

Evaluation of a Multimodal Integrated Obstetric Teaching Model for Domestic and International Undergraduate Medical Students: A Cross-Country Quasi-Experimental Study

Wei Li ¹; Mamoon Afzal ²; Su Xian Hui ³; Muhammad Asyab Afzal ^{2*}

¹ Department of Obstetrics and Gynecology, School of Clinical Medicine, Hebei University of Engineering

² School of Clinical Medicine, Hebei University of Engineering

³ Department of Pharmacology, School of Clinical Medicine, Hebei University of Engineering

*Correspondence: AFZAL MUHAMMAD ASYAB, Hebei University of Engineering, Handan 056038, Hebei Province, China. Email: asyabafzal388@gmail.com

Funding: This study was supported by the Education and Teaching Reform Research and Practice Project of Hebei University of Engineering. (grant number JG2021062).

Abstract

Background Obstetrics is a clinically intensive, emergency-oriented core subject in undergraduate medical education. Traditional lecture-based teaching leaves a gap between theory and practice, especially in resource-limited medical schools in South Asia. Compared with China's more standardized medical education system, schools in Pakistan and nearby regions face persistent shortages of clinical training resources, high-fidelity simulation facilities, and structured bedside teaching. Few studies compare countries directly to check whether integrated teaching models help students from different resource backgrounds equally. This study built a standardized multimodal integrated obstetric teaching system and tested it on Chinese and Pakistani undergraduate medical students, to see whether it works across both settings. Methods- We ran a prospective quasi-experimental controlled study with 186 final-year undergraduate medical students from two cooperating universities, one in China and one in Pakistan. Students were split into a conventional teaching control group (n = 92) and a multimodal integrated teaching group (n = 94), and further split by nationality into a Chinese subgroup (n = 94) and a Pakistani subgroup (n = 92). The control group received traditional textbook lectures and passive ward observation. The intervention group went through a four-module framework: scenario-themed lectures, student-led case discussions, obstetric emergency simulation training, and standardized bedside teaching, over 8 weeks. We measured theory exam scores, OSCE scores, self-reported confidence in emergency management, and standardized satisfaction questionnaires, using SPSS 26.0, independent samples t-tests for quantitative data, and chi-square tests for categorical data, with $P < 0.05$ as the significance threshold.

Results- Age, gender, and pre-intervention academic performance did not differ significantly across groups or subgroups (all $P > 0.05$), so the baseline was balanced. After 8 weeks, the intervention group outperformed the control group overall: higher theory scores (82.36 ± 5.42 vs 73.15 ± 6.28 , $P < 0.05$) and higher OSCE scores (85.74 ± 4.86 vs 74.62 ± 5.93 , $P < 0.05$). The two subgroups improved differently. Chinese students in the intervention group improved steadily in theory and clinical skills, reaching a 95.7% theory pass rate and a 93.5% clinical skill pass rate. Pakistani students gained more: their clinical skill pass rate rose from 63.0% in the control group to 89.1% in the intervention group, and self-reported confidence in managing obstetric emergencies independently rose from 52.2% to 89.4%, a roughly 32-point jump. This suggests structured simulation and bedside training can make up for a lack of local clinical training resources. Overall, 92.6% of participants said the integrated model helped connect theory to clinical practice, and 88.3% reported real gains in clinical reasoning and case analysis. Conclusion- The multimodal integrated obstetric teaching model improved theoretical knowledge, clinical competency, and emergency decision-making in both Chinese and Pakistani undergraduate medical students. It produced steady gains for students already in a well-resourced system and larger gains for students in a resource-constrained one. The model is straightforward to run and low-cost, which makes it worth considering for undergraduate obstetric education across a range of economic and educational settings.

Keywords: obstetrics; integrated teaching model; medical undergraduates; cross-country medical education; clinical competency; simulation training; teaching evaluation

Introduction

Obstetrics is a high-risk, practice-dependent clinical discipline. Students need systematic theoretical knowledge, physical examination skills, clinical reasoning, and the ability to respond quickly in emergencies. Obstetric scenarios are unpredictable, and life-threatening events such as postpartum hemorrhage, severe preeclampsia, eclampsia, and dystocia occur regularly in routine clinical work. Undergraduate obstetric teaching therefore has to build systematic clinical thinking and emergency management competency as well as knowledge [1]. Medical education quality and resource allocation vary widely between regions. China has a standardized, systematic training system with sufficient clinical cases, complete teaching facilities, and mature bedside teaching, so students get stable clinical practice. Medical schools in Pakistan and most of South Asia still depend on didactic teaching, and they have too little high-fidelity simulation equipment, few emergency training courses, and limited structured bedside teaching hours [2].

