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Early Field Training Barriers Among Medical Students in Yemen, Aden: An Analytical Cross-Sectional Study

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Abstract

Background

Field training and research experience are highly important parts of medical training. Nevertheless, learners in low-resource and conflict-impacted environments experience institutional challenges. This paper is an exploration of the obstacles to early-field-training in medical and health sciences among students of the University of Science and Technology in Aden, Yemen.

Methods

An analytical cross-sectional survey was carried out on 203 undergraduate medical and pharmaceutical students. The parameters of demographics, academic departments, and perceived barriers were gathered. The data were analyzed using descriptive statistics, chi-square tests, and binary logistic regression.

Results

The larger proportion of the respondents were females (72.9%), and those between 20 and 25 (76.4%). On the whole, high organizational barriers were experienced by 11.8% of students. Academic department and age were significant predictors, determined by logistic regression (Nagelkerke R 2 = .259). The pharmacy students were significantly more likely to experience high barriers as opposed to students in other departments (OR = 3.34, 95% CI [1.05, 10.68], p = .042). Students between 20 and 25 years were found to be at much lower odds of experiencing high barriers than older students (OR = 0.26, 95% CI [0.07, 1.00], p = .049).

Conclusion

Although the majority of students indicate low-to-moderate barriers, institutional support is especially required to pharmacy students and older non-traditional students. To overcome these systemic barriers, it would be necessary to implement specific curriculum changes and mentorship systems that would be adapted to low-resource settings.

Introduction

Globally, medical education has changed from traditional, fragmented preclinical teaching to integrated curriculum that emphasizes early clinical and field experience (ECE) (1–3). ECE is based on experiential learning theory, namely Kolb's model, and fosters learning through experience, reflection, conceptualization, and experimentation (4, 5). Engaging students early in real or simulated clinical settings helps to bridge the gap between biological theory and clinical practice (6). This method

improves clinical reasoning, motivation, and professional identity building, as well as communication skills, empathy, and knowledge of patient-centered care and social determinants of health (7, 8).

Although there is ample evidence that the early clinical/field-based education program can contribute to the development of competence, self-efficacy, and the application of theoretical concepts, it is problematic to implement in developing nations for a number of reasons (9, 10). Unlike in developed nations, maintaining a continuous supply of clinical experiences in developing nations is more difficult (11). Curriculum overload, a lack of teaching resources, inadequate faculty supervision, and severe clinical workloads are all significant impediments (12). Furthermore, poor institutional coordination and limited infrastructure impede effective implementation (9, 13).

These systemic issues are exacerbated by organizational and institutional impediments within medical education institutions in underdeveloped countries. At the institutional level, infrastructure limitations, inadequate budget, and weak policy frameworks impede effective field training integration (14). Faculty constraints, particularly a lack of trained clinical supervisors and mentors, lower the quality of clinical rotations and limit student support during practical learning experiences (15). Restrictions with the curriculum design include overload of information and poor integration of knowledge with the actual needs of the community and clinic, thus resulting in an emphasis on rote learning rather than critical thinking skills (16). This is exacerbated by factors that constrain the entire health care system, such as a lack of teaching hospitals, clinic space, and diagnostic equipment. (17).

These organizational difficulties are especially severe in unstable and war-affected situations like Yemen, where long-term conflict and economic collapse have drastically undermined both healthcare and educational systems (18). The crisis has resulted in a severe lack of functioning clinical training environments, widespread destruction of educational infrastructure, and the loss of trained academic staff owing to brain drain (17). Because of institutional flaws and organizational shortcomings in pre-service training, medical graduates frequently enter the industry with inadequate clinical competence. (19). Despite the large global literature on early clinical exposure, there is a significant dearth in empirical research exploring the specific institutional and organizational constraints to early field training throughout Yemeni medical school institutions (18).

Filling this gap will be crucial in advancing the quality of medical education and patient care results in vulnerable health systems. Insight into organizational and structural impediments to early field training can lead to effective curriculum reforms based on evidence, efficient utilization of scarce clinical resources, and enhanced readiness of the learners in dealing with the challenges of healthcare practice (20). Hence, the main objective of this study is to fill this gap through exploring the organizational impediments of early field training for medical students at the University of Science and Technology, Aden, Yemen.

