students feedback on Likert Scale

Faculty feedback, gathered through focused group discussions (FGD), highlighted several advantages and limitations of the mini-CEX method. Faculty members praised the method for being more objective and effective in assessing psychomotor and affective domains during formative assessments. They also appreciated the opportunity for immediate feedback and the ability to directly observe students' performance. However, they identified several limitations, including the time-consuming nature of the process and the need for more faculty members. Additionally, they mentioned challenges related to maintaining faculty motivation and the requirement for thorough faculty training.

DISCUSSION

Our study compared the scores between the mini-CEX and TPE. The score range for the mini-CEX was 30.15% to 87.30%, showing greater variability compared to the TPE's narrower range of 45% to 67.5%. These results indicate that Mini-CEX is an objective method of assessment that can differentiate between strong and weak students. By constructive feedback we can improve the performance of weak students. A study by Buch PM in 2019, examined the effects of implementing Mini-CEX for undergraduate medical students in pediatrics, and found that it significantly improved students' clinical skills by providing more comprehensive and immediate feedback compared to traditional assessment methods.[7] A systematic review compared the mini-CEX with other formative assessment tools and emphasized its role in postgraduate medical training. It demonstrated that mini-CEX can influence trainees' attitudes, perceptions, and acquisition of skills, although its implementation in undergraduate programs remains less explored.[8]

In our study, we also found significant inter-examiner variability in mini-CEX marks ($p < 0.00001$). This may be due to different teaching experience of all four examiners. A study by Hill et al and Yanting at al also found inter-examiner variability in marks which negatively impact mini-CEX assessment.[9,10] In our study, students & faculty members had given positive feedback regarding mini-CEX. Majority of students (128) expressed positive feedback about the mini-CEX method. A study from Pakistan examined the feasibility and effectiveness of the mini-CEX in an undergraduate medical program. The results indicated that mini-CEX assessments were positively received by students and provided valuable feedback for their clinical skill development, suggesting its potential as a formative assessment tool in undergraduate medical education.[4] Faculty members also find mini-CEX to be a valuable formative assessment tool because it provides real-time feedback, allowing students to identify areas for improvement. But they also highlighted several limitations, as the need for more faculty members and also requirement of thorough faculty training. Time required for conduction of exam is a major limitation for undergraduate assessment. Feasibility issues related to time constraints have been highlighted in numerous other studies.[11-13]

To the best of our knowledge, this is the first study comparing the Mini-Clinical Evaluation Exercise (Mini-CEX) and Traditional Practical Examination in undergraduate Pediatrics assessment.

CONCLUSIONS

With Mini-CEX assessment, we can differentiate between strong and weak students. By constructive feedback we can improve the performance of weak students. Both students and faculty members gave positive feedback on the Mini-CEX. However, the time required to conduct the examination poses a significant limitation for undergraduate assessment.

Limitations

While the Mini-Clinical Evaluation Exercise (Mini-CEX) demonstrates high validity in assessing clinical skills, its reliability is contingent on multiple encounters to ensure comprehensive evaluation. This requirement for repeated assessments can pose significant logistical challenges, making the implementation of Mini-CEX less feasible for undergraduate students. The findings regarding the inter-examiner variability highlight another limitation, suggesting that further standardization may be necessary to ensure consistent scoring among faculty evaluators.

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