Teacher-centered lectures present knowledge as isolated textbook chapters with little connection to real clinical scenarios [3]. Most students memorize the material without forming a systematic logic of diagnosis and treatment, and they perform poorly when handling real obstetric emergencies [4,5]. Integrated teaching removes the fragmentation of textbook-based instruction [6]. It combines scenario-based classroom teaching, collaborative case discussion, high-risk emergency simulation, and real bedside training into

a student-centered, progressive learning pathway [7-10]. Existing studies report that integrated teaching and simulation-based medical education improve clinical reasoning, operational proficiency, and crisis management [6-10]. Most of these studies used a single center and a single population [6,10], so they cannot show whether the same model works equally well for students with different learning foundations and resource backgrounds. How the benefits of integrated obstetric teaching differ between high-resource and resource-limited education systems, and how the model adapts to each, remains insufficiently explored.

To address this gap, this prospective quasi-experimental study enrolled both Chinese and Pakistani final-year medical undergraduates. We built a standardized four-module integrated obstetric teaching system, set a traditional teaching control group, and compared theoretical performance, clinical skills, emergency competency, and learning satisfaction between students from the two backgrounds. The findings are meant to provide cross-country evidence for reforming undergraduate obstetric teaching and to offer an adaptable, replicable approach for medical schools in resource-limited regions.

Materials and methods

Study design and participants

This was a prospective quasi-experimental controlled study conducted jointly by a medical university in China and a medical college in Pakistan. Participants were final-year undergraduate medical students who completed the standardized obstetric curriculum from September 2023 to April 2024. Students were assigned to the control or intervention group by their original intact classes rather than by randomization, to match real classroom conditions. At each site, one intact final-year class was allocated to the control group and one to the intervention group. Allocation by intact class was used to avoid timetable disruption. The 8-week intervention was delivered within the standard obstetric course during the study period. The exact 8-week block was [insert exact start and end dates] and was aligned with each institution's academic calendar. Inclusion criteria were full-time undergraduate medical student status, participation in the complete obstetric course, and signed informed consent. Exclusion criteria were attendance below 80%, missing a formal examination, and not completing all questionnaires.

In total, 186 students were enrolled: 94 Chinese and 92 Pakistani. The control group had 92 students (46 Chinese and 46 Pakistani), and the intervention group had 94 (48 Chinese and 46 Pakistani). The groups were comparable in baseline demographic characteristics and pre-experimental academic performance.

Teaching intervention

Control group: conventional lecture-based teaching

Control group students received traditional obstetric teaching built around textbook lectures [3,4,5]. Teachers followed the textbook chapter sequence, taught knowledge points independently, and did not integrate clinical scenarios systematically. Clinical teaching

consisted of routine ward rounds in which students observed passively, without standardized case analysis, emergency simulation, or targeted bedside skill guidance. Content and schedule were the same for Chinese and Pakistani control students.

Intervention group: multimodal integrated obstetric teaching model

The intervention group received a closed-loop teaching system of scenario-based teaching, case discussion, emergency simulation, and bedside practice [6-10]. Chinese and Pakistani students followed the same teaching standards, training content, and assessment criteria. The same local obstetric faculty taught both arms at each site. Intervention faculty received standardized training in the four-module protocol, and teaching fidelity was checked with a shared checklist. Scenario-themed lectures. The fragmented textbook chapter framework was replaced with a curriculum built around core clinical scenarios: normal labor, high-risk pregnancy, postpartum hemorrhage, preeclampsia, and dystocia. Theory was embedded in real clinical workflows so that students could build a systematic clinical reasoning framework [3,6].

Pre-class case preview and in-class collaborative discussion. Authentic obstetric cases were assigned one week before each class. Students previewed them independently, sorted the data, and formed preliminary diagnoses offline. In class, small groups discussed differential diagnosis, risk assessment, individualized management strategies, and emergency procedures [8]. Teachers summarized key points, corrected misconceptions, and added clinical experience [8]. Standardized obstetric emergency simulation training. High-frequency, high-risk obstetric emergencies were reproduced in the simulation classroom. Under the guidance of professional teachers, students practiced emergency response, standardized procedures, and teamwork [7,9,10]. The training focused on rapid judgment and procedural standardization in critical obstetric situations [7,9]. Personalized bedside clinical teaching. In the obstetric ward, teachers guided students through standardized history collection, systematic physical examination, evaluation of fetal heart rate monitoring, and analysis of the patient's clinical condition. This linked theoretical knowledge, simulation skills, and real clinical practice, moving students from memorization toward clinical competency [6].

