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Quality Gaps in Clinical Medical Education in Yemen: A Comparative Study of Student Satisfaction in Public and Private Universities

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ABSTRACT: The quality of clinical training is a decisive component of medical education, yet empirical evidence from conflict-affected settings such as Yemen remains scarce. This study investigates undergraduate medical students' satisfaction with clinical education quality across public and private universities, with a focus on identifying structural and demographic determinants of variation. A cross-sectional survey was conducted among 670 clinical-phase medical students in two major Yemeni cities using an Arabic-adapted version of the National Student Survey (NSS), covering eight domains of educational quality. Data were analyzed using non-parametric statistical techniques at a significance level of $\alpha = 0.05$. The findings reveal consistently higher levels of satisfaction among students enrolled in private universities, particularly in teaching quality, assessment and feedback, learning opportunities, and academic support. In contrast, public university students reported lower satisfaction across most domains, suggesting systemic constraints in resource availability and instructional delivery. Demographic factors also influenced perceptions, with male, married, and older students (24–26 years) reporting significantly higher satisfaction in selected areas. Importantly, institutional characteristics emerged as stronger predictors of satisfaction than individual-level factors. This study provides robust evidence of inequities in clinical education quality within Yemen's higher education system. It contributes to the limited regional literature by offering a comparative and data-driven assessment of student experience in a fragile context. The findings underscore the need for targeted policy interventions, resource optimization, and pedagogical reforms to enhance the effectiveness, equity, and responsiveness of clinical medical education in Yemen.

Keywords: Clinical medical education, Student satisfaction analysis, Public vs private universities, Healthcare education quality gaps, Educational equity in Yemen.

I. INTRODUCTION

The quality of medical education during the clinical phase pertains to the evaluation and assessment of the educational experiences and outcomes that occur throughout this stage of medical training, wherein

medical students shift from classroom-based to hospital-based learning [1]. Basic science courses are part of the pre-clinical phase, which usually comes before the clinical phase [1]. The clinical phase, which typically occurs during the fourth to sixth years of undergraduate medical studies, involves direct patient care in a range of healthcare settings, including clinics, hospitals, and other medical institutions. Future healthcare professionals' skills and knowledge are greatly influenced by the caliber of medical education throughout the clinical phase [2]. A crucial phase of medical school is clinical education, where students progressively hone their skills by working closely with patients at the bedside. In order to apply the ideas they have learnt in a real-world setting, students work together with teachers and engage with their surroundings in this setting [3].

Under the supervision of seasoned doctors and healthcare professionals, medical students are given the opportunity to apply their theoretical knowledge in practical settings, develop their clinical reasoning skills, and gain practical experience during this period [4, 5]. Numerous elements that could negatively impact students during their clinical phase have been found by research. A large number of students in wards, inadequate communication between doctors, nurses, and students and patients, and suboptimal clinical circumstances for routine procedures are some of these issues [6, 7]. Consequently, issues and worries about the caliber of medical education during this stage may surface, especially in light of the variance in clinical exposure. At different universities, the amount and caliber of clinical experience can vary greatly. Some universities can provide limited clinical possibilities, while others might offer a wide range of medical diseases and significant hands-on exposure. Students' ability to develop thorough clinical skills and interact with various patient demographics may be impacted by this diversity in clinical experience [8, 9].

For medical education to remain high-quality during the clinical phase, experienced doctors must effectively supervise. However, there are times when there may not be enough accessible and skilled supervising doctors. Insufficient supervision can compromise patient safety, limit feedback, and hinder students' learning [10]. Practical patient care and academic knowledge from previous medical education phases should be combined during the clinical phase. However, the development of critical thinking abilities and the efficient application of knowledge may be hampered by the gap between theoretical learning and its application in clinical settings [11, 12].

A variety of teaching methods, including bedside teaching, case-based learning, problem-based learning, team-based learning, and simulation exercises, may be used by different universities throughout the clinical phase. Diverse teaching approaches can enhance learning results, but their inconsistent or inefficient use might harm educational quality [13, 14]. Medical students must be evaluated during the clinical phase in order to assess their competency and identify areas that need improvement. However, evaluation techniques might vary and may not always align with the desired learning objectives. Inaccurate assessments of pupils' skills and comprehension may arise from inadequate or irregular assessment methods [15]. A comprehensive strategy is required to address these issues and provide excellent medical education during the clinical phase. This entails curriculum development and evaluation, faculty training and assistance, clinical exposure standardization, efficient supervision, integration of basic sciences, and appropriate assessment techniques [1, 9, 15]. The total quality of medical education throughout the clinical phase at universities can be further improved by ongoing quality improvement procedures, feedback mechanisms, and monitoring frameworks [16-18].

Yemen is a country facing numerous economic and societal challenges. These problems have had a significant effect on Yemen's medical education system and healthcare system [19]. Research on the caliber of Yemeni undergraduate medical programs is lacking, even though the clinical component is essential to medical education. Our understanding of the advantages and disadvantages of the current medical education system in these areas is hampered by this lack of data.

To implement appropriate initiatives that can raise the standard of medical education, it is imperative to acknowledge the difficulties that already exist. Given its crucial role in enabling students to apply their theoretical knowledge in practical settings, it is imperative that the quality of Yemen's clinical component of medical education be assessed [20]. Furthermore, as students are the main participants in medical education,

it is critical to understand their viewpoints. Their learning experiences and future professional development can be significantly impacted by their level of involvement, motivation, and satisfaction [21, 22].

Educational institutions may ensure that students' requirements are met and that they continue to be actively involved in their education by assessing their perspectives. Programs for faculty development can also be guided by student feedback regarding the caliber of medical education [22]. Educational institutions can identify areas where faculty may require additional training and support to improve their teaching efficacy by understanding students' opinions regarding clinical supervision, teaching approaches, and faculty support [23]. Assessing students' opinions regarding the caliber of medical education aligns with the general goals of accreditation and quality control in this domain [24]. Institutions are generally expected by accrediting bodies to demonstrate a commitment to continuous improvement, which includes gathering input from pertinent stakeholders [25]. In conclusion, studying Yemeni undergraduate medical students' opinions regarding the quality of medical education during the clinical phase can provide important information for educational institutions, allowing them to improve their curricula, increase student satisfaction, and develop qualified medical professionals who can satisfy the needs of the community. As a result, this study is the first nationwide survey of Yemeni students about the caliber and satisfaction of medical education.

