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Impact of Structured Early Clinical Exposure on Confidence and Competence among Undergraduate Health Science Students in Islamabad

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ABSTRACT

Transitioning from classroom to clinical settings can be overwhelming for undergraduate health sciences students. Early Clinical Exposure (ECE) has been proposed to enhance confidence and competence during early training, yet its impact remains under-evaluated in local contexts. **Objective:** To assess the effect of structured early clinical exposure on the self-reported confidence and perceived competence of undergraduate medical, dental, and nursing students. **Methods:** This quasi-experimental pretest-posttest study was conducted from November 2024 to April 2025 at Rawal Institute of Health Sciences, Islamabad. A total of 71 students from 3rd, 4th, and final year were enrolled through convenience sampling. Participants completed a validated self-assessment questionnaire before and after a structured ECE session, which included classroom orientation, ward rotations, bedside interaction, and debriefing. The tool was pilot tested and showed strong internal consistency (Cronbach's alpha = 0.86). Paired t-tests and chi-square tests were used for analysis ($p < 0.05$). **Results:** Post-intervention scores showed significant improvements across all five domains of clinical confidence, including history taking, communication, examination skills, case presentation, and anxiety management ($p < 0.001$). Gender was significantly associated with comfort in ward settings and understanding hospital hierarchy. No significant differences were observed across academic years. **Conclusions:** Structured early clinical exposure significantly enhanced students' clinical confidence and preparedness across domains. Integrating ECE into undergraduate curricula can foster smoother transitions into clinical environments.

INTRODUCTION

In recent years, there has been a growing emphasis on integrating clinical experiences early in medical and health sciences education [1]. Traditional curricula often delayed clinical exposure until the later years, leaving students underprepared for real-world patient interactions [2]. This delay not only affected their clinical confidence but also widened the gap between theoretical learning and practical application. Early clinical exposure (ECE) emerged as a promising educational approach to bridge this gap by introducing students to patient care settings during the pre-clinical or early clinical years [3].ECE allowed students to observe, interact, and reflect within the clinical environment under structured guidance [4]. It offered opportunities to apply basic science knowledge in real-life contexts, develop professional behavior, and become familiar with hospital systems and team dynamics. Numerous international studies demonstrated that early exposure enhanced communication skills, promoted

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patient-centered attitudes, and improved confidence in performing clinical tasks. For example, a study conducted at Burapha University in Thailand reported that ECE improved second-year students' confidence and understanding of hospital roles,while Kalusopa *et al.*, in (2023) observed enhanced integration of theoretical knowledge and practical care in early neonatal nursing exposure in Zambia [5, 6]. However, the impact of such interventions in local and regional contexts, such as India, Nepal, and Pakistan, remained underexplored. For instance, a study conducted in a North Indian medical college found that early exposure significantly reduced student anxiety, while another study from a Pakistani institution reported improved self-efficacy in clinical communication following ECE interventions [7, 8]. In Pakistan, many medical and dental colleges still followed traditional didactic models, offering limited opportunities for early hospital engagement [9]. As a result, students often felt anxious and unprepared when they first entered the wards in their senior years.There was, therefore, a growing need to investigate whether structured early clinical experiences could improve student preparedness and confidence before formal clinical rotations began.

This study aimed to evaluate the effect of early clinical exposure on the self-reported confidence and perceived competence of undergraduate students at a health sciences institute in Islamabad. Specifically, it sought to answer the research question: *Does structured early clinical exposure significantly enhance the clinical confidence and perceived competence of undergraduate students in pre-final and final years?* The study addressed a critical gap in the literature by providing evidence from a local setting and examined how early clinical exposure could support a smoother transition into clinical practice.

