

The Attractive and Deterring Factors for Medical Students Towards Pathology as a Specialty in Saudi Arabia

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Purpose: This study aims to assess the level of interest in pathology among medical students in Saudi Arabia and identify factors influencing their decision to pursue pathology as a career.

Patients and methods: This cross-sectional study was conducted across multiple universities in Saudi Arabia, including Umm Al Qura University, King Faisal University, King Saud bin Abdulaziz University for Health Sciences, Imam Abdulrahman bin Faisal University, Jazan University, and King Khalid University. Data was collected from medical students at different academic levels, including first-year students through interns using an online questionnaire via Google Forms. Responses were cleaned in Microsoft Excel and analyzed using SPSS version 23. Descriptive statistics and Chi-square tests were used, with significance set at $p < 0.05$.

Results: A total of 612 valid responses were received, with an almost equal distribution of male (49.8%) and female (50.2%) participants. Overall, 45.3% of students expressed interest in pathology, while 54.7% were not interested. Female students (52.1%) showed a greater interest compared to males (38.4%). The most influential factors attracting students to pathology included lifestyle (37.4%), research opportunities (35.9%), and fewer on-call duties (33.2%). The most common deterring factors reported by those interested in pathology was the perceived challenge of the discipline (56.9%), other career interests (41.5%), and limited job opportunities (35.3%).

Conclusion: Several factors influence medical students' decisions regarding pathology as a career choice. Notably, female students demonstrated a higher level of interest in pathology than their male counterparts. Future studies should explore strategies to enhance the visibility and appeal of pathology, such as increasing early exposure to the field within the medical curriculum.

Keywords: pathology interest, specialty selection, medical education, student perceptions

Introduction

Selecting the right medical specialty is a pivotal decision for medical students to make. While some students are driven towards certain specialties early in their training, others remain undecided until their last year or during internship. Numerous research has been done to uncover the underlying factors, including personal, professional, and familial reasons, that may affect medical students' specialty of choice.¹ Cultural and societal pressure has also been shown to influence their choice of specialty.² The process of medical socialization and self-realization during clinical training and rotations also helps guide students into the specialty suited to them.² Thus, students are able to come to conclusions by evaluating the motivating and discouraging elements of each specialty during their years in medical school.³

During medical training, students are introduced to a range of specialties; however, some fields receive less exposure, limiting their opportunities to explore all potential career paths. Without sufficient exposure, students may feel pressured

to make seemingly irreversible career decisions without fully understanding their options.⁴ This may ultimately reduce the variety of specialists within the healthcare system. Since a diverse range of available specialists is essential for providing optimal local healthcare, a shortage in any specialty can create imbalances, weaken the healthcare system, and increase economic strain through a greater reliance on referrals.⁵

Pathology is one specialty that medical students are underexposed to during their medical education. Pathology is an essential medical specialty that plays a foundational role in modern medicine by bridging basic science and clinical care. It focuses on the study of diseases, including cancers, infectious diseases, autoimmune disorders, and hematologic conditions, their causes, and their impact on human organs, tissues, and cells. Medical doctors who specialize in detecting diseases by studying samples of body fluids, tissues, and organs are known as pathologists. Also, with rapid technological advances, the field is evolving beyond traditional microscopy and histology. The integration of artificial intelligence (AI) in digital pathology has shown promise in improving diagnostic accuracy and efficiency by automating pattern recognition and supporting pathologist decision-making.⁶

Pathologists contribute significantly to the healthcare system by supporting diagnostic and treatment decisions. However, there is a shortage of pathologists in many parts of the world, which can lead to delays in diagnosis, longer hospital stays, and higher healthcare costs. Additionally, pathologists face significant risks associated with overwork, including a reduction in the quality of their work and a higher likelihood of diagnostic errors.⁷

