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Integration of Competency-Based Medical Education (CBME) in Undergraduate Curriculum: Opportunities and Challenges in Pakistani Medical Colleges

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ABSTRACT

Competency-Based Medical Education (CBME) is an outcome-oriented approach increasingly emphasized in undergraduate medical training. Its successful integration depends largely on faculty understanding and their perceptions of opportunities and barriers. **Objectives:** To assess the feasibility of integrating CBME into the undergraduate curriculum by examining faculty knowledge, perceived opportunities, and perceived challenges. **Methods:** This cross-sectional study was conducted at the Department of Medical Education, CMH Lahore Medical College and Institute of Dentistry, Lahore, Pakistan, from September 2024 to December 2024. Seventy-eight faculty members involved in undergraduate teaching were included through non-probability consecutive sampling. A structured self-administered questionnaire was used. The knowledge domain comprised five items scored 0-5; scores of 0-2 were categorized as inadequate knowledge and 3-5 as adequate knowledge. Opportunity and challenge domains were summarized as mean composite scores. Data were analyzed in SPSS version 26.0 using chi-square and independent-samples t-tests, with $p<0.05$ considered significant. **Results:** Mean age was 45.27 ± 9.17 years, and mean teaching experience was 12.17 ± 7.48 years. Mean CBME knowledge score was 2.50 ± 1.09. Knowledge level was significantly associated with gender ($p=0.007$). Faculty aware of PMDC guidelines had significantly higher Opportunity Scores ($p=0.020$). Challenge Scores did not differ significantly across subgroups. **Conclusions:** Faculty demonstrated modest knowledge of CBME, while perceptions of opportunities improved with greater policy awareness. Shared challenge scores suggest the need for broader institutional support, faculty development, and clearer dissemination of CBME guidance.

INTRODUCTION

Medical education is moving from time-based teaching models toward competency-based frameworks that define the knowledge, skills, attitudes, and professional behaviors expected from graduates. Competency-Based Medical Education (CBME) emphasizes observable outcomes, integration of learning, and accountability to patient and societal needs [1]. In Pakistan, curricular reform has increasingly focused on outcome-based undergraduate education. The Pakistan Medical and Dental Council (PMDC) has issued guidance that supports integration, skills development, and learner-centered approaches in undergraduate medical training [2]. These developments have made CBME an important topic for medical colleges attempting to align local curricula with contemporary standards. Despite its conceptual advantages, CBME implementation is not straightforward. Institutions in resource-constrained settings often face limited infrastructure, inadequate digital support, and insufficient assessment systems for workplace-based and competency-focused evaluation [3, 4]. Faculty development is therefore central to successful implementation, because teachers must move beyond

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traditional lecture-based delivery to facilitation, coaching, feedback, and competency-based assessment [5, 6]. CBME also creates opportunities. International experience shows that structured competency frameworks, better alignment of learning outcomes with assessment, and educational technology can improve the relevance and consistency of undergraduate training [7, 8]. In addition, contextual adaptation of global CBME principles may help medical schools respond more effectively to local healthcare priorities. At the same time, implementation depends heavily on how faculty understand CBME and how they perceive the opportunities and barriers associated with it. If faculty have limited understanding, inconsistent policy awareness, or concerns about feasibility, adoption may remain superficial despite curricular reform efforts [9, 10].

Even though the trend of competency-based medical education (CBME) is growing in the world, there is a gap in evidence concerning faculty knowledge, perceived opportunities, and challenges associated with the implementation of competency-based medical education in undergraduate medical education in Pakistan. The absence of local, institution-based information leaves a knowledge gap regarding the preparedness of faculty and the practicality of incorporating CBME into current programs, which could impede effective implementation plans. The present study aimed to assess the feasibility of integrating CBME into the undergraduate curriculum by examining faculty knowledge, perceived opportunities, and perceived challenges in a medical college in Lahore, Pakistan. The findings may help educators and policymakers design more realistic faculty development and implementation strategies.