METHODS

This was a quantitative, quasi-experimental pre-post-test study designed to assess the impact of structured Early Clinical Exposure (ECE) on the confidence and self-perceived competence of undergraduate health science students. The study was conducted at Rawal Institute of Health Sciences, Islamabad, over six months, from November 2024 to April 2025. Ethical approval was obtained from the Institutional Review Board (IRB) of Rawal Institute of Health Sciences, under Reference No. RIHS/IRB/29/2024. The study titled "Impact of Early Clinical Exposure on Medical Students' Confidence and Competency" was approved for one year. Informed written consent was obtained from all participants, who were informed of their right to withdraw from the study at any stage without penalty. Participation was entirely voluntary. The principles outlined in the Declaration of Helsinki were strictly followed. All collected data were used solely for research purposes, and participant anonymity and confidentiality were rigorously maintained throughout. The sample size was calculated using G*Power software (version 3.1.9.7) for a paired-sample t-test. With an effect size (Cohen's d) of 0.8, a power of 80%, and an alpha of 0.05, the minimum required sample was 64 participants. To allow for potential dropouts, the final sample was increased to 71 students. The effect size estimation was based on a prior interventional study by AkbariRad et al., in (2023), which reported comparable gains in self-reported confidence following structured clinical exposure [10]. Participants were recruited via convenience sampling. Eligible students were those enrolled in the 3rd, 4th, or final year of MBBS, who had no prior structured clinical exposure and who voluntarily agreed to participate with written informed consent. First and second-year students were excluded from this study as they had not yet entered the clinical phase of their curriculum and lacked the necessary foundational clinical knowledge and hospital orientation. The study focused on 3rd, 4th, and final-year students who had sufficient academic background and readiness to engage in structured clinical exposure and meaningfully reflect on their confidence and competency in patient care settings. Students who had participated in pilot ECE sessions, external hospital rotations, or who submitted incomplete questionnaires were excluded. The study used a single-group pre-post design. Initially, participants completed a pre-intervention questionnaire assessing confidence in five clinical domains: (a) taking patient history, (b) communicating with patients, (c) performing general physical examination, (d) presenting cases to seniors, and (e) managing clinical anxiety. Responses were rated on a 5-point Likert scale ranging from 1 (not confident at all) to 5 (very confident). The questionnaire was adapted from previously validated tools used in studies evaluating early clinical exposure and student readiness [11, 12]. The ECE intervention included: A structured classroom orientation on hospital protocols and clinical communication. A guided hospital tour introducing key clinical departments. Supervised small-group ward rotations in medical and surgical units. Real-time bedside exposure with patient interaction. A concluding debriefing and reflection session with faculty. After one week, the same students completed a post-intervention questionnaire with identical items for comparison. The questionnaire was pilot tested on 10 students (excluded from the main sample) for clarity and structure. Content validity was reviewed by two senior faculty members. Internal consistency was assessed using Cronbach's alpha, which yielded a value of 0.86, indicating strong reliability. All responses were entered and analysed using IBM SPSS Statistics version 25.0. Descriptive statistics were used to summarize demographic data and confidence scores. A paired sample t-test was conducted to compare pre- and post-exposure confidence means. Chi-square tests examined associations between demographics (gender, academic year, clinical exposure) and perceived

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competencies. Effect sizes were reported using Phi coefficient or Cramer's V, and one-way ANOVA was applied to compare post-confidence scores across academic years. Levene's test was used to assess homogeneity of variance, and the Shapiro-Wilk test confirmed data normality. A p-value of <0.05 was considered statistically significant. Missing data were addressed using listwise deletion.

RESULTS

The study included 71 students, with a fairly even age distribution between 18–20 years (42.3%) and 21–23 years (43.7%). Slightly more females (54.9%) participated than males (45.1%). Representation was balanced across academic years. Notably, 87.3% of students had no prior clinical exposure, highlighting the relevance of evaluating early clinical exposure in this cohort, Table 1.

Table 1: Demographic Characteristics of Participants (n = 71)

Variables	Category	Frequency (%)
Age Group	18–20 Years	30 (42.3)
	21–23 Years	31 (43.7)
	>23 Years	10 (14.1)
Gender	Male	32 (45.1)
	Female	39 (54.9)
Year of Study	3rd Year	24 (33.8)
	4th Year	22 (31.0)
	Final Year	25 (35.2)
Previous Clinical Exposure	Yes	9 (12.7)
	No	62 (87.3)

All five domains of clinical confidence showed statistically significant improvement following the intervention ($p < 0.001$). The largest gains were observed in history taking and general examination skills. Communication, case presentation, and anxiety management also improved markedly, indicating a broad and consistent impact of early clinical exposure on self-perceived competence, Table 2.