II. METHODOLOGY

1. STUDY DESIGN

A cross-sectional study was conducted among 670 medical students from February to March 2023 to assess the caliber of medical education in Yemen via the use of an online questionnaire. The study was carried out in the Faculty of Medicine at Aljeel Aljadeed University. This study included all medical students enrolled in the clinical phase (years four to six and internships). Students in the clinical phase who did not complete the questionnaire and students who were not in the clinical phase were excluded.

This study used a cross-sectional design to capture medical students' perceptions of clinical education and their overall satisfaction at a single point in time. We chose this approach because it allows for the efficient collection of data from a large and diverse group of students across multiple universities, providing a clear snapshot of their experiences. While we recognize that this design does not allow for causal conclusions, it is well-suited for identifying patterns, associations, and areas needing improvement, which can guide future interventions and longitudinal research. In the context of Yemen, where logistical and resource constraints are significant, the cross-sectional design offered a practical and rigorous way to gather meaningful insights into the quality of clinical education and student satisfaction.

2. DATA COLLECTION

The UK National Student Survey (NSS) questionnaire, which was used by another study [26], was used to gather data for this study because the NSS is already recognized as a valid and reliable tool in the English language [26]. This survey was translated into the Arabic language and then pretested on a pilot sample of Yemeni medical students. The pretest was then used to slightly alter the survey to fit the objectives of the particular study and the Yemeni context. The survey was distributed via a structured Google Forms questionnaire.

3. SAMPLING AND REPRESENTATIVENESS

To ensure broad coverage of the target population, the survey link was distributed to all students enrolled in the clinical phase (years 4–6 and internships) across the participating universities via official WhatsApp groups. Participation was voluntary, and reminders were sent one and two weeks after the initial invitation to maximize response rates. To reduce potential selection bias, we monitored responses to ensure proportional representation by university type, year of study, and gender. The final sample of 670 students closely reflected the demographic distribution of clinical-phase students, supporting the representativeness of the data and enhancing the generalizability of our findings.

4. VALIDITY AND RELIABILITY

To validate the questionnaire, two forward translations into the Arabic language were undertaken by language experts, who translated the original NSS instrument into Arabic to produce the first consensus of the Arabic language version. Reconciliation of the forward translations was then completed by other native Arabic speakers not involved in the forward translation process. The next step consisted of two back translations of the reconciled version of the Arabic language into English. The second consensus of the Arabic language version of the NSS was produced by comparing it with the original English.

To ensure the adapted National Student Survey (NSS) was reliable and valid in the Yemeni context, we conducted a thorough psychometric evaluation following translation and pretesting. The survey was pretested with 20 Yemeni medical students, and feedback was used to refine clarity and cultural relevance.

- Reliability: Internal consistency of the adapted instrument was assessed using Cronbach's alpha. The overall Cronbach's alpha for the full questionnaire was 0.87, indicating excellent reliability. Subscale alphas ranged from 0.76 to 0.84, demonstrating good reliability across all eight domains: teaching, learning opportunities, assessment and feedback, academic support, organization and management, learning resources, learning community, and student voice.
- Construct Validity: Exploratory factor analysis (EFA) was performed to evaluate the survey's construct validity. The analysis supported the eight-domain structure of the NSS, with most items showing factor loadings above 0.50, confirming that the instrument adequately captured the intended educational quality constructs in the Yemeni clinical education context.
- These psychometric results demonstrate that the adapted NSS is a reliable and valid instrument for assessing medical students' perceptions of education quality in Yemen.

The procedures and techniques taken by bilinguals to obtain equivalence to the original language were based on Brislin's back-translation technique [27]. Twenty medical students who were not involved in our study were randomly selected from Sana'a and Amran Universities to identify any ambiguities and ensure that the questionnaire's length and content were appropriate.

5. INSTRUMENT AND SCORING

There were two sections to the questionnaire. Part 1 included five questions concerning demographic characteristics (age, sex, type of university, marital status, and study level). Part 2 comprised 8 subscales (categories) out of 27 questions about the quality of medical education: "Teaching assessment, learning opportunities, assessment and feedback, academic support, organization and management, learning resources, learning community and medical environment, student voice, and overall satisfaction. The scoring of each item followed a Likert scale ranging from 4 (strongly agree) to 0 (strongly disagree), with a neutral point at 2 ("neutral"). A total of 27 items were included in the survey, with a maximum possible score of 108. Scores below 55 (less than 50%) were categorized as low-quality medical education, scores above 108 (more than 75%) were categorized as high, and scores between those ranges were categorized as medium [26].

6. SURVEY ADMINISTRATION

The data were gathered via Google Forms. The Form's introduction detailed the research: who was conducting it, along with their contact information in case of any questions, and an explanation of the study's goal. Additionally, the introduction stated that participation was voluntary and that confidentiality was guaranteed. After the consent agreement for participation was selected, the participant then began answering the questionnaire. The questionnaire took approximately 10 minutes to complete. The Google Form link was distributed to all WhatsApp groups of students at each university that participated in this study. The reminders were then sent to the groups after one week and then after two weeks.

7. ETHICAL CONSIDERATION

Amran University, Faculty of Medicine and Health Sciences, approved the ethical dimensions of the proposal of this study. Before any data were collected, all participants provided informed consent, were

informed of the purpose of the research, and were given the opportunity to withdraw or refuse participation at any time during the study period.

8. DATA ANALYSIS

All data were first checked for normality using the Shapiro-Wilk test. The results indicated that the data were not normally distributed for several key variables, so non-parametric tests were used to analyze differences between groups. Specifically, the Mann-Whitney U test was applied for comparisons between two groups (for example, male vs. female students), and the Kruskal-Wallis test was used for comparisons among three or more groups (for example, age or study level). These non-parametric tests are suitable for ordinal data and non-normally distributed continuous variables, ensuring the results are robust and statistically valid.