METHODS

This cross-sectional study was conducted at the Department of Medical Education, CMH Lahore Medical College and Institute of Dentistry, Lahore, Pakistan, from September 2024 to December 2024. The study aimed to assess the feasibility of integrating Competency-Based Medical Education (CBME) into the undergraduate curriculum by examining faculty knowledge, perceived opportunities, and perceived challenges, and by exploring their association with selected demographic and institutional variables. Faculty members from both basic and clinical departments who were actively involved in undergraduate MBBS teaching were eligible for inclusion. Faculty on leave during the data-collection period or those not engaged in undergraduate teaching were excluded. Participants were enrolled through non-probability consecutive sampling, and the final analyzable sample comprised 78 faculty members. Data were collected using a structured self-administered questionnaire developed from published CBME faculty survey tools and reviewed by medical education experts for content relevance [11-13]. The questionnaire captured demographic variables (age, gender, designation, teaching experience, and department), prior CBME training, awareness of PMDC guidelines, perceived institutional support, and availability of CBME-related resources. The knowledge domain comprised five items scored as 1 for a correct response and 0 for an incorrect response, giving a total score from 0 to 5. For categorical analysis, scores of 0-2 were considered inadequate knowledge, and scores of 3-5 were considered adequate knowledge. Opportunity and challenge perceptions were measured using Likert-based items, and composite mean scores were calculated for each domain. Ethical approval was obtained from the Institutional Review Board of CMH Lahore Medical College and Institute of Dentistry, Lahore (IRB Ref. No. IERC No. IERC/OBS/2024/09). Administrative permission for data collection was obtained from the concerned department, and written informed consent was obtained from all participants. Confidentiality was maintained by anonymizing responses and storing the data in a password-protected database.

Data were entered and analyzed in IBM SPSS Statistics version 26.0. Quantitative variables, including age, teaching experience, knowledge score, Opportunity Score, and Challenge Score, were summarized as mean ± standard deviation. Categorical variables, including gender, designation, department, CBME training status, PMDC guideline awareness, institutional support, resource availability, and knowledge category, were summarized as frequencies and percentages. The chi-square test was used to examine associations between faculty characteristics and the categorized knowledge level. Independent-samples t-tests were used to compare mean Opportunity Scores and Challenge Scores across participant groups. A p-value of less than 0.005 was considered statistically significant.

RESULTS

A total of 78 faculty members participated in the study. Their mean age was 45.27 ± 9.17 years, and their mean teaching experience was 12.17 ± 7.48 years. The mean CBME knowledge score was 2.50 ± 1.09 out of 5, indicating a generally modest level of knowledge among participants. Knowledge was significantly associated with gender (p=0.007). No significant associations were observed with designation, department, previous CBME training, PMDC guideline awareness, institutional support, or the availability of CBME resources. Adequate knowledge in this analysis is defined as a score of 3-5, whereas inadequate knowledge is defined as a score of 0-2 (Table 1).

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Table 1: Association Between Faculty Characteristics and Knowledge Level

Variables	Subgroup	Inadequate Knowledge, n (%)	Adequate Knowledge, n (%)	p-value
Gender	Male	25 (69.4%)	11 (30.6%)	0.007
	Female	39 (92.9%)	3 (7.1%)	
Designation	Lecturer	18 (94.7%)	1 (5.3%)	0.268
	Assistant Professor	13 (86.7%)	2 (13.3%)	
	Associate Professor	19 (73.1%)	7 (26.9%)	
	Professor	14 (77.8%)	4 (22.2%)	
Department	Basic Sciences	32 (84.2%)	6 (15.8%)	0.628
	Clinical Sciences	32 (80.0%)	8 (20.0%)	
CBME Training	No	36 (87.8%)	5 (12.2%)	0.163
	Yes	28 (75.7%)	9 (24.3%)	
PMDC Awareness	No	34 (81.0%)	8 (19.0%)	0.785
	Yes	30 (83.3%)	6 (16.7%)	
Institutional Support	No	35 (83.3%)	7 (16.7%)	0.750
	Yes	29 (80.6%)	7 (19.4%)	
CBME Resources	No	37 (84.1%)	7 (15.9%)	0.593
	Yes	27 (79.4%)	7 (20.6%)	

Note: Adequate knowledge = score 3-5; inadequate knowledge = score 0-2

Faculty members who were aware of PMDC guidelines had significantly higher Opportunity Scores than those who were unaware (p=0.020). Differences according to gender, CBME training, department type, institutional support, and resource availability were not statistically significant, although some trends were observed (Table 2).

Table 2: Comparison of Opportunity Scores Across Participant Groups

Variables	Group	n	Mean ± SD	p-value
Gender	Male	36	2.93 ± 0.738	0.472
	Female	42	3.05 ± 0.690	
CBME Training	No	41	3.13 ± 0.740	0.066
	Yes	37	2.84 ± 0.651	
Department Type	Basic Sciences	38	3.11 ± 0.788	0.153
	Clinical Sciences	40	2.88 ± 0.618	
Institutional Support	No	42	2.96 ± 0.680	0.697
	Yes	36	3.03 ± 0.753	
PMDC Awareness	No	42	2.82 ± 0.699	0.020
	Yes	36	3.19 ± 0.679	
CBME Resources	No	44	3.07 ± 0.771	0.295
	Yes	34	2.90 ± 0.622	

Challenge Scores did not differ significantly by gender, CBME training, department, institutional support, PMDC guideline awareness, or resource availability. These findings suggest that perceived implementation barriers were broadly shared across faculty groups (Table 3).