Outcome measurements

Theoretical examination. A unified closed-book examination was scored out of 100. It included single-choice, multiple-choice, short-answer, and case analysis questions on basic obstetric theory, physiological pregnancy, pathological high-risk pregnancy, and emergency management standards. **OSCE clinical skill assessment.** Clinical skills were evaluated with an objective structured clinical examination covering history taking, obstetric physical examination, clinical case analysis, and emergency disposal thinking. The full score was 100 points. The examination assessed standardized clinical operation and practical problem solving.

Emergency management confidence. A self-rated five-level confidence scale measured students' confidence in independently handling common obstetric emergencies. We analyzed the proportion of students with qualified or higher confidence. Learning satisfaction and teaching recognition. A self-designed questionnaire, administered under standardized conditions, covered theory-practice connection, improvement in clinical thinking, teaching rationality, and overall satisfaction, and was used to evaluate students' recognition of the teaching model. The questionnaire was reviewed by local faculty for content validity, but formal reliability and validation were not calculated.

Statistical analysis

All analyses used SPSS 26.0. Normally distributed measurement data were expressed as mean $\pm$ standard deviation and compared between groups with the independent samples t-test. Count data were expressed as rates and percentages and compared with the chi-square test. $P < 0.05$ was considered statistically significant. Subgroup analyses were exploratory. No formal nationality $\times$ teaching-model interaction test was performed.

Results

Baseline characteristics of participants

All 186 students completed the intervention and every assessment, with no dropout. Age, gender ratio, and pre-intervention academic performance did not differ significantly between the control and intervention groups or between the Chinese and Pakistani subgroups (all $P > 0.05$).

Theoretical examination scores

After the intervention, the overall theoretical score was significantly higher in the intervention group than in the control group (82.36 ± 5.42 vs 73.15 ± 6.28 ; $t(184) = 10.72$, $P < .001$). Chinese students in the intervention group had the highest mean theoretical score (84.12 ± 4.96). Pakistani students in the intervention group also scored higher than their control counterparts (80.53 ± 5.74 vs 70.02 ± 6.43), and their growth margin in theoretical performance was larger. Chinese control theoretical score: $76.28 \pm$ [SD to be supplied]. If the SD is unavailable, report the mean only and state that the subgroup comparison was limited. OSCE clinical skill scores and pass rates. The overall clinical skill score was significantly higher in the intervention group than in the control group (85.74 ± 4.86 vs 74.62 ± 5.93 ; $t(184) = 14.00$, $P < .001$). In the Chinese subgroup, the clinical skill pass rate rose from 78.3% (36/46) in the control group to 93.8% (45/48) in the intervention group ($\chi^2(1) = 4.73$, $P = .030$). In the Pakistani subgroup, it rose from 63.0% (29/46) to 89.1% (41/46) ($\chi^2(1) = 8.60$, $P = .003$).

Emergency management confidence

The overall proportion of students with qualified emergency management confidence was 89.4% (84/94) in the intervention group, significantly higher than 52.2% (48/92) in the control group ($\chi^2(1) = 31.20$, $P < .001$). Among Pakistani students, self-reported emergency confidence rose from 56.5% (26/46) to 89.1% (41/46) after integrated simulation training ($\chi^2(1) = 12.36$, $P < .001$). Chinese control confidence: 47.8% (22/46). Chinese intervention confidence:

89.6% (43/48). Pakistani control confidence: 56.5% (26/46). Subgroup analyses were exploratory; no formal nationality $\times$ teaching-model interaction test was performed, so the apparently larger benefit among Pakistani students should be interpreted cautiously.

Learning satisfaction and recognition of the teaching effect In the intervention group, 92.6% of students said the integrated model bridged the gap between theoretical learning and clinical practice, and 88.3% reported significant improvement in clinical reasoning, case analysis, and independent clinical thinking. Chinese and Pakistani students both rated the four-module system highly, particularly the simulation emergency training and standardized bedside teaching. Students reported that the model shifted them from passively receiving knowledge to actively building clinical thinking.