All analyses were conducted using SPSS (Statistical Package for the Social Sciences) version 25, and a significance level of $\alpha = 0.05$ was adopted. Results are presented as medians with InterQuartile Ranges (IQR) to reflect the distribution of the data.

III. RESULTS

The 670 undergraduate medical students who completed the survey (see Table 1) were mostly between 24 and 26 years (66.1%), predominantly male (67.9%), and more commonly from public universities (59.7%). The majority of the students who responded were almost equally distributed in their fifth (36.1%) and sixth (36.6%) levels of study, and for most, their marital status was single (71.0%).

Table 1. Demographic characteristics of medical students.

Student Characteristics		Frequency	Percent
Age	≤ 23 years	106	15.8
	24 to 26 years	443	66.1
	> 26 years	121	18.1
Sex	Male	455	67.9
	Female	215	32.1
University	Public	400	59.7
	Private	270	40.3
Study level	4^{th}	170	25.4
	5^{th}	242	36.1
	6^{th}	245	36.6
	7^{th}	13	1.9
Marital Status	Single	476	71.0
	Ever married	194	29.0

The students' perceptions of the quality of education during the clinical phase of their medical training in each of the eight broad domains are presented in Table 2. In the domain of teaching, 45.1% of the students agreed, and 11.5% strongly agreed that the faculty made the subject matter interesting. Similarly, for learning opportunities, 43.6% agreed, and 14.2% strongly agreed that the course provided opportunities for in-depth exploration of ideas or concepts. In the area of assessment and feedback, 32.7% agreed, and 10.6% strongly agreed that the criteria used in marking were clear in advance. In terms of academic support, 32.2% of the students agreed, and 10.4% strongly agreed that they were able to contact staff when needed. However, 27.8% strongly disagreed, and 27.6% disagreed that the feedback on their work was timely. In the realm of organization and management, 23.1% of the students strongly disagreed, and an equal percentage disagreed that the timetable was efficient for them. With respect to learning resources, 33.4% of the students agreed, and 13.4% strongly agreed, that library resources, such as books, online services, and learning spaces,

supported their learning well. A sense of community was reported by 49.4% of the students who agreed and 19.7% who strongly agreed that they felt part of a community of staff and students. Finally, 29.7% of the students agreed, and 11.5% strongly agreed that they had appropriate opportunities to provide feedback on their course.

Table 2: Perceptions of medical students regarding the quality of medical education in the clinical phase.

Statements	Strongly disagree n(%)	Disagree n(%)	Natural n(%)	Agree n(%)	Strongly agree n(%)	Median	min/max	IQR
The teaching on my course (D1)						9.0	0.0/16.0	7.0-12.0
Staff are good at explaining things.	57(8.5)	170(25.4)	177(26.4)	208(31)	58(8.7)	2.0	0/4	1.0-3.0
Staff have made the subject interesting	32(4.8)	98(14.6)	161(24)	302(45.1)	77(11.5)	3.0	0/4	2.0-3.0
The course is intellectually stimulating	51(7.6)	127(19)	170(25.4)	257(38.4)	65(9.7)	2.0	0/4	1.0-3.0
My course has challenged me to achieve my best work	61(9.1)	115(17.2)	166(24.8)	248(37)	80(11.9)	2.0	0/4	1.0-3.0
Learning opportunities (D2)						8.0	0.0/12.0	5.0-9.0
My course has provided me with opportunities to explore ideas or concepts in depth	45(6.7)	100(14.9)	138(20.6)	292(43.6)	95(14.2)	3.0	0/4	2.0-3.0
My course has provided me with opportunities to bring information and ideas together from different topics	37(5.5)	109(16.3)	159(23.7)	278(41.5)	87(13)	3.0	0/4	2.0-3.0
My course has provided me with opportunities to apply what I have learnt	54(8.1)	132(19.7)	154(23)	257(38.4)	73(10.9)	2.0	0/4	1.0-3.0
Assessment and feedback (D3)						7.0	0.0/16.0	4.0-10.0
The criteria used in marking have been clear in advance	100(14.9)	152(22.7)	128(19.1)	219(32.7)	71(10.6)	2.0	0/4	1.0-3.0
Marking and assessment has been fair	136(20.3)	156(23.3)	139(20.7)	196(29.3)	43(6.4)	2.0	0/4	1.0-3.0
Feedback on my work has been timely	186(27.8)	185(27.6)	115(17.2)	143(21.3)	41(6.1)	1.0	0/4	0.0-3.0
I have received helpful comments on my work	99(14.8)	137(20.4)	162(24.2)	208(31)	64(9.6)	2.0	0/4	1.0-3.0
Academic support (D4)						6.0	0.0/12.0	3.0-8.0
I have been able to contact staff when I needed to	103(15.4)	152(22.7)	129(19.3)	216(32.2)	70(10.4)	2.0	0/4	1.0-3.0
I have received sufficient advice and guidance in relation to my course	112(16.7)	177(26.4)	157(23.4)	177(26.4)	47(7.0)	2.0	0/4	1.0-3.0