Several studies have been made in Saudi Arabia to determine medical students' preferences in the choice of future medical specialties. One study conducted by Al-Hariri et al that involved 579 students showed that only 1% of students are considering pathology as a future career path.⁸ Another similar study conducted in Dammam by Alshahrani et al involving 379 medical students and interns revealed that less than 2% considered pathology as a future career.⁹ As for medical students' perceptions of pathology, local research found that 48% of students lacked awareness about the role of a pathologist, 55% cited that the limited exposure to real-world pathology practice was the main reason, and up to 77% felt that hands-on practical sessions would be the most effective way to learn pathology.¹⁰

Other international studies have also reported similar findings. A China-based study found that only 48.72% of students were interested in pathology, with key suggestions from students being more clinical cases and more engaging classes.¹¹ Another study conducted in Germany also showed that clinical experiences and clerkships had a significant impact on students' specialty choices.¹²

The lack of recognition of pathology as an acceptable option may be due to its absence from students' regular clinical experiences and their lack of comprehension of its significance in patient care.¹³ Studies have highlighted that traditional teaching methods, such as didactic lectures, may not effectively convey the clinical relevance of pathology. For instance, a study at King Saud University found that only 29% of students perceived pathology as applicable to clinical practice, indicating a disconnect between theoretical knowledge and clinical application.¹⁴ Additionally, the transition to integrated, modular curricula in medical education has resulted in the dilution of fundamental scientific disciplines such as pathology. Replacing dedicated pathology courses with fragmented lectures distributed across modules in pre-clinical years has weakened students' comprehension of the subject and diminished their interest in pursuing it further.¹⁵

Even though pathologists are necessary for patient safety, quality assurance, diagnosis, and treatment planning, medical students are hesitant to consider pathology as a realistic career option. It has been determined that understaffed pathology departments pose a risk to patient safety.¹⁶ Thus, understanding the factors that influence individuals' decisions to become pathologists is vital for addressing this shortage and ensuring that the healthcare system has an adequate supply of pathologists. By identifying these factors, healthcare organizations and policymakers can develop strategies to attract and retain talented individuals in this essential field.

The current study aims to get a better understanding of the advantages and disadvantages perceived by students regarding a career in pathology. Beyond previously identified factors like lifestyle and work-life balance, and interest in the field,¹⁷ we aim to investigate additional variables, including the role of mentors, innovation, and income. Additionally, by performing a geographic analysis, we seek to uncover potential regional correlations influencing students' beliefs and attitudes toward pathology. This comprehensive approach will provide valuable insights into the determinants of specialty choice, contributing to medical education improvements and healthcare sector development.

Methods

Study Design and Setting

This cross-sectional study was conducted between May to July 2023 across six universities around the Kingdom of Saudi Arabia including Umm Al Qura University, King Faisal University, King Saud bin Abdulaziz University for Health Sciences, Imam Abdulrahman bin Faisal University, Jazan University, and King Khalid University. A sample of 612 students was collected using Google Forms and was distributed at random by five selected students from different universities to students from first year to interns, equally distributing them between the six universities' female and male students.

Sampling Technique and Sample Size

The total population of medical students from across all the universities combined is 7400. The sample size is calculated using EPIinfo program. Based on 95% confidence interval and 5% margin of error and a prevalence of 15%, the estimated sample size recommended was 750. This number was adjusted to 600 to compensate for non-response rate of 20%.

Data Collection Tool

Three primary sections made up the questionnaire. The first section is the consent to take part in the study. The second section discusses demographic information such as age, medical year, gender, and GPA. The third section focuses on the understanding of pathology as a profession, what the applicant must know to be accepted into the residency program, and whether the participant has shown interest in the field by taking pathology-related courses, attending conferences, or working on projects. The final section discusses what attracts or deters students from a pathology specialty. Several factors have been studied to determine what attracts students to a specialization, including having a role model, research possibilities, and technological advancements in the area. Factors that discourage students from choosing the specialty were asked as well, such as long training time, a lack of public recognition and credit, and a lack of training facilities ([Supplementary Figure 1](#)).