Table 3: Comparison of Challenge Scores Across Demographic and Institutional Variables

Variables	Subgroup	n	Mean ± SD	p-value
Gender	Male	36	2.82 ± 0.78	0.431
	Female	42	2.95 ± 0.64	
CBME Training	No	41	2.90 ± 0.67	0.848
	Yes	37	2.87 ± 0.75	
Department	Basic Sciences	38	2.89 ± 0.72	0.997
	Clinical Sciences	40	2.89 ± 0.70	
Institutional Support	No	42	2.89 ± 0.63	0.946
	Yes	36	2.88 ± 0.79	
PMDC Awareness	No	42	2.82 ± 0.65	0.330
	Yes	36	2.97 ± 0.77	
CBME Resources	No	44	2.90 ± 0.72	0.826
	Yes	34	2.87 ± 0.70	

DISCUSSION

This study evaluated the feasibility of integrating CBME into the undergraduate curriculum through faculty knowledge and perceptions. Overall, faculty members demonstrated modest knowledge of CBME, while perceptions of opportunities were more favorable among those who were aware of PMDC guidance. In contrast, perceived challenges were similar across subgroups, suggesting that barriers to implementation are experienced at a broader institutional level rather than within a single faculty category. The finding of modest knowledge is consistent with previous studies showing that faculty often support the concept of CBME but remain uncertain about its operational details and implementation requirements [13, 14]. Studies from India have similarly reported that although faculty generally recognize the value of CBME, gaps remain in practical understanding, assessment planning, and curricular alignment [15-17]. The significant association between gender and knowledge level should be interpreted cautiously. Because this was a single-institution study with unequal subgroup sizes, the observed difference may reflect variation in prior exposure, teaching responsibilities, or access to faculty development rather than an intrinsic gender-related effect. Upadhyay et al. also reported variable faculty knowledge across subgroups, emphasizing the importance of institutional exposure and training opportunities rather than demographic labeling alone [11]. Faculty who had received CBME training showed higher knowledge levels numerically, but the association was not statistically significant. This may indicate that training exposure alone is insufficient unless it is recent, practical, and reinforced through mentorship and implementation support. Similar observations have been reported in studies showing that short or isolated training programs improve awareness but may not produce sustained readiness for CBME practice [12, 17]. Awareness of PMDC guidelines was associated with significantly higher Opportunity Scores. This likely reflects the role of

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policy familiarity in shaping faculty confidence about curriculum reform. However, self-selection is also possible, because more engaged or motivated faculty may be both more aware of guidelines and more optimistic about implementation. Earlier work has also shown that policy communication, administrative backing, and institutional readiness influence how faculty perceive the benefits of CBME [9, 18]. The lack of significant subgroup differences in Challenge Scores suggests that implementation barriers were widely recognized by participants regardless of background. Previous literature has similarly identified shared concerns related to infrastructure, workload, assessment methods, and administrative support [13-16]. At the same time, limited variation in challenge scores may also indicate that the scoring system had restricted sensitivity to detect smaller subgroup differences, which should be considered while interpreting the findings. Findings from qualitative and program-evaluation studies further support the need for faculty development that goes beyond orientation sessions. Effective CBME implementation requires continuous mentoring, assessment support, curricular coordination, and institutional commitment to resources and governance [19, 20].

The present findings therefore support a phased implementation strategy that combines faculty training with clearer policy dissemination and practical systems for assessment and feedback. This study is limited by its single-center design, modest sample size, and use of self-reported perceptions. Because the survey was conducted in one institution, the findings may not be generalizable to all Pakistani medical colleges. Nevertheless, the study provides useful local evidence on faculty readiness and perceived feasibility of CBME integration in the undergraduate setting.

CONCLUSIONS

Faculty demonstrated modest knowledge of CBME, and awareness of PMDC guidance was associated with more positive perceptions of implementation opportunities. Perceived challenges, however, were shared across groups, indicating the need for institution-wide solutions. Targeted faculty development, clearer policy dissemination, and stronger administrative and assessment support are likely to improve the successful integration of CBME into the undergraduate curriculum.

Authors' Contribution

Conceptualization: ZS
Methodology: ZS, SG
Formal analysis: SBN, SG, JSK
Writing and Drafting: ZS, FM, JSK
Review and Editing: ZS, SBN, SG, FM, JSK

All authors approved the final manuscript and take responsibility for the integrity of the work

Conflicts of Interest

All the authors declare no conflict of interest.

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