Good advice was available when I needed to make study choices for my course	92(13.7)	172(25.7)	165(24.6)	194(29)	47(7.0)	2.0	0/4	1.0-3.0
Organization and management (D5)						6.0	0.0/12.0	3.0-9.0
The course is well organized and running smoothly	121(18.1)	163(24.3)	107(16)	178(26.6)	101(15.1)	2.0	0/4	1.0-3.0
The timetable works efficiently for me	155(23.1)	155(23.1)	97(14.5)	178(26.6)	85(12.7)	2.0	0/4	1.0-3.0
Any changes in the course or teaching have been communicated effectively.	111(16.6)	144(21.5)	125(18.7)	212(31.6)	78(11.6)	2.0	0/4	1.0-3.0
Learning resources (D6)						6.0	0.0/12.0	4.0-9.0
The IT resources and facilities provided have supported my learning well	99(14.8)	167(24.9)	131(19.6)	198(29.6)	75(11.2)	2.0	0/4	1.0-3.0
The library resources (e.g. books, online services and learning spaces) have supported my learning well	85(12.7)	145(21.6)	126(18.8)	224(33.4)	90(13.4)	2.0	0/4	1.0-3.0
I have been able to access course-specific resources (e.g. equipment, facilities, software, collections) when I needed to	93(13.9)	136(20.3)	139(20.7)	239(35.7)	63(9.4)	2.0	0/4	1.0-3.0
Learning community (D7)						6.0	0.0/8.0	4.0-6.0
I feel part of a community of staff and students.	38(5.7)	67(10)	102(15.2)	331(49.4)	132(19.7)	3.0	0/4	2.0-3.0
I have had the right opportunities to work with other students as part of my course	34(5.1)	85(12.7)	159(23.7)	300(44.8)	92(13.7)	3.0	0/4	2.0-3.0
Student voice (D8)						8.0	0.0/16.0	4.0-10.0
I have had the right opportunities to provide feedback on my course.	67(10)	171(25.5)	156(23.3)	199(29.7)	77(11.5)	2.0	0/4	1.0-3.0
Staff value students' views and opinions about the course	103(15.4)	149(22.2)	167(24.9)	204(30.4)	47(7)	2.0	0/4	1.0-3.0
It is clear how students' feedback on the course has been acted on	112(16.7)	153(22.8)	155(23.1)	197(29.4)	53(7.9)	2.0	0/4	1.0-3.0
The students' union effectively represents students' academic interests	193(28.8)	149(22.2)	133(19.9)	149(22.2)	46(6.9)	1.00	0/4	0.0-3.0

Notes: Responses are presented as n (%) and median (IQR). Abbreviations: D1 = Teaching, D2 = Learning Opportunities, D3 = Assessment and Feedback, D4 = Academic Support, D5 = Organization and Management, D6 = Learning Resources, D7 = Learning Community, D8 = Student Voice.

Compared with those enrolled in public universities, students enrolled in private universities presented a greater degree of satisfaction with their program quality (see Figure 1). Specifically, 14.10% of privately educated students reported being very satisfied, whereas 51.90% expressed satisfaction. Conversely, students at public universities presented lower satisfaction levels. Only 5.0% indicated being very satisfied, and a considerably greater proportion (33.0%) expressed dissatisfaction. Furthermore, the percentage of very dissatisfied students was notably higher in public universities (24.8%) than in private universities (7.40%).

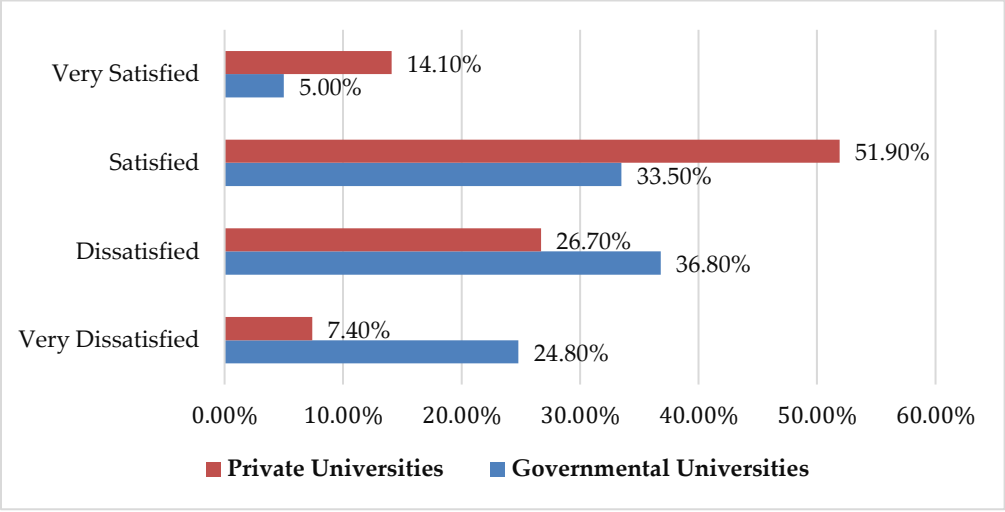

FIGURE 1. Student satisfaction with the quality of the study program. Notes: satisfaction categories include very dissatisfied, dissatisfied, satisfied, and very satisfied.

Several significant associations between student demographics and their perceptions of educational quality in the clinical phase are evident from the analyses presented in Table 3. Students aged 24-26 years presented a higher median score (8.0) and interquartile range (4.5-12.0) in the assessment and feedback of the quality of education domain than did the other younger and older age groups ($p<0.05$). Compared with their female peers, male students achieved higher median perceptions in the learning opportunities, assessment and feedback domains and total scores of qualities of education while demonstrating a wider range of responses (as indicated by a higher IQR) in their perceptions of teaching and academic support ($p<0.05$). Interestingly, students enrolled in private universities reported significantly higher median scores across all domains of the quality of education in the clinical phase ($p<0.05$) than did students enrolled in public universities.

Furthermore, students in their fourth year of study presented a significantly greater median score perception, specifically in the assessment and feedback domain ($p<0.001$), organization and management (p 0.001) and total score of quality of education (p 0.027), than did students in their 5th, 6th or internship years. Compared with single students, married students reported higher median scores in both the teaching and assessment and feedback domains ($p<0.05$). Finally, students who expressed high satisfaction with the program presented significantly higher medians across total scores and all domains of the quality of education in the clinical phase ($p<0.05$) than did those who experienced low levels of satisfaction.

Table 3. Association between the quality of medical education in the clinical phase, overall satisfaction, and demographic characteristics of medical students.