Before the study began, a pilot study was conducted on 20 students who were not part of the study population to evaluate the questionnaire's readability, comprehension, question structure, and length. We excluded non-medical students from the study, along with a questionnaire that was not completed.

Statistical Analysis

Excel and SPSS version 23 was used for calculating the mean and standard deviation for quantitative data and frequency and percentage for Chi square test. P-value less than 0.05 will be used as a significance for the study and a confidence interval of 95%.

Ethical Considerations

Each participant gave their written consent before the questionnaire was distributed, and a discussion of the research summary occurred. Ethical approval was obtained from King Abdullah International Medical Research Center (Study protocol NRJ24/002/7). The names of the students were protected on coding sheets. Data were saved on a workplace PC that was password-protected.

Results

In this study, we received 612 valid responses from medical students studying in King Saud bin Abdulaziz University for Health Sciences, Umm Al Qura University, Jazan University, King Faisal University, King Khalid University, and Imam Abdulrahman bin Faisal University, which are the biggest universities in Saudi Arabia. Out of these medical students, 305 (49.8%) were males and 307 (50.2%) were females. Regarding their interest in pathology, 277 (45.3%) of them were interested, while 335 (54.7%) were not. Not all students interested in pathology considered it as a career path; approximately half of them (47.7%) do not wish to pursue it as a future profession. Using a Chi-square test of

independence, we tested the null hypothesis that males and females are not equally interested in pathology with high significance ($P < 0.001$).

The result showed that females were more interested (52.1%) compared to males (38.4%). The respondents' education levels in the university were as follows: 26 first-year students (4.2%), 78 second-year students (12.7%), 88 third-year students (14.4%), 112 fourth-year students (18.3%), 101 fifth-year students (16.5%), 83 sixth-year students (13.6%), and 124 interns (20.3%). Additionally, education level was found to significantly affect the interest in pathology, in which there was a decreased level of interest with an increase in the education level ($P < 0.001$). In the first year, 57.7% were interested, while in the sixth year, only 34.9% were interested in pathology. There was an exception for the students in the internship year, where they showed more interest (46.8%). Students who were interested in pathology were more likely to attend conferences and courses ($n=131$, 66.8%) and to be involved in projects ($n=87$, 64%) related to the specialty ($P < 0.001$) (Table 1).

Table 1 Demographic Data, Interest Responses (Yes/No), and Actions Taken to Demonstrate Interest in the Field

Demographics		Total (N)	Interested in Pathology		P-value
			Yes (N, %)	No (N, %)	
Gender	Male	305	117 (38.4%)	188 (61.6%)	<0.01
	Female	307	160 (52.1%)	147 (47.9%)	
Educational level	First year	26	15 (57.7%)	11 (42.3%)	<0.01
	Second year	78	44 (56.4%)	34 (43.6%)	
	Third year	88	44 (50.0%)	44 (50.0%)	
	Fourth year	112	47 (42.0%)	65 (58.0%)	
	Fifth year	101	40 (39.6%)	61 (60.4%)	
	Sixth year	83	29 (34.9%)	54 (65.1%)	
	Internship	124	58 (46.8%)	66 (53.2%)	
Academic GPA	4.75–5.0	176	80 (45.5%)	96 (54.5%)	0.578
	4.5–4.74	118	50 (42.4%)	68 (57.6%)	
	4.0–4.49	144	70 (48.6%)	74 (51.4%)	
	3.5–3.99	119	56 (47.1%)	63 (52.9%)	
	3.0–3.49	44	15 (34.1%)	29 (65.9%)	
	2.5–2.99	11	6 (54.5%)	5 (45.5%)	
Perceptions and Exposure to Pathology					
Statement	Response	Total (N)	Interested in Pathology		P-value
			Yes (N, %)	No (N, %)	
I am considering pathology as a career path.	Yes	172	145 (84.3%)	27 (15.7%)	<0.01
	No	440	132 (30.0%)	308 (70.0%)	
I understand what a career in pathology involves.	Yes	360	194 (53.9%)	166 (46.1%)	<0.01
	No	252	83 (32.9%)	169 (67.1%)	

(Continued)

Table 1 (Continued).