Methodology

Study Design

This study employed an analytical cross-sectional survey design to examine the organizational impediments to early field training and research involvement among undergraduate medical students.

Study setting and duration

This study was conducted at the University of Science and Technology, Aden, Yemen. The university is a major higher education institution operating in a low-resource, conflict-affected setting and comprises several faculties in the health and medical sciences. Its diverse undergraduate student population provides a relevant context for examining organizational and institutional barriers to early field training in medical education within fragile environments.

The study was carried out over a three-month period from November 2024 to January 2025. This period covered all phases of the research process, including ethical and protocol approval, pilot testing of the study instrument, data collection, and data analysis

Study population

The study population consisted of undergraduate students enrolled in medical and health science programs at the University of Science and Technology, Aden, including Medicine, Pharmacy, and allied health sciences.

Sample Size

The required sample size was calculated using Cochran's formula for cross-sectional studies: $n = Z^2 p (1-p) / e^2$

Where:

- **n** = required sample size
- **Z** = 1.96 (reflecting a 95% confidence interval)
- **p** = 0.50 (assumed prevalence of perceived barriers due to lack of prior local estimates, used to maximize sample size)
- **e** = 0.07 (a margin of error)

The minimum calculated sample size was 196 students. To account for potential non-response and incomplete questionnaires, the sample size was increased, resulting in a final valid sample of 203 participants.

Inclusion and Exclusion Criteria

The inclusion criteria comprised undergraduate students enrolled at the University of Science and Technology, Aden, from medical and health sciences disciplines, including Medicine, Pharmacy, and allied health sciences. Students from all academic levels, ranging from first year to sixth year, including interns, were eligible to participate. Only students who provided voluntary informed consent were included in the study.

The exclusion criteria included postgraduate students (master's or doctoral level), students enrolled in non-medical faculties such as engineering and business, participants with incomplete or unreliable questionnaire responses, and students who declined to participate in the study.

Study Instruments

Data were collected using a structured, self-administered questionnaire developed based on previously validated instruments used in international studies assessing barriers to medical education, research engagement, and field training (21, 22). The questionnaire consisted of three main sections.

The first section covered sociodemographic characteristics, including age, sex, place of residence, marital status, economic status, and employment status. The second section addressed academic characteristics, including academic discipline (Medicine, Pharmacy, and other health-related programs) and level of study. The third section assessed perceived organizational barriers to early field training through 10 items (Q1–Q10), covering issues such as lack of time, inadequate mentorship, insufficient funding, and poor infrastructure. Responses were measured using a 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

For inferential analysis, the total score of the Likert-scale items was computed and subsequently categorized into a binary variable representing low–moderate barriers and high barriers.

Data Collection Process

data were collected from eligible participants. The questionnaire was distributed using both face-to-face administration and online platforms, including secure university email systems and official student communication groups, to maximize participation and accessibility.

The first page of the questionnaire included a clear explanation of the study purpose, estimated completion time (approximately 10 minutes), and assurance of voluntary participation. Consent was obtained prior to participation

Data Analysis

Data were analyzed using SPSS software. Descriptive statistics were used to summarize participants' sociodemographic and academic characteristics and responses to the barrier items. Chi-square tests were applied to examine associations between independent variables and perceived organizational barriers. A binary logistic regression model (Enter method) was used to identify independent predictors of high barriers. Model fit was assessed using the Omnibus test and Hosmer–Lemeshow test, and results were reported using odds ratios (OR), 95% confidence intervals (CI), and a significance level of $p < 0.05$.

Results

Table 1 presents the baseline characteristics of the study. Most of them were between 20 and 25 years (76.4%) and were female (72.9%). Most of the respondents were living in urban settings (90.1%) and were single (86.7%). Their economic status was medium (78.8%), whereas only (16.7%) of them were working. In terms of departments, the participants were equally distributed, including those from the department of Pharmacy (36.5%), Medicine (26.6%), and other health sciences (36.9%).