	D1 Median (IQR)	D2 Median (IQR)	D3 Median (IQR)	D4 Median (IQR)	D5 Median (IQR)	D6 Median (IQR)	D7 Median (IQR)	D8 Median (IQR)	S Median (IQR)	Total Median (IQR)
Age										
≤ 23 years	10.0(7.0-12.0)	8.0(5.0-9.0)	8.0(5.0-11.0)	6.0(3.0-9.0)	6.0(3.0-9.0)	7.0(4.0-9.0)	5.0(4.0-6.0)	8.0(4.0-10.0)	2.0(1.0-3.0)	55.5(42.0-70.0)
24 to 26 years	9.0(7.0-11.0)	8.0(5.0-9.0)	7.0(4.0-10.0)	6.0(3.0-8.0)	5.0(3.0-9.0)	6.0(3.0-9.0)	6.0(4.0-6.0)	8.0(4.0-10.0)	2.0(1.0-3.0)	54.0(39.0-67.0)
> 26 years	9.0(6.0-12.0)	7.0(5.0-9.0)	8.0(4.5-12.0)	6.0(3.0-9.0)	7.0(3.0-9.0)	6.0(4.0-9.0)	6.0(4.0-6.0)	8.0(4.0-11.5)	2.0(1.0-3.0)	58.0(42.5-58.0)
p value [K]	.504	.621	.018	.609	.081	.176	.081	.610	.167	.312
Sex										
Male	9.0(7.0-12.0)	8.0(6.0-9.0)	8.0(5.0-11.0)	6.0(3.0-9.0)	6.0(3.0-9.0)	6.0(4.0-9.0)	6.0(4.0-6.0)	8.0(4.0-10.0)	2.0(1.0-3.0)	56.0(42.0-68.0)
Female	9.0(6.0-11.0)	7.0(5.0-9.0)	6.0(4.0-9.0)	6.0(3.0-8.0)	5.0(3.0-9.0)	6.0(3.0-9.0)	5.0(4.0-6.0)	8.0(4.0-10.0)	2.0(1.0-3.0)	52.0(36.0-66.0)
p value [M]	.038	.031	.005	.014	.216	.404	.051	.939	.058	.027
University										
Public	8.0(6.0-11.0)	7.0(5.0-9.0)	6.0(3.0-9.0)	5.0(3.0-7.0)	4.0(2.0-7.0)	5.0(3.0-8.0)	5.0(4.0-6.0)	6.0(3.25-9.0)	2.0(1.0-3.0)	47.0(34.3-59.8)
Private	10.0(8.0-12.0)	8.0(6.0-9.0)	9.0(7.0-12.0)	8.0(5.75-9.0)	8.0(6.0-10.0)	8.0(6.0-9.0)	6.0(5.0-7.0)	10.0(7.0-12.0)	3.0(2.0-3.0)	66.0(54.0-74.3)
p value [M]	.09	.021	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001
Study level										
4th	10.0(7.0-12.0)	7.0(5.0-9.0)	8.5(6.0-11.0)	6(4.0-9.0)	7(4.0-9.0)	7(4.0-9.0)	6(4.0-7.0)	8(4.0-11.0)	2(1.0-3.0)	60.0(34.0-72.0)
5th	9(7.0-12.0)	8(6.0-9.0)	8(4.0-10.0)	6(3.0-8.0)	5(3.0-9.0)	7(3.0-9.0)	6(4.0-6.0)	8(4.0-10.0)	2(1.0-3.0)	56.0(42.3-67.0)
6th	9(6.0-11.0)	7(5.0-9.0)	6(3.0-10.0)	6(3.0-8.0)	5(3.0-8.0)	6(3.0-9.0)	5(4.0-6.0)	8(4.0-10.0)	2(1.0-3.0)	51.0(37.0-64.5)
7th	8(7.0-9.0)	7(4.0-9.0)	7(6.0-12.0)	6(3.5-9.0)	7(5.0-9.0)	7(5.5-9.0)	6(4.0-6.0)	8(3.5-11.5)	2(1.5-3.0)	57.0(42.5-69.0)
p value [K]	.090	.242	<.001	.148	.001	.128	.287	.488	.436	.008
Marital status										
Single	9(7.0-11.0)	7(5.0-9.0)	7(4.0-10.0)	6(3.0-8.0)	6(3.0-9.0)	6(4.0-9.0)	5(4.0-6.0)	8(4.0-10.0)	2(1.0-3.0)	54.0(38.0-67.0)
Ever married	10(8.0-12.0)	8(6.0-9.0)	8(5.8-11.3)	6(4.0-9.0)	6(3.0-9.0)	6(4.0-9.0)	6(4.0-6.0)	8(4.8-11.0)	2(1.0-3.0)	57.0(43.8-68.3)
p value [M]	.020	.059	.008	.555	.361	.712	.064	.528	.175	.118
Overall satisfaction										
Very dissatisfied	7(4.0-9.0)	5(3.0-8.0)	3(1.0-6.0)	2(0.0-4.0)	2(0.0-4.0)	3(1.0-5.0)	4(2.0-6.0)	3(2.0-6.0)		30.0(22.0-42.0)
Dissatisfied	9(7.0-10.0)	7(5.0-9.0)	6(4.0-8.0)	6(3.0-8.0)	5(3.0-7.0)	6(3.0-8.0)	5(4.0-6.0)	7(4.0-9.0)		50.0(39.0-61.0)

Satisfied	10(8.0-12.0)	8(6.0-9.0)	9(7.0-12.0)	7(5.0-9.0)	8(5.0-9.0)	8(6.0-9.0)	6(5.0-6.0)	9(7.0-11.0)	62.0(53.0-72.0)
Very satisfied	13(12.0-14.0)	10(8.0-11.0)	12(8.0-14.0)	9(7.0-11.0)	9(7.0-11.0)	10(8.0-11.0)	7(6.0-8.0)	13(10.0-14.0)	81.5(69.0-87.0)
p-value [K]	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001

D1=Teaching the course, D2=Learning opportunities, D3= Assessment and feedback, D4= Academic support, D5= Organization and management, D6=Learning resources, D7= Learning community, D8= Student voice. S = Overall satisfaction. K=Kruskal–Walli's test, M=Mann–Whitney U test. Figure 2 illustrates the distribution of perceived educational quality among students at public and private universities. In public universities, the largest proportion of students (58.5%) reported receiving low-quality education. In contrast, private universities presented a higher prevalence of medium-quality education (60%). Additionally, a greater percentage of students at private universities (19.3%) reported receiving high-quality education than did those at public universities (5.3%).