Statement	Response	Total (N)	Interested in Pathology		P-value
			Yes (N, %)	No (N, %)	
I understand what is required to obtain a pathology residency.	Yes	247	140 (56.7%)	107 (43.3%)	<0.01
	No	365	137 (37.5%)	228 (62.5%)	
I have attended a pathology conference/course.	Yes	196	131 (66.8%)	65 (33.2%)	<0.01
	No	416	146 (35.1%)	270 (64.9%)	
I completed a degree/project related to pathology.	Yes	136	87 (64.0%)	49 (36.0%)	<0.01
	No	476	190 (39.9%)	286 (60.1%)	
I received pathology teaching during medical education.	Yes	532	244 (45.9%)	288 (54.1%)	0.439
	No	80	33 (41.3%)	47 (58.8%)	

Even though more students (54.7%) were not interested in pathology, there were multiple attractors that were listed from all students regardless of their interest. The top 3 attractive factors were: lifestyle and work-life balance (n=229, 37.4%), research opportunities (n=220, 35.9%), and a smaller number of on-calls (n=203, 33.2%). However, lifestyle and work-life balance were significantly higher in students who were not interested (53.3%) in comparison to those who were interested (46.7%). Regarding the research opportunities, many students (55.5%) who were interested considered it more attractive than those (44.5%) who were not interested. Students who were not interested (55.7%) consider less number of on-calls as an attractive factor more than students who were interested (44.3%) ($P < 0.001$).

Other factors, including impact on patients, interest in histopathology, diversity of cases and patient populations, having a role model, challenging specialty, variety of career options available, and enjoy laboratory work were reported as attractive factors in students who were interested more than others ($P < 0.001$). In contrast, income and less contact with patients were reported as attractive factors in students who were not interested. Innovation and technology were equal in both (50%) (Table 2 and Figure 1).

Table 2 Factors That Attract Students Interested in Becoming Pathologists

Attractive Factors	Response	Total (N)	Yes (N, %)	No (N, %)	P-value
Less number of on-calls	Yes	203	90 (44.3%)	113 (55.7%)	0.746
	No	409	187 (45.7%)	222 (54.3%)	
Research opportunities	Yes	220	122 (55.5%)	98 (44.5%)	<0.01
	No	392	155 (39.5%)	237 (60.5%)	
Innovation & technology	Yes	152	76 (50.0%)	76 (50.0%)	0.176
	No	460	201 (43.7%)	259 (56.3%)	
Impact on patients and rewarding specialty	Yes	112	64 (57.1%)	48 (42.9%)	<0.01
	No	500	213 (42.6%)	287 (57.4%)	
Challenging specialty	Yes	140	88 (62.9%)	52 (37.1%)	<0.01
	No	472	189 (40.0%)	283 (60.0%)	

(Continued)

Table 2 (Continued).

