

Assessing Medical Ethics Knowledge in CBME vs. Conventional MBBS Students: A Comparative Cross-Sectional Study

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How to citation this article: Dr. Kazi Kamranuddin Fazaluddin, Dr. Munazzah Mehvish Kalyankar Khawaja Mateenuddin, “Assessing Medical Ethics Knowledge in CBME vs. Conventional MBBS Students: A Comparative Cross-Sectional Study”, IJMACR– September – 2026, Volume – 9, Issue – 5, P. No. 790 – 798.

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Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Background: Medical ethics are fundamental to professionalism and compassionate care. With the introduction of Competency-Based Medical Education (CBME) by the National Medical Commission (2019), structured ethics teaching was formally embedded in undergraduate training. Evidence comparing ethical reasoning between CBME and conventional curricula, however, remains limited.

Objective: To compare knowledge and ethical decision-making abilities between MBBS students trained under CBME (2019 batch) and those taught via the traditional curriculum (2018 batch).

Methods: A comparative cross-sectional study was conducted at IIMSR Medical College, Jalna, among 142 MBBS students (2018: $n = 63$; 2019: $n = 79$).

Participants completed a validated 15-item scenario-based questionnaire assessing core ethical principles and reasoning. Each correct answer received one point (maximum = 15). Data were analyzed using Welch’s t -test, Mann–Whitney U test, and Cohen’s d for effect size. Reliability was assessed via Cronbach’s α .

Results: Internal consistency was acceptable (Cronbach’s $\alpha = 0.712$). Mean total score was significantly higher among CBME students (9.94 ± 1.86) than among traditional-curriculum students (4.92 ± 1.50) ($t = 14.31$, $p 0.001$). The effect size was large (Cohen’s $d = 2.55$), reflecting a substantial improvement in ethical reasoning associated with CBME training.

Conclusion: Students trained under CBME demonstrated markedly stronger understanding and application of ethical principles compared with those under the

conventional curriculum. Structured integration of ethics teaching within the CBME framework appears to significantly enhance ethical awareness and decision-making skills in undergraduate medical education.

Keywords: Medical Ethics, CBME, Medical Education, Cross-Sectional Study, Ethical Reasoning, MBBS Students.

Introduction

Ethics form the moral and philosophical foundation of medical practice, defining the standards by which physicians make decisions and interact with patients. They ensure that medical care is guided not only by clinical expertise but also by compassion, fairness, and respect for human dignity (Wilkinson2009). A doctor's ethical judgment profoundly affects patient outcomes, trust, and the overall quality of care. In today's healthcare environment marked by rapid technological advances, patient autonomy, and increasing medico-legal complexity future physicians must be equipped to navigate ethically ambiguous situations(Frank2010). Teaching ethics early in medical education helps students cultivate professionalism, empathy, and accountability, ultimately preparing them to make morally sound decisions in real-world clinical practice (Wilkinson2009 Streiner2003).

Recognizing these needs, the National Medical Commission (NMC) of India introduced the Competency-Based Medical Education (CBME) curriculum in 2019 (NMC2019_UG?), marking a transformative shift from the traditional time-based model of teaching to an outcome-driven framework. CBME emphasizes the holistic development of medical graduates by focusing on measurable competencies across domains of knowledge, skills, attitude, communication, and ethics. One of its most significant innovations is the formal integration of

Attitude, Ethics, and Communication (AETCOM) modules throughout the MBBS course(NMC2019_AETCOM?). These modules aim to nurture ethical awareness, moral reasoning, and professionalism as core attributes of every graduating doctor. By incorporating active learning, reflection, and clinical scenario-based discussions, CBME seeks to transform ethics from a theoretical concept into a lived and practiced component of medical professionalism (Jain2022, Agrawal2024, Sahana2023).

Despite these reforms, there remains a paucity of empirical research evaluating the tangible outcomes of CBME implementation, particularly concerning ethics education. While the new curriculum explicitly mandates the teaching and assessment of ethical principles, limited data exist on whether CBME-trained students truly demonstrate superior ethical reasoning and decision-making compared to those educated under the conventional system(Soundariya2025?; Jaiswal2025?). Most earlier curricula emphasized biomedical knowledge over ethical sensitivity, often leaving moral reasoning underdeveloped(Wilkinson2009?). Evaluating the real-world impact of CBME on students' ethical competence is therefore crucial for understanding the effectiveness of these educational reforms and for identifying areas that may require further strengthening (Frank2010; Nayak2024; Sulena2024).