Table 2: Comparison of Confidence Levels Before and After Clinical Exposure (n = 71)

Domain of Confidence	Pre-Exposure Mean ± SD	Post-Exposure Mean ± SD	p-Value
Taking patient history	2.67 ± 0.56	3.99 ± 0.54	p < 0.001
Communicating with patients	2.62 ± 0.37	4.01 ± 0.40	p < 0.001
Performing general examination	2.59 ± 0.52	3.99 ± 0.48	p < 0.001
Presenting cases to seniors	2.25 ± 0.55	3.77 ± 0.54	p < 0.001
Handling clinical anxiety	2.39 ± 0.45	3.66 ± 0.49	p < 0.001

Chi-square analysis showed no significant associations between background variables and most competencies. However, gender was significantly associated with comfort in the ward ($p = 0.021$, Phi = 0.329) and understanding of hospital hierarchy ($p = 0.036$, Phi = 0.307), suggesting gender-specific differences in adapting to the clinical environment. Other factors, including year of study and prior exposure, showed no meaningful associations, Table 3.

Table 3: Summary of Chi-Square Test Results and Strength of Association (n = 71)

Competency	Variables	Chi-square	p-Value	Phi/ Cramer's V
Link theory to practice	Gender	3.93	p = 0.140	0.235 (small)
	Year of Study	4.30	p = 0.367	0.174 (weak)
	Previous Clinical Exp.	1.74	p = 0.419	0.156 (weak)
	Confidence Category	0.11	p = 0.949	0.039 (v. weak)
Conduct physical exams	Gender	1.71	p = 0.425	0.155 (weak)
	Year of Study	3.82	p = 0.431	0.164 (weak)
	Previous Clinical Exp.	2.76	p = 0.251	0.197 (weak)
	Confidence Category	0.19	p = 0.908	0.052 (v. weak)
Comfortable in ward	Gender	7.70	p = 0.021	0.329 (moderate)
	Year of Study	2.87	p = 0.580	0.142 (weak)
	Previous Clinical Exp.	2.28	p = 0.320	0.179 (weak)
Understand hospital hierarchy	Gender	6.68	p = 0.036	0.307 (moderate)
	Year of Study	7.33	p = 0.120	0.227 (weak)
	Previous Clinical Exp.	1.83	p = 0.402	0.160 (weak)

Post-intervention confidence levels were comparable between male and female students. Although a higher proportion of females (28.2%) reported high confidence compared to males (21.9%), the difference was not statistically significant ($p = 0.542$), suggesting that the intervention benefited both genders similarly, Table 4.

Table 4: Gender-wise Change in Confidence Score (Post-Exposure) (n=71)

Confidence Category	Male Frequency (%)	Female Frequency (%)	p-Value (Chi-square)
High confidence (≥ 4.0)	7 (21.9)	11 (28.2)	p = 0.542
Moderate confidence (3.0–3.9)	25 (78.1)	28 (71.8)	
Total	32 (100)	39 (100)	

Post-exposure confidence scores were slightly higher among 4th-year students (mean = 3.913), followed closely by 3rd-year students (3.905), with final-year students slightly lower (3.833). However, these differences were not statistically significant ($p = 0.257$), indicating consistent benefits of early clinical exposure across academic levels, Table 5.