Attractive Factors	Response	Total (N)	Yes (N, %)	No (N, %)	P-value
Income	Yes	92	45 (48.9%)	47 (51.1%)	0.445
	No	520	232 (44.6%)	288 (55.4%)	
Geographic location of the training center	Yes	74	38 (51.4%)	36 (48.6%)	0.262
	No	538	239 (44.4%)	299 (55.6%)	
Interested in histopathology	Yes	142	89 (62.7%)	53 (37.3%)	<0.01
	No	470	188 (40.0%)	282 (60.0%)	
Less contact with patients	Yes	171	81 (47.4%)	90 (52.6%)	0.514
	No	441	196 (44.4%)	245 (55.6%)	
Diversity of cases and patient populations	Yes	116	73 (62.9%)	43 (37.1%)	<0.01
	No	496	204 (41.1%)	292 (58.9%)	
Lifestyle & work-life balance	Yes	229	107 (46.7%)	122 (53.3%)	0.574
	No	383	170 (44.4%)	213 (55.6%)	
Having a role model	Yes	99	65 (65.7%)	34 (34.3%)	<0.01
	No	513	212 (41.3%)	301 (58.7%)	
Variety of career options available	Yes	78	44 (56.4%)	34 (43.6%)	0.034
	No	534	233 (43.6%)	301 (56.4%)	
Enjoy laboratory work	Yes	164	94 (57.3%)	70 (42.7%)	<0.01
	No	448	183 (40.8%)	265 (59.2%)	
Others	Yes	69	24 (34.8%)	45 (65.2%)	0.63
	No	543	253 (46.6%)	290 (53.4%)	

Multiple deterring factors were reported by the students. The most reported three deterring factors were as follows: challenging discipline (56.9%), other career interests (41.5%), and limited job opportunities (35.3%). Challenging discipline was significantly higher in students who were not interested (56.9%) in comparison to those who were interested (43.1%). Limited job opportunities was considered by students who were not interested (53.2%) as a deterring factor more than those who were interested (46.8%).

The major responsibilities of pathologists was considered as a deterring factor for interested students (52.30%) higher than those who were not interested (47.70%) ($P < 0.001$). Similarly, long training time and few training centers were also reported equally in non-interested students (50%) in comparison to interested students (50%) ($P > 0.001$). However, many deterring factors were surprisingly comparable between both groups of students including less known by community and less rewarding, no credit, practical aspect, and complex cases (Table 3 and Figure 2).

Discussion

The present study explored the factors influencing the decision to pursue pathology as a career among medical students in Saudi Arabia. The sample comprised 612 medical students from various universities across the country, with an almost

Attractive Factors

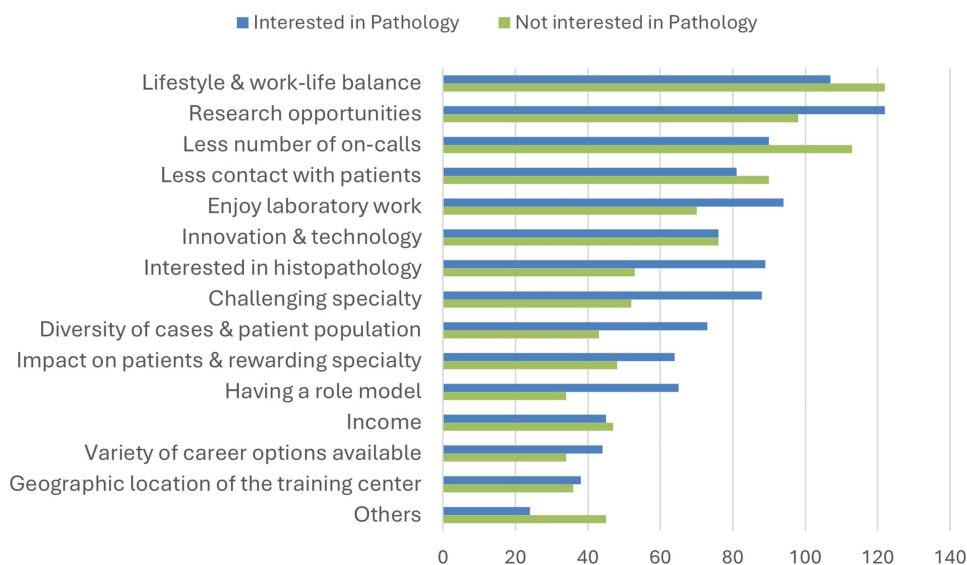


Figure 1 Attractive factors for pathology that have been reported by students.