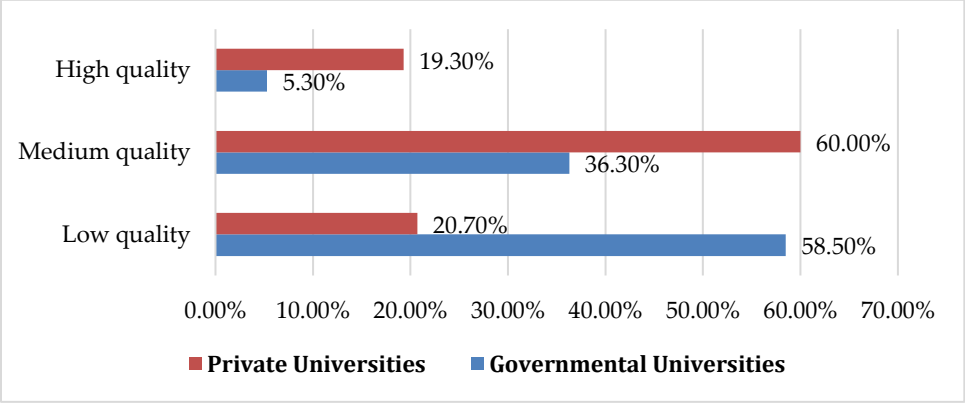

FIGURE 2. Quality of education in the clinical phase. Notes: Quality levels are categorized as Low (<50% of maximum score), Medium (50–75%), and High (>75%). D1–D8 refer to the eight quality domains as defined in Table 2.

IV. DISCUSSION

1. SIGNIFICANCE OF CLINICAL EDUCATION

Our study's goal was to assess Yemen medical students' levels of satisfaction with the clinical phase of their training. A crucial part of medical school is clinical education, where students spend approximately half of their time in hospitals and clinical settings. To ensure that medical students can provide high-quality patient care and have a meaningful learning experience, it is imperative that they receive outstanding clinical teaching. Students' motivation, self-esteem, and contentment with their learned abilities and knowledge are greatly impacted by clinical education. The future of patient care depends on clinical education. Thus, thorough clinical training is necessary to develop doctors who can provide high-quality medical care [28].

2. OVERALL SATISFACTION AND UNIVERSITY TYPE

While the results of this study highlight some positive dimensions of the clinical phases of medical training in Yemen, a number of concerns have been highlighted for us as educators. Significant concerns emerge around assessment, evaluation, feedback and academic help.

Beyond statistical significance, the magnitude of the observed differences provides important insights into educational practice. For instance, students at private universities reported substantially higher satisfaction than those at public institutions [29], reflecting a large effect size that highlights meaningful disparities in resources, teaching methods, and student support. Similarly, male students and married students showed moderately higher satisfaction in certain domains, indicating that demographic factors can influence perceptions of educational quality.

According to the study's findings, Yemeni students enrolled in private and state medical schools report significantly different levels of satisfaction, with those who receive private instruction typically reporting far better experiences. The results show that students at private institutions are more likely to be happy with their educational experiences than those at government universities. Specifically, 51.90% of private university students reported being "satisfied," while 14.10% reported being "very satisfied." Just 5.0% of students at government universities, however, reported being "very satisfied," compared to 33.0% who were unsatisfied and an even higher 24.8% who were "very dissatisfied."

These results point to notable differences between the two categories of schools' infrastructure, student support services, and educational delivery quality. The higher levels of satisfaction recorded at private universities could be explained by a number of factors. Owing to their typically greater financial freedom, private institutions are able to invest in cutting-edge facilities, state-of-the-art labs, and comprehensive student support services [30]. Additionally, lower class numbers at private universities usually result in more individualized instruction and stronger bonds between students and professors. According to a new study, higher student satisfaction in medical education is closely linked to personalized attention and resource access [31]. The students' comparatively high evaluations of academic quality at Yemen's private universities could be attributed to these factors.

On the other hand, public colleges could experience structural problems that lower student happiness. Public higher education institutions continue to face challenges such as outdated infrastructure, increasing student-teacher ratios, and limited resources [32]. Similar results were obtained by another study [33], which showed that students at public medical schools expressed discontent with clinical training opportunities and teaching methods. There is a pressing need for legislative measures to enhance educational quality and student experiences in the public sector, as evidenced by the higher percentage of "very dissatisfied" students (24.8%) in public universities in the current survey.

The perceived responsiveness of private institutions to student demands could be another factor contributing to the discrepancy in satisfaction ratings. Research indicates that private schools are more likely to consider student input and regularly modify their curricula to meet evolving educational needs. This attention may result in students feeling more empowered and fulfilled. Conversely, public universities typically function within rigid bureaucratic structures that may postpone infrastructure upgrades and curriculum reform, which would annoy students [28].

3. ASSESSMENT, EVALUATION AND FEEDBACK

Regarding evaluation and feedback, 32.7% of the respondents agreed, and 10.6% strongly agreed that the marking criteria were known ahead of time. These findings suggest that neither Yemen's public nor private colleges employ precise standards for grading exam papers. The most commonly used assessment method for both formative and summative evaluation is the written exam. No other approach can completely replace it. In the event of a dispute, a written examination provides a record for reevaluation [34]. However, in practice and under various circumstances, this is not feasible.

The question paper is the tool utilized in the written exam for medical students. There are two methods of evaluation: formative and summative [34]. Setting up the question paper is crucial for both approaches. Appropriate and methodical preparation can increase the quality of the paper. The development of a marking scheme is the next step after a model paper is created. Assigning varying percentages of marks to various sections of the response is the aim of the marking scheme. Analytical and global marking schemes are the two varieties.

With respect to academic help, 10.4% of the students highly agreed, and 32.2% of the students felt that they could contact staff when they needed it. This suggests that many students find it challenging to contact personnel when they need help. Clinicians' lack of time may be the main cause of this challenge. Owing to Yemen's lack of experts, many clinicians are preoccupied with running their own clinics and frequently working in several institutions. Owing to this continuous conflict, the health system has been badly undermined, resulting in a considerable lack of medical specialists [35, 36].

However, 27.6% disagreed, and 27.8% strongly disagreed that feedback on their work was given on time. One of the most crucial ways that the "teacher" and the "student" can connect is through feedback. However, it has been commonly reported that during their clinical rotations, medical students are rarely seen in person and provide feedback [37]. As a result, feedback facilitation has drawn increasing attention [37]. Giving feedback is a crucial component of the learning process and aids in closing the performance gap between expected and actual performance [37]. One effective way to let the student know how they are doing at a given moment is by direct observation and feedback [38, 39].