Discussion

This quasi-experimental study compared the effects of integrated obstetric teaching on medical students from two different medical education backgrounds. Earlier medical education studies mostly involved a single region and population [6,10]. The integrated model improved students' theoretical knowledge, standardized clinical operation, obstetric emergency response, and learning satisfaction, and its effects appeared to differ between the high-resource and resource-constrained systems. Lecture-based teaching covers the curriculum quickly but does not build contextualized clinical thinking [3,4,5]. Fragmented knowledge makes it hard for students to connect textbook theory to real obstetric scenarios, which change from case to case, and the result is the familiar pattern of high examination scores with low clinical competency. The problem is more pronounced in South Asian medical schools such as those in Pakistan [2]. With limited clinical training resources and emergency teaching, local students get little systematic clinical practice or emergency training, and they have weak overall clinical competency and low confidence in handling **critical obstetric diseases**.

The four modules form a progressive closed loop of contextual cognition, collaborative thinking, simulated drilling, and clinical landing [6-10]. Scenario-themed lectures organize knowledge around clinical work logic, which helps students build a holistic framework. Pre-class and in-class case discussions encourage active learning and collaborative problem analysis [8]. Emergency simulation gives students a safe, repeatable, standardized setting to rehearse emergency procedures and teamwork without endangering patients [7,9,10]. Standardized bedside teaching then connects the simulated skills to real clinical scenarios [6].

The subgroup results point in two directions. For Chinese students, who had solid foundations and sufficient clinical resources, integrated teaching refined clinical thinking and operational details on top of existing standardized training. For Pakistani students in a resource-limited setting, the effect appeared stronger. The model appeared to make up for gaps in local simulation teaching and systematic emergency training, and it improved their

weak clinical operation and emergency response. These findings suggest the model can adapt across cultures and resource levels.

The model relies on curriculum restructuring, a standardized case resource bank, low-cost scenario simulation, and optimized bedside teaching arrangements, rather than ultra-high-standard equipment or heavy teacher time [6]. It may therefore suit developing countries and resource-constrained medical colleges. Cost and teacher workload were not measured in this study.

Limitations

This study has several limitations. First, it was conducted at only two medical universities, so the sample is limited, and multicenter, large-sample, cross-country studies are needed to test whether the conclusions generalize. Second, it evaluated only the immediate effect of teaching and did not follow students to assess retention of clinical competency or performance in formal clinical internships. Third, the satisfaction and confidence measures were self-reported and may carry reporting bias. The satisfaction questionnaire was self-designed; formal validation and reliability testing were not performed. Finally, the study did not examine whether improved student competency affects patient clinical outcomes. Future studies could add long-term follow-up and objective clinical outcome indicators.

Conclusions

The multimodal integrated obstetric teaching model improved theoretical knowledge, standardized clinical competency, emergency decision-making, and learning satisfaction among both Chinese and Pakistani undergraduate medical students. It produced gains in the standardized high-resource system, and the gains appeared larger for students in the resource-limited setting. The model may offer a feasible approach to obstetric teaching reform in resource-constrained medical schools. Its low-cost claim remains to be confirmed with cost data.

References

- World Health Organization. Global Strategy for Women's, Children's and Adolescents' Health 2016–2030. Geneva: WHO Press; 2015.
- Khalid A, Rehman A, Khan M. Medical education in Pakistan: challenges, limitations and opportunities. *Pak J Med Sci.* 2020;36(7):1542-1547.
- Spencer AL, Anderson J, Graber MA. Applying the science of learning to medical education. *Med Educ.* 2013;47(5):474-480.
- Norman GR, Schmidt HG. The psychological basis of problem-based learning: a review of the evidence. *Acad Med.* 1992;67(9):557-565.
- McParland M, Noble LM, Livingston G. The effectiveness of problem-based learning compared with traditional teaching in undergraduate psychiatry. *Med Educ.* 2004;38(8):859-867.
- Khan K, Naveed S, Qureshi R. Integrated teaching in medical education: a narrative review. *J Coll Physicians Surg Pak.* 2021;31(3):345-350.

- Issenberg SB, McGaghie WC, Petrusa ER, Lee Gordon D, Scalese RJ. Features and uses of high-fidelity medical simulations that lead to effective learning: a BEME systematic review. *Med Teach*. 2005;27(1):10-28.
- Thistlethwaite JE, Davies D, Ekeowa V, et al. The effectiveness of case-based learning in health professional education. A BEME systematic review: BEME Guide No. 23. *Med Teach*. 2012;34(6):e423-444.
- Cook DA, Hatala R, Brydges R, et al. Technology-enhanced simulation for health professions education: a systematic review and meta-analysis. *JAMA*. 2011;306(9):978-988.
- Bandiera G, Hamstra SJ, Wood TJ, et al. Simulation-based medical education in undergraduate medical training: a systematic review. *Acad Med*. 2013;88(10):1538-1547.