equal distribution of male and female participants. The findings revealed that 45.3% of students expressed interest in pathology; however, less than half of these students considered it as a potential career path. Our finding is aligned with a study by Alomaish et al conducted at Jazan University where only 16.2% were interested in pathology, while 3.1% chose the field as their first future career choice.¹⁸

Table 3 Factors That Deter Students from Becoming Pathologists

Deterring Factors	Response	Total (N)	Yes (N, %)	No (N, %)	P-value
Major responsibilities of pathologists	Yes	132	69 (52.3%)	63 (47.7%)	0.068
	No	480	208 (43.3%)	272 (56.7%)	
Other career interests	Yes	254	103 (40.6%)	151 (59.4%)	0.049
	No	358	174 (48.6%)	184 (51.4%)	
Less known by community and less rewarding	Yes	200	81 (40.5%)	119 (59.5%)	0.99
	No	412	196 (47.6%)	216 (52.4%)	
Long training time	Yes	152	76 (50.0%)	76 (50.0%)	0.176
	No	460	201 (43.7%)	259 (56.3%)	
No credit	Yes	179	75 (41.9%)	104 (58.1%)	0.099
	No	410	202 (49.3%)	208 (50.7%)	
Challenging discipline	Yes	348	150 (43.1%)	198 (56.9%)	0.218
	No	264	127 (48.1%)	137 (51.9%)	

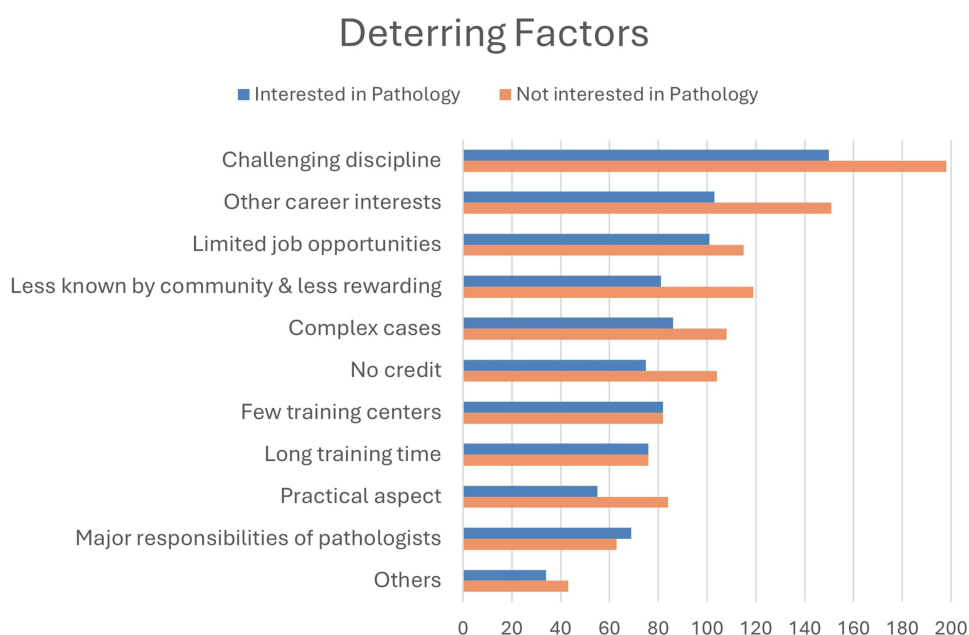
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Table 3 (Continued).