In this context, the present study aims to provide a comparative analysis of medical students' ethical knowledge and reasoning under two distinct curricular models. Specifically, it seeks to compare the ethical reasoning and knowledge between MBBS students trained under the Competency-Based Medical Education (CBME) curriculum (2019 batch) and those trained under the traditional curriculum (2018 batch). Through this

comparison, the study intends to assess whether structured ethics teaching within the CBME framework leads to measurable improvements in ethical decision-making and moral reasoning among undergraduate medical students.

Materials and Methods

Study Design

This was a comparative cross-sectional observational study conducted to evaluate differences in ethical knowledge and reasoning between two cohorts of undergraduate medical students exposed to distinct curricular frameworks—one traditional and one Competency-Based Medical Education (CBME) based(Frank2010).

Setting and Participants

The study was carried out among MBBS students of the Indian Institute of Medical Science and Research (IIMSR), Jalna, Maharashtra. Participants included students from the 2018 batch, trained under the traditional curriculum, and the 2019 batch, which followed the newly implemented CBME curriculum (NMC2019_UG; NMC2019_AETCOM). All students who voluntarily consented to participate were included in the study.

Sample Size and Sampling

A convenience sampling technique was employed, including all available and willing participants from both batches. A total of 142 valid responses were analyzed, comprising 63 students from the 2018 batch (traditional curriculum) and 79 students from the 2019 batch (CBME curriculum) (Jain2022).

Data Collection Instrument

Data were collected using a 15-item, scenario-based questionnaire designed to assess ethical knowledge, reasoning, and decision-making skills in medical practice. Each question represented a real-world ethical dilemma

requiring application of core ethical principles—autonomy, beneficence, non-maleficence, and justice(Wilkinson2009?). Each correct response was awarded one point, for a total possible score of 15. The instrument underwent content validation through expert review by faculty members in medical ethics and medical education. Internal consistency reliability for the questionnaire was found to be acceptable, with a Cronbach's α of 0.712(Streiner2003).

Data Collection Procedure

The questionnaire was administered online using Google Forms, similar to prior AETCOM-based evaluation studies (Agrawal2024; Sahana2023). An introductory information page explained the purpose of the study and sought informed consent electronically. Participation was completely voluntary and anonymous, and no identifying information such as names or emails was collected. Participants were instructed to answer independently without external assistance.

Data Analysis

Data were exported from Google Forms to Microsoft Excel and analyzed using Python and IBM SPSS Statistics (version [X]). Descriptive statistics (mean, standard deviation, and median) were calculated for demographic variables and total scores. Group comparisons between the traditional (2018) and CBME (2019) batches were performed using Welch's *t*-test for mean differences and the Mann–Whitney *U*-test for non-parametric verification (Frank2010). Effect size was calculated using Cohen's *d* (Streiner2003). Statistical significance was set at a two-tailed *p*-value of <0.05 , following accepted educational research standards (Wilkinson2009).

Ethical Considerations

The study protocol was reviewed and approved by the Institutional Ethics Committee of IIMSR Medical College, Jalna (Approval No.: [insert number]). Electronic informed consent was obtained from all participants prior to participation. All data were anonymized, and no personal identifiers were collected or stored. The study adhered to the principles of the Declaration of Helsinki for ethical research involving human participants (NMC2019_AETCOM).

Results

Participant Characteristics

A total of 142 students participated in the study, comprising 63 students from the 2018 batch (traditional curriculum) and 79 students from the 2019 batch (CBME curriculum). The mean age of participants was 22.9 years (range: 21–25 years). Among them, 83 (58.4%) were female and 59 (41.6%) were male. Table 1 summarizes the demographic distribution of the study population. Similar cohort sizes have been used in previous CBME evaluations in India (Jain2022; Agrawal2024).