Table 5: Comparison of Post-Exposure Confidence Scores Across Years of Study (n = 71)

Year of Study	Mean ± SD	p-Value (ANOVA)
3rd Year	3.905 ± 0.178	p = 0.257
4th Year	3.913 ± 0.200	
Final Year	3.833 ± 0.172	

As shown in Figure 1, post-intervention confidence scores were relatively consistent across all academic years. The

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median score was similar for 3rd, 4th, and final-year students, suggesting that structured early clinical exposure was equally beneficial regardless of academic level. Slightly greater variability was noted among 4th-year students, as reflected by a wider interquartile range and the presence of outliers. These findings align with the ANOVA results, which indicated no statistically significant difference in post-confidence scores between academic years ($p = 0.257$) This boxplot illustrates the distribution of average self-reported post-exposure confidence scores among 3rd, 4th, and final-year undergraduate students. Median values appear comparable across all three cohorts, with slightly higher interquartile variability observed in the 4th-year group. Outliers are present in the 4th-year data, suggesting individual differences in response to early clinical exposure. Overall, the distribution indicates a consistent positive impact of the intervention across academic years.

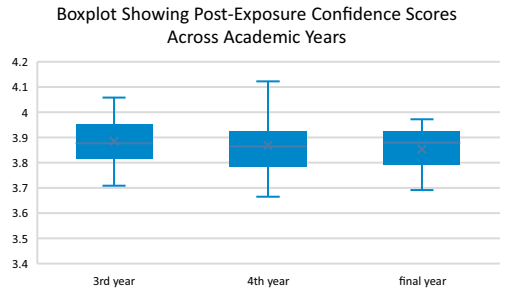

Figure 1: Boxplot Showing Post-Exposure Confidence Scores Across Academic Year

DISCUSSION

The findings of this study demonstrated that structured Early Clinical Exposure (ECE) significantly improved undergraduate students' confidence across multiple domains. Notable gains were observed in patient history taking, physical examination, communication, case presentation, and anxiety management.These results reinforced the value of even short-term, well-structured clinical exposure in enhancing students' readiness for real-world responsibilities [13]. Similar improvements have been reported in the literature. Liu *et al.*, in (2022), Velou *et al.*, in (2020), and Klumpp *et al.*, in (2025) found that structured ECE programs enhanced students' self-reported competence, particularly in basic clinical and communication skills [2, 14, 15]. Other studies from regional contexts, including Reddi *et al.*, in (2025), Yu *et al.*, in (2021), and Maheshwari (2023), also emphasized the value of bedside exposure in bridging the gap between theory and practice [16-18].The consistency of these outcomes across diverse educational systems supports the broader applicability of ECE interventions.This study also revealed significant gender-based differences.Female students reported greater comfort in ward settings and a better understanding of hospital hierarchy. These findings are consistent with those of Farajpour *et al.*, in (2024), who noted higher self-assurance among female students in collaborative learning environments [19].However, no significant differences were observed across academic years, suggesting that ECE benefited students equally regardless of seniority similar to findings by Kachuei *et al.*, in (2024) and Klumpp *et al.*, in (2025), who reported enhanced self-efficacy across all levels [15, 20]. While the overall findings were encouraging, several limitations must be acknowledged.The study was conducted at a single institution with a modest sample size, which may affect generalizability.The reliance on self-reported data introduces potential bias, as responses may reflect perceptions rather than actual performance. Additionally, the gender-wise comparison (Table 4) included small subgroups (e.g., only 7 males and 11 females in the high-confidence category), which may have limited the power of the chi-square analysis.The short follow-up period also captured only immediate changes in confidence and did not assess long-term outcomes. Future studies should involve multi-institutional designs, include objective measures such as OSCE scores, and examine the sustainability of ECE impacts over time.

CONCLUSIONS

This study demonstrated that structured early clinical exposure significantly improved undergraduate students' confidence and perceived competence across technical, interpersonal, and emotional domains. Notably, gender differences were observed in comfort within ward settings and understanding of hospital hierarchy. These findings support the integration of structured ECE into early medical training to ease the transition into clinical practice. This study recommended that health sciences curricula adopt early, structured clinical modules to enhance student readiness. Future studies should use larger, multi-institutional samples and incorporate objective assessments such as OSCEs to validate long-term impacts.

Authors Contribution

Conceptualization: SA
Methodology: SA
Formal analysis: KA, WR, HG
Writing, review and editing: KA, BH, ZQ, WR, HG, SA

All authors have read and agreed to the published version of the manuscript

Conflicts of Interest

All the authors declare no conflict of interest.

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