Table 1
Socio-demographic and Academic Characteristics of the Study Sample (N = 203)

Variable	Category	Frequency (n)	Percentage (%)
Age Category	Less than 20	19	9.4
	20–25	155	76.4
	More than 25	29	14.3
Gender	Male	55	27.1
	Female	148	72.9
Residence	City	183	90.1
	Village	20	9.9
Marital Status	Single	176	86.7
	Married	27	13.3
Economic Level	Low	31	15.3
	Medium	160	78.8
	High	12	5.9
Employment	Unemployed	169	83.3
	Employed	34	16.7
Academic Department	Pharmacy	74	36.5
	Medicine	54	26.6
	Other	75	36.9
Level of Study	First	11	5.4
	Second	40	19.7
	Third	62	30.5
	Fourth	57	28.1
	Fifth	12	5.9
	Sixth	1	0.5
	Others	20	9.9

Table 2 provides details on the students' opinions regarding barriers encountered in relation to early field training. Participants found it difficult to communicate with the medical institutions in order to arrange for training (65.1% agree/strongly agree), and that unclear application procedures limit access to training

opportunities (85.7% agree/strongly agree). Respondents perceived that current laws and regulations hinder early training opportunities (69.9% agree/strongly agree). (67.59% agree/strongly agree) of students reported that available medical institutions are not adequately prepared to train students at the early stages.

The majority (95.1%) agreed that "Early practical training helps in developing clinical skills", and (95.1%) also agreed that "Early practical training increases self-confidence in medical practice". And (94.6%) of respondents emphasized the importance of institutional support to facilitate training opportunities, also (93.6%) believed that feasible solutions exist to improve access to early training programs.

Table 2

Responses to perceived organizational barriers to early field training among students (N = 203)

Survey Item	Strongly Agree n (%)	Agree n (%)	Neutral n (%)	Disagree n (%)	Strongly Disagree n (%)
The organizational environment within the college or university provides sufficient practical training opportunities before the advanced stage.	12 (5.9)	62 (30.5)	55 (27.1)	45 (22.2)	29 (14.3)
There are difficulties in communicating with medical institutions to secure training opportunities.	46 (22.7)	86 (42.4)	45 (22.2)	21 (10.3)	5 (2.5)
Current laws and regulations hinder students from obtaining early training opportunities.	65 (32.0)	77 (37.9)	37 (18.2)	18 (8.9)	6 (3.0)
The lack of clear information on how to apply for practical training affects students' opportunities.	86 (42.4)	88 (43.3)	13 (6.4)	12 (5.9)	4 (2.0)
Early practical training helps in developing the skills required for higher academic levels.	152 (74.9)	41 (20.2)	9 (4.4)	0 (0.0)	1 (0.5)
The obstacles I face reduce my readiness to enter the labor market after graduation.	71 (35.0)	81 (39.9)	26 (12.8)	17 (8.4)	8 (3.9)
Support from the college and administration is essential to facilitate summer training opportunities before the advanced stage.	133 (65.5)	59 (29.1)	5 (2.5)	3 (1.5)	3 (1.5)
Medical institutions in my area are not prepared to train students in the early stages.	63 (31.0)	75 (36.9)	39 (19.2)	20 (9.9)	6 (3.0)
I believe that early training enhances self-confidence among students in medical fields.	136 (67.0)	57 (28.1)	3 (1.5)	5 (2.5)	2 (1.0)
I believe there are feasible solutions that can be easily implemented to facilitate summer training opportunities before the advanced stage.	115 (56.7)	75 (36.9)	9 (4.4)	1 (0.5)	3 (1.5)

Table 3. There is a significant relationship between age group and the perceived barriers ($\chi^2 = 6.875$, $p = 0.032$), with students aged over 25 years reporting a higher proportion of high barriers. The academic department has a significant relationship with the perception of barriers ($\chi^2 = 8.151$, $p = 0.017$), whereby

there is a relatively high percentage of high barriers among pharmacy students. The perception of barriers does not have a significant relationship with economic status, level of study, residence, employment status, or marital status ($p > 0.05$).