Setting precise evaluation standards and offering helpful criticism that concentrates on particular behaviors or actions are essential for enhancing the efficacy of direct observation and feedback [40]. This method directs students toward the intended learning outcomes while also assisting them in understanding their present performance [41]. Peer evaluation can also promote collaborative learning environments and provide a variety of viewpoints [42]. When combined, these tactics improve the feedback process and make it an essential tool in learning environments [43].

4. STUDENT VOICE AND ENGAGEMENT

Our findings highlight the importance of the student voice in shaping perceptions of educational quality. While many students reported opportunities to provide feedback, fewer felt that their opinions were consistently acted upon, particularly in public universities. This suggests that active mechanisms for student engagement and responsiveness are essential for enhancing overall satisfaction. Evidence from regional studies indicates that when students feel heard, and their feedback is integrated into curriculum and policy decisions, it can improve motivation, learning outcomes, and institutional accountability. By considering the student voice alongside other domains such as teaching, assessment, and learning resources, institutions can foster a more inclusive and supportive educational environment that encourages continuous improvement and greater student satisfaction.

5. DEMOGRAPHIC FACTORS

According to this study, students between the ages of 24 and 26 years scored higher than did students in other age groups ($p<0.05$) in the assessment and feedback of the quality of education domain. This may be because students in this age range may have greater life experience and maturity, which enables them to more fully value and assess the calibre of education they receive [44]. Furthermore, this student body might be more goal-oriented and study-focused, which could result in a more favourable opinion of their educational experience [45].

Our findings indicate that students aged 24–26 years reported higher satisfaction across several domains. This may be explained by greater life experience and maturity, which can enhance students' engagement with learning, their appreciation of feedback, and their ability to navigate clinical education effectively. Students in this age range are often more goal-oriented and confident in applying knowledge during clinical rotations, which may contribute to higher perceptions of teaching quality and overall satisfaction.

In addition to achieving higher medians in the learning opportunities, assessment and feedback domains, and overall score of quality of education, male students also had a wider range of responses (as shown by a bigger IQR) in their opinions on academic support and instruction ($p<0.05$). One possible explanation for this could be that male students have unique learning preferences or styles that align better with the learning opportunities, assessments, and feedback systems provided in the classroom. Because they engage in these activities more frequently, male students may have higher median perceptions in areas like learning

opportunities and assessment [46]. Furthermore, male students may feel more at ease offering feedback and assessing the quality of instruction, which may result in higher grades and a greater range of responses [47].

Cultural norms and societal expectations may have an impact on the thoughts and experiences of male students, leading to differing evaluations of their education from those of their female counterparts. Our results contrast with those of other studies that reported no correlation between gender and medical education satisfaction [48-50].

Our findings indicate that male students reported slightly higher satisfaction in certain domains, such as learning opportunities, assessment, and feedback. While these differences were observed, we acknowledge that the interpretation is exploratory. Existing literature suggests that gender can influence perceptions and engagement in medical education [51, 52], with factors such as communication styles, confidence in providing feedback, and responsiveness to teaching methods contributing to these patterns. Similar trends have been reported in studies from the Middle East and other regions [53], where male students sometimes report higher satisfaction in active learning and feedback domains. However, cultural, institutional, and individual factors likely interact to shape these perceptions [54], and further research is needed to fully understand the underlying causes. By framing these observations as exploratory, we provide insights while maintaining caution in interpretation.

The fourth-year students in this study had considerably higher median score perceptions, particularly in the domains of assessment and feedback ($p<0.001$), organization and management (p.001), and overall educational quality score (p.027). This may be because the year of study and age are correlated. A related study revealed that students' satisfaction with the CLE increases with each academic year [55]. This suggests that to improve students' initial impressions of their clinical placement and increase their satisfaction in their first year of study, an effective orientation may be necessary [50, 56].

In all the teaching, evaluation, and feedback categories, married students reported higher median scores ($p<0.05$). Married students may be more focused and dedicated to their studies as a result of their increased duties and commitments [57]. This greater commitment could lead to a more favourable opinion of feedback and instruction. Married students frequently have a more robust support network at home, which can offer both practical and emotional assistance, improving their school experience. Marriage can provide stability and a feeling of direction, which inspires pupils to do better in school and value the high caliber of instruction and criticism they receive [58]. To combine their personal and academic lives, married students may improve their time management abilities, creating a more orderly and fulfilling life [59].

Our study found that married students reported higher satisfaction in certain domains, including teaching and assessment. This pattern can be understood within the cultural and social context of Yemen, where marriage often provides stability, emotional support, and a structured environment that may help students balance academic and personal responsibilities. Married students may also have greater life experience and maturity, which can enhance their engagement with clinical education and their ability to appreciate and apply feedback effectively. While these observations offer plausible explanations, we acknowledge that the relationship between marital status and satisfaction is exploratory and may be influenced by additional cultural, social, or individual factors that warrant further investigation.

6. STRUCTURAL AND SYSTEMIC FACTORS

A greater percentage of students at private colleges (19.3%) reported obtaining high-quality education than did those at public universities (5.3%) [29]. Resource Allocation: Private colleges frequently have stronger financial resources, allowing them to invest in state-of-the-art buildings, sophisticated equipment, and well-qualified staff members. The infrastructure at private schools is usually more sophisticated and well-maintained, which contributes to a more favourable learning environment [29]. This could be the result of a number of factors.

The more comprehensive student support services that private universities may offer, like career counseling, academic guidance, and mental health resources, can enhance the entire educational experience. Smaller class sizes at private institutions can lead to more individualized attention from instructors, better rapport between students and faculty, and an interesting learning environment. Private colleges have more

freedom to create their own curricula and use innovative teaching methods, which could improve the quality of education [60]. Because private universities are frequently chosen for their reputation and quality, their students may be more engaged and driven. Owing to their greater links with businesses and organizations, better internship and employment placement options may be available to students at private colleges [61]. Interestingly, many academics worldwide concur that one of the most significant elements of global education is private education [62-64].