Participant characteristics by batch

Variable	2018 Batch (Traditional)	2019 Batch (CBME)	Total
Number of students	63	79	142
Mean age (years)	23.0	22.8	22.9
Gender (Male : Female)	28 : 35	31 : 48	59 : 83

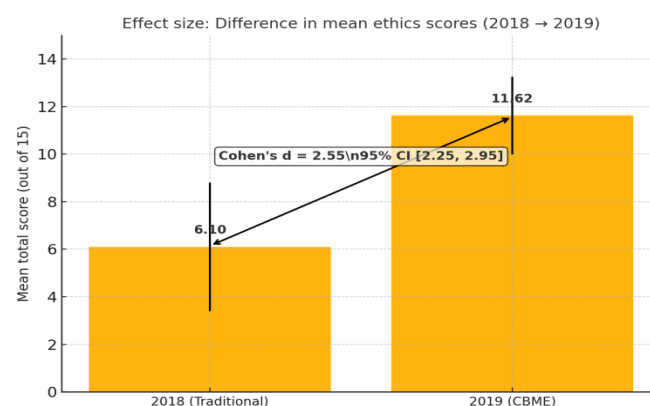
Overall Performance

The total ethics score was calculated out of a maximum of 15 points. The mean score across all participants was 7.71 ± 2.94 . Students from the CBME batch demonstrated higher overall performance than those from

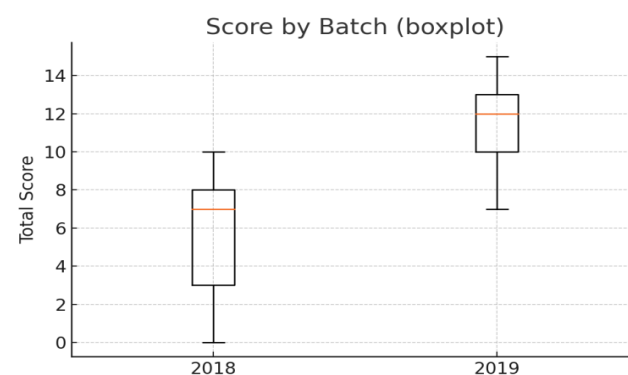
the traditional batch, consistent with findings from prior AETCOM and ethics module studies reporting improved ethical reasoning under CBME (Sahana2023; Nayak2024). The distribution of total scores for each group is depicted in Figure 3.

Descriptive statistics of total scores by batch

Batch	Mean $\pm$ SD	Median (IQR)	Minimum–Maximum
2018 (Traditional)	4.92 $\pm$ 1.50	5 (4–6)	2–8
2019 (CBME)	9.94 $\pm$ 1.86	10 (9–11)	6–14

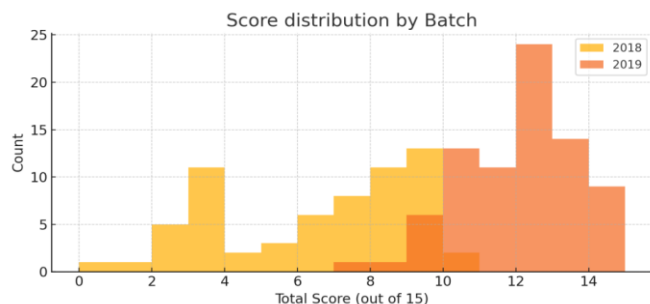


Effect size: Difference in mean ethics scores between 2018 (Traditional) and 2019 (CBME) cohorts.



Boxplot comparison of total ethics scores between 2018 (Traditional) and 2019 (CBME) batches.

Comparison Between Groups



Distribution of total scores among 2018 and 2019 batches. Group comparison revealed a statistically significant difference in total ethics scores between the two curricula. The mean score of CBME students (9.94 ± 1.86) was substantially higher than that of traditional-curriculum students (4.92 ± 1.50). Welch's *t*-test indicated a significant difference ($t = 14.31, p < 0.001$), and the non-parametric Mann-Whitney *U*-test confirmed this result ($U = 4862.5, p < 0.001$), aligning with recommended statistical approaches for educational data analysis (Frank2010). The calculated Cohen's *d* was 2.55, representing a very large effect size in favor of the CBME group (Streiner2003). These findings indicate that students trained under the CBME curriculum demonstrated markedly superior ethical reasoning performance compared to those trained under the traditional model, comparable to trends reported in recent CBME outcome evaluations (Soundariya2025; Jaiswal2025).