Table 3

Bivariate Analysis (Chi-Square) Exploring Associations Between Student Characteristics and High Organizational Barriers. N = 203

Variable	Category	Low-Moderate Barriers n (%)	High Barriers n (%)	χ^2	*p*-value
Age Category	Less than 20	19 (100.0)	0 (0.0)	6.875	**.032***
	20–25	138 (89.0)	17 (11.0)		
	More than 25	22 (75.9)	7 (24.1)		
Academic Department	Pharmacy	59 (79.7)	15 (20.3)	8.151	**.017***
	Medicine	51 (94.4)	3 (5.6)		
	Other	69 (92.0)	6 (8.0)		
Economic Level	Low	24 (77.4)	7 (22.6)	4.092	.129
	Medium	144 (90.0)	16 (10.0)		
	High	11 (91.7)	1 (8.3)		
Level of Study	First to Sixth, Others	179 (88.2)	24 (11.8)	9.341	.155
Residence	City	160 (87.4)	23 (12.6)	0.991	.320
	Village	19 (95.0)	1 (5.0)		
Employment	Unemployed	150 (88.8)	19 (11.2)	0.326	.568
	Employed	29 (85.3)	5 (14.7)		
Marital Status	Single	156 (88.6)	20 (11.4)	0.267	.605
	Married	23 (85.2)	4 (14.8)		

** Significant at p < .05. (Note: Gender crosstab was not provided in the raw bivariate output, thus omitted here to maintain strict data integrity, though controlled for in the subsequent regression).*

Table 4 shows the results of multivariate binary logistic regression analysis on predictors of high organizational barriers. there was a significant association between the Pharmacy department and a likelihood of encountering organizational barriers compared to other departments (AOR = 3.34, 95% CI: 1.05–10.68, p = 0.042). Furthermore, the age group of 20–25 years had a significant relationship whereby there was less chance of having high barriers compared to participants above 25 years old

(AOR = 0.263, 95% CI: 0.069–0.997, p = 0.049). Gender, residential area, marital status, economic level, employment status, and level of study were not significant variables in the adjusted model (p > 0.05)

Table 4
Multivariate binary logistic regression analysis predicting high organizational barriers (N = 203)

Variable	B	p-value	Adjusted OR	95% CI
Age (Ref: >25 years)				
< 20	-19.9	0.998	0.000	0.000 –
20–25	-1.34	**0.049***	**0.263**	0.069–0.997
Department **(Ref: Other)**				
Pharmacy	1.21	**0.042***	**3.343**	1.047–10.677
Medicine	-0.17	0.831	0.847	0.185–3.875
Gender (Male vs Female)	-0.45	0.458	0.640	0.197–2.077
Residence (City vs Village)	1.29	0.281	3.628	0.349–37.744
Marital Status (Single vs Married)	0.16	0.832	1.168	0.278–4.911
Economic Level (Ref: High)				
Medium	-0.05	0.967	0.952	0.090–10.106
Low	1.364	0.303	3.913	0.292–52.487
Employment (Unemployed vs Employed)	-0.31	0.643	0.730	0.194–2.752

* Significant at p < 0.05.

Model fit statistics

- -2 Log likelihood = 118.338
- Cox & Snell R^2 = 0.134
- Nagelkerke R^2 = 0.259
- Hosmer–Lemeshow test: p = 0.962

Discussion

The results from the present study show that despite the fact that most students have faced low to moderate levels of organizational barriers (88.2%), there were also those who faced very high levels of barriers that would prevent their access to early field training (11.8%). This indicates that despite some availability of early clinical exposure, inequality remains entrenched within the system. The findings of the study are aligned with studies that show that barriers to practical and clinical learning experiences

vary among different students. These studies conducted by Ashour and Hatamleh and Mokhwelepa et al. showed that some students experienced a relatively high level of barriers due to institutional and organizational factors despite having moderate accessibility to these experiences (21, 22).

A large number of respondents agree with that "early practical training assists in developing necessary academic skills" (95.1%) and "increases self-confidence" (95.1%). While such positive aspects are well understood, (67.9%) of students believe that local medical institutions are not prepared to train early-stage students. While almost 70% believed that existing laws and regulations restrict these training and Lack of adequate information about how to apply for the practical training was identified by (85.7%) participants. These results are similar to those from research that focused on barriers to clinical training and stated that organizational problems, administrative confusion, and inadequate communication are among the major hindrances (23, 24).