The observed differences in student satisfaction between private and public universities can be further understood by considering structural and systemic factors. Private universities in Yemen often have greater financial flexibility [65], which allows them to invest in modern facilities, well-equipped labs, smaller class sizes, and comprehensive student support services. They may also have more autonomy in curricular design and teaching methods [66], enabling them to respond more quickly to student needs and feedback. In contrast, public universities frequently face budgetary limitations, rigid governance structures, and slower processes for curricular reform, which can impede improvements in teaching quality and infrastructure [66]. Differences in accreditation and quality assurance processes also play a role, as private institutions may adopt more stringent or internationally aligned standards that enhance educational delivery [67]. Considering these structural factors helps explain why students at private universities reported higher satisfaction and highlights areas where targeted reforms in public institutions could enhance the quality of medical education.

7. CROSS-NATIONAL COMPARISONS

The results of this study are consistent with those of other countries with both private and public education systems. For instance, research conducted in Egypt found that students at private medical institutions were happier than those at state schools [68]. This was ascribed to private colleges' better learning environments and more efficient administration. Comparable patterns have been observed in Saudi Arabia and Jordan, where private medical students assert greater access to educational materials and encouraging classroom environments [69].

Our findings are consistent with patterns reported in other regional and global studies. For instance, research in Egypt, Saudi Arabia, and Jordan also shows that students at private medical institutions tend to report higher satisfaction than those in public universities [70, 71], often attributed to smaller class sizes, better resources, and more responsive teaching practices. Similarly, differences in satisfaction by gender, age, and study level have been observed in international studies, suggesting that demographic factors can influence how students perceive educational quality across diverse contexts [72]. By situating our results alongside these studies, we highlight both common trends and unique aspects of the Yemeni context, strengthening the comparative perspective and providing a clearer understanding of how local and structural factors interact with global patterns in medical education quality.

8. FOUNDATION OF THE STUDY (THE DONABEDIAN MODEL)

To provide a systematic interpretation of our findings, we applied the Donabedian model of quality, which evaluates education in terms of structure, process, and outcomes. Structural factors, such as infrastructure, availability of resources, and faculty qualifications, help explain why private universities reported higher satisfaction than public institutions. Process elements, including teaching methods, learning opportunities, assessment practices, feedback, and student support, shed light on differences observed across the eight quality domains (D1–D8). Therefore, overall student satisfaction represents the outcome, reflecting how students perceive the effectiveness of their educational experiences. Using this framework allows us to link empirical results to theoretical constructs, highlight areas for targeted improvement, and provide a clear rationale for institutional and policy-level interventions aimed at enhancing the quality of medical education in Yemen.

9. IMPLICATIONS FOR POLICY AND PRACTICE

The findings of this study have important implications for improving medical education in Yemen. The noticeable gap in satisfaction between private and public universities suggests that public institutions could benefit from targeted reforms, such as increased funding for modern facilities, enhanced faculty development programs, smaller class sizes, and more accessible student support services. At the national level, the results highlight the need for standardized quality assurance and accreditation processes to ensure that all medical students, regardless of institution, receive a high-quality education. Additionally, understanding differences in satisfaction across gender, study level, and age groups can help policymakers and university leaders design tailored support programs that address the needs of students who may feel less satisfied. By linking these findings to actionable reforms, the study provides a roadmap for evidence-based improvements in both institutional practices and national policy for medical education in Yemen.

V. CONCLUSION

This study provides the first comprehensive assessment of medical student satisfaction across both private and public universities in Yemen using a culturally adapted and validated survey. Our findings reveal significant differences in satisfaction, with private university students reporting higher perceptions of educational quality across multiple domains. These results highlight practical areas for improvement, particularly in public institutions, including investment in infrastructure, faculty development, student support services, and implementation of standardized quality assurance processes. Furthermore, the study identifies demographic and institutional factors that influence satisfaction, offering guidance for tailored interventions. Future research should prioritize longitudinal studies to track changes over time, qualitative investigations to explore the reasons behind satisfaction differences, and evaluations of targeted reforms aimed at enhancing the quality of medical education. Collectively, these insights provide a foundation for evidence-based strategies to improve medical education in Yemen and similar conflict-affected contexts.

This study has several limitations that should be considered when interpreting the findings. First, the use of self-reported data may introduce social desirability bias, as students could overstate satisfaction or underreport dissatisfaction. Second, non-response bias is possible, since students who did not participate may differ systematically from respondents in their perceptions or experiences. Third, interpreting satisfaction in the Yemeni context requires attention to cultural factors, as societal norms and expectations may influence how students evaluate and report their educational experiences. Additionally, the study's cross-sectional design limits the ability to draw causal conclusions, capturing only a snapshot of student perceptions at a single point in time. Despite these limitations, the findings provide valuable insights into medical students' experiences and highlight areas for potential institutional and national improvements in clinical education.

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Author Contributions

H.A. led the conceptualization of the study, oversaw manuscript revisions, and granted final approval of the version to be published. A.A. was responsible for the study design and methodology, prepared the initial draft, and carried out critical revisions, culminating in final approval. J.T. contributed through editing, proofreading, and critical review of the manuscript prior to approval. M.A. participated in the study design, supported the data analysis, and provided substantive feedback on the manuscript. B.S. assisted with data collection, conducted the literature review, and contributed feedback on the manuscript.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data used in this study can be accessed by contacting the corresponding author. We've stored the data in accordance with Qatar University's guidelines for data sharing.

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Ethics Approval and Consent to Participate

Ethical approval for this study was obtained from the Faculty of Medicine at Aljeel Aljadeed University. The approval specifically covered all aspects of the research, including the translation and adaptation of the NSS survey into Arabic and the online dissemination via Google Forms and WhatsApp groups. The study adhered to international ethical standards, including the Declaration of Helsinki, ensuring voluntary participation, informed consent, confidentiality, and the right to withdraw at any stage. The translation and adaptation process was carefully conducted to maintain the validity of the instrument while respecting cultural and linguistic appropriateness, and these procedures were reviewed and approved as part of the ethical clearance.

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