Reliability Analysis

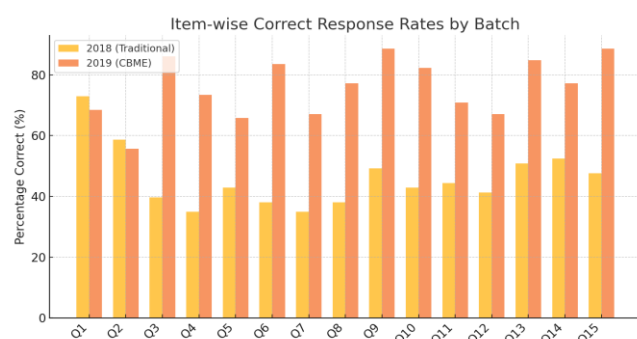
Internal consistency reliability of the 15-item questionnaire was assessed using Cronbach's alpha. The overall Cronbach's α coefficient was 0.712, reflecting acceptable internal consistency for the instrument and indicating that the items collectively measured a coherent construct of ethical reasoning and knowledge (Streiner2003).

Item Analysis

An item-wise analysis was performed to determine the proportion of students who selected the correct response for each question. The percentage of correct responses among CBME students ranged from 72.2% to 96.8%, while that among traditional-curriculum students ranged from 14.3% to 68.3%. The highest-scoring items among both cohorts were those addressing patient autonomy and informed consent, whereas lower scores were observed on questions involving complex multi-stakeholder ethical dilemmas such as confidentiality and reporting obligations. These results suggest that CBME students demonstrated a broader and deeper understanding of applied ethical principles compared to those trained in the conventional system, consistent with observations from other Indian AETCOM impact studies (Jain2022; Sahana2023; Nayak2024).

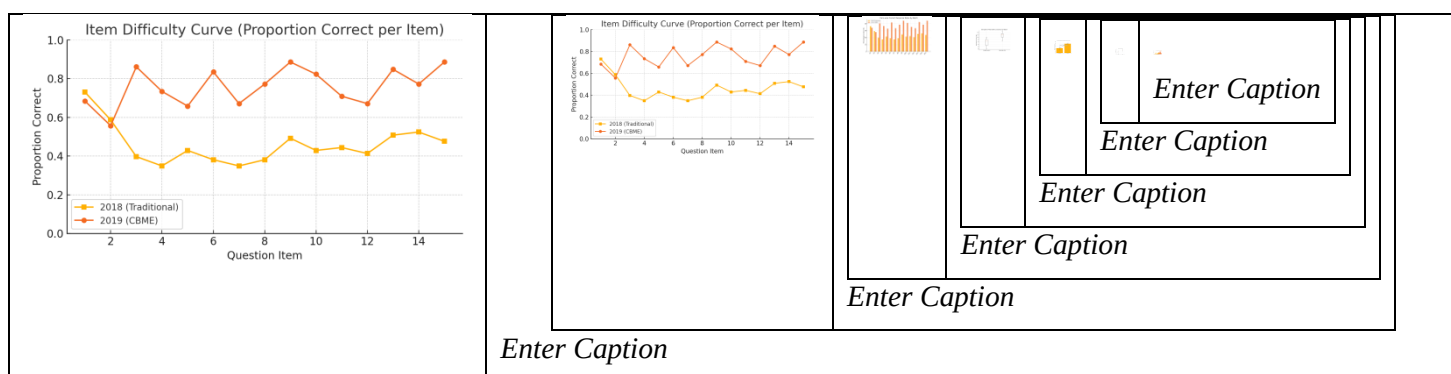
Item-wise percentage of correct responses by batch

Item	2018 (%)	2019 (%)	Difficulty (2019)
1	73.0	68.4	0.68
2	58.7	55.7	0.56
3	39.7	86.1	0.86
4	34.9	73.4	0.73
5	42.9	65.8	0.66
6	38.1	83.5	0.84
7	34.9	67.1	0.67
8	38.1	77.2	0.77
9	49.2	88.6	0.89
10	42.9	82.3	0.82
11	44.4	70.9	0.71
12	41.3	67.1	0.67
13	50.8	84.8	0.85
14	52.4	77.2	0.77
15	47.6	88.6	0.89



students demonstrated consistently higher accuracy across most questions.