Additionally, a lack of prepared facilities causes a barrier, limiting early field experience (25).

It is also notable that the relationship between academic department and organizational barriers, especially the probability of being higher among pharmacy students, corroborates previous research conducted in other health education settings. According to Bhagavathula et al., “pharmacy students encounter several barriers during their clinical placements, which include limited opportunities for hands-on training, poor supervision, and inadequate integration of clinical placements in their academic curricula.” (26, 27)

The bivariate analysis found that some demographics are strongly associated with a higher perception of organizational barriers. Students older than 25 years reported a higher proportion of high barriers (24.1%) than the younger ($p = 0.032$). This gap could be attributable to mature students' increased personal and professional demands, which make early field training more difficult. As reported by Ashour and Hatamleh, lack of time was among the most frequently reported barriers, with several studies indicating that a substantial proportion of students experience this constraint. (21). Similarly, Mokhwelepa et al. emphasized that academic hard workloads leave students with no time to participate in extracurricular field activities, making training a strain (22)

Interestingly, gender was not a significant predictor of organizational barriers in our multivariate model, which contradicts some other research in the literature. Snyder et al. revealed significant gender disparities among medical students, with female students being disproportionately affected by the challenges of family and work life, as well as institutional debt loads (28). The absence of a gender gap among Aden respondents indicates a local phenomenon influenced by severe, overarching constraints. There is such an extreme scarcity of institutional and infrastructural resources in Yemen that it impacts all students uniformly, regardless of their gender. In these low-resource conflict contexts, when everyone has equal challenges with the system due to systemic constraints (such as a lack of finance and institutional support), demographic differences at the micro-level are ignored, resulting in a floor effect

Other variables, such as economic level, marital status, and employment, were also found to be statistically insignificant in predicting high barriers. The lack of a relationship between individual economic status and organizational barriers suggests that the challenges students face are predominantly institutional and policy-based rather than individual (29).

Implications and Future Directions

According to the research, a lack of organizational assistance still hinders student readiness. Approximately 94.6% of surveyed students believe administrative support is critical to supporting early training opportunities.

To close the gap between theoretical learning and practice, universities and medical institutions must collaborate to design clearer, more accessible pathways for students. Possible solutions include formalizing communication channels with healthcare institutions, changing present rules to allow for earlier observational or supportive practical experience, and developing interprofessional training opportunities that benefit both pharmacy and medical students equally.

Conclusion

In this study, it is observed that even though the majority of students perceive organizational barriers as being low to moderate for early field training, there are still a few who perceive barriers to be quite high, which can affect their practical exposure. Pharmacy students and senior students are particularly vulnerable, showing inequity in the prevalence of organizational barriers. Overall, the barriers are mostly structural and institutional, emphasizing the importance of focused reforms in curriculum design, training access, and institutional support to guarantee equitable and successful clinical education.

Declarations

Ethical Considerations

The protocol of the study was reviewed and accepted by the Ethics Committee of the University of Science and Technology, Aden, Yemen, number (MEC /AD0151). The study was conducted in accordance with the principles of the Declaration of Helsinki. All the participants were informed of participation either in writing or electronically. Participants were clearly informed of their right to withdraw from the study at any time without any academic or personal consequences.

Conflict of Interest

According to the authors, they do not possess any competing financial interests or personal relationship that can have contributed to the provision of work in this study.

Consent for publication

Not applicable.

AI Disclosure:

In writing this manuscript, the authors used Grammarly to assist with language editing, proofreading, and improving the clarity of the text. These tools were not used in the study design, data analysis, or interpretation of results. The authors carefully reviewed, verified, and approved all content and take full responsibility for the final manuscript.

Conflict of interest

The authors declared no conflicts of interest.

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Author Contribution

F.M.S.M contributed to the study's conceptualization and supervision. R.R.S.A contributed to the methodology design. R.R.M.S was responsible for data collection. O.F.M.N contributed to data analysis and interpretation of results. H.A.A.M contributed to manuscript writing. All authors contributed to the study design, participated in the research process, reviewed the final manuscript, and approved it for publication.

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Availability of data and materials

All data generated during this study are included in this manuscript. Additional information can be made available upon reasonable request.

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