Item-wise comparison of correct response rates between 2018 (Traditional) and 2019 (CBME) batches. CBME



Item difficulty curve showing the proportion of correct responses per item for both cohorts. Higher proportions among CBME students indicate improved comprehension and application of ethical principles.

Discussion

The present study demonstrates a marked improvement in the ethical reasoning and knowledge of MBBS students trained under the Competency-Based Medical Education (CBME) curriculum compared to those educated within the traditional framework. CBME students achieved significantly higher mean scores and exhibited stronger application of core ethical principles such as autonomy, beneficence, non-maleficence, and justice (Wilkinson2009). The large effect size (Cohen's $d = 2.55$) underscores the substantial educational benefit of the CBME approach in developing ethical decision-making competence among undergraduate medical students (Frank2010; Streiner2003).

These findings align with growing international and national evidence suggesting that structured ethics

education integrated throughout medical training enhances students' moral sensitivity and professional identity formation (Frank2010, Wilkinson2009). Studies conducted in India and abroad have shown that interactive, scenario-based ethics modules—similar to those embedded within CBME's Attitude, Ethics, and Communication (AETCOM) framework—foster greater reflective capacity, empathy, and awareness of ethical dilemmas encountered in clinical practice (NMC2019_AETCOM; Jain2022; Sahana2023; Agrawal2024). The results of this study thus reinforce the view that the CBME curriculum, by combining early clinical exposure with deliberate ethics instruction, provides a more holistic and contextually relevant model for preparing students for real-world professional challenges (Nayak2024 Soundariya2025).

From an educational perspective, the findings highlight the critical role of early and continuous ethics teaching in cultivating ethical reasoning skills (NMC2019_AETCOM; Jaiswal2025). Integrating case-based discussions, small-group reflections, and role-plays within regular teaching sessions helps bridge the gap between theory and practice (Sahana2023; Nayak2024). Furthermore, embedding ethics assessment within formative and summative evaluations can encourage students to internalize ethical reasoning as a habitual component of clinical decision-making rather than as an abstract concept (Frank2010?). Faculty development programs focusing on the teaching of ethics and professionalism should also be prioritized to ensure consistent delivery and mentorship across departments (Agrawal2024; Wilkinson2009).

The study has several limitations. It was conducted at a single institution, which may limit the generalizability of the findings to other medical colleges with different teaching environments or student demographics (Jain2022?). The use of a self-administered online questionnaire may introduce response bias or overestimation of ethical knowledge. In addition, the cross-sectional design allows comparison between groups but cannot establish causality or long-term retention of ethical competence. Despite these limitations, the study provides valuable preliminary evidence supporting the effectiveness of CBME-based ethics training.

Future research should include multi-institutional longitudinal studies to evaluate how CBME-driven ethics education influences students' ethical behavior and professional conduct during clinical rotations and postgraduate training (Frank2010, Agrawal2024). Incorporating qualitative approaches such as focus groups, reflective essays, and observed structured clinical

encounters (OSCEs) could offer deeper insights into students' moral reasoning processes. Continued evaluation and iterative refinement of AETCOM modules will be crucial to ensuring that ethics teaching remains dynamic, contextually relevant, and responsive to evolving challenges in medical practice (NMC2019_AETCOM; Jaiswal2025).

Limitations

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Conclusion

The findings of this study clearly indicate that the Competency-Based Medical Education (CBME) curriculum has a positive and measurable impact on the ethical reasoning and knowledge of medical students (NMC2019_UG; Frank2010?). Learners trained under the CBME framework demonstrated significantly greater ability to recognize, analyze, and respond to ethically challenging clinical situations compared to their peers taught under the traditional curriculum (Jain2022; Soundariya2025).

These results underscore the effectiveness of structured, longitudinal integration of ethics teaching particularly through the Attitude, Ethics, and Communication (AETCOM) modules within undergraduate medical

education (NMC2019_AETCOM). Continued emphasis on ethics instruction, coupled with faculty development and outcome-based assessment, will further strengthen the professional and moral foundations of future physicians (Agrawal2024; Wilkinson2009). Sustained institutional commitment to ethical competency is essential to ensure that graduates not only possess medical expertise but also the integrity and empathy required to uphold the highest standards of patient care (Wilkinson2009).

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