Detering Factors	Response	Total (N)	Yes (N, %)	No (N, %)	P-value
Practical aspect	Yes	139	55 (39.6%)	84 (60.4%)	0.125
	No	473	222 (46.9%)	251 (53.1%)	
Limited job opportunity	Yes	216	101 (46.8%)	115 (53.2%)	0.582
	No	396	176 (44.4%)	220 (55.6%)	
Complex cases	Yes	194	86 (44.3%)	108 (55.7%)	0.752
	No	418	191 (45.7%)	227 (54.3%)	
Few training centers	Yes	164	82 (50.0%)	82 (50.0%)	0.154
	No	448	195 (43.5%)	253 (56.5%)	
Others	Yes	77	34 (44.2%)	43 (55.8%)	0.835
	No	535	243 (45.4%)	292 (54.6%)	

Importantly, there was a significant gender difference, with female students showing greater interest in pathology than male students (52.1% vs 38.4%). The findings are consistent with those reported by Asaad et al who identified a significant gender difference in specialty preferences, with female students showing a stronger tendency toward non-surgical fields.¹⁹ This preference may be influenced by the perception that non-surgical specialties offer a more balanced lifestyle, something many female students consider when planning their future roles both professionally and personally. Cultural expectations may also play a role, as surgical specialties are often viewed as more demanding and stressful. Additionally, emotional factors may contribute, as some students prefer specialties that involve less acute pressure and lower exposure to high-risk situations.

Moreover, the results suggested a significant relationship between the students' educational level and their interest in pathology. As the education level advanced, the interest in pathology declined from 57.7% among 1st-year students to

**Figure 2** Detering factors for pathology that have been reported by students.

34.9% among interns. This suggests that as students acquire more knowledge and experience in various fields of medicine, they may develop interests in other specialties. The declining interest in pathology with advancing education level observed in our study is consistent with the findings of a study by Weaver et al. They reported that as medical students progress in their education, they tend to develop interests in other specialties.²⁰ This suggests a need for more engaging and comprehensive pathology education throughout medical curricula. To increase students' familiarity with pathology early on, it is recommended to incorporate interactive lectures that highlight the specialty's clinical relevance into the first and second years of the medical curriculum. Additionally, fostering mentorship is essential. Inviting practicing regional pathologists to share their personal career journeys may offer students a relatable and inspiring perspective. Finally, providing structured visits to pathology departments, including histopathology units, laboratories, and autopsy rooms, allows students to gain practical insights into the day-to-day responsibilities of the field and helps demystify its role within the broader healthcare system.

Students who expressed interest in pathology were more likely to have attended relevant conferences and courses and participated in related projects. This finding aligns with the concept that increased exposure and involvement in a field may foster interest and commitment to that field which aligns with a study by Al Shawwa et al, which found that students who participated in research projects or clinical rotations in a particular field were more likely to choose that field as their specialty.²¹ In contrast, another study by McCloskey et al found that participating in a separate pathology course did not increase the probability of choosing pathology.²²

The study also explored the factors that attract students to pathology. The top three factors were lifestyle and work-life balance, research opportunities, and fewer on-call duties. However, these factors seemed to attract more students who were not interested in pathology. This could suggest that these students value work-life balance and research opportunities but might not be aware that these factors are also characteristic of the pathology specialty. The factors that attract students to pathology in our study are also echoed in another study which found that lifestyle, work-life balance, and interest in the discipline were among the top factors influencing specialty choice.¹⁷

Conversely, factors such as the impact on patients, interest in histopathology, diversity of cases and populations, having a role model, the specialty's challenges, career options, and enjoyment of laboratory work were more attractive to students interested in pathology. This aligns with several previous research suggesting that personal interest is a strong motivator in career choice.^{23,24}

Common deterrents to choosing pathology included the perceived challenge of the discipline, other career interests, and limited job opportunities. These deterrents were reported more often by students who were not interested in pathology, suggesting that addressing these concerns might increase the appeal of pathology as a specialty. Comparison of deterrents to choosing pathology in our study with other research, such as that by Burgess et al, suggests that perceived challenges and limited job opportunities are common concerns among medical students across different regions.²⁵ Addressing these concerns through targeted educational interventions and career counseling may be beneficial in increasing the appeal of pathology.

Strengths and Limitations

This study possesses several notable strengths that enhance the reliability and relevance of its findings. Students from multiple universities across different regions in Saudi Arabia were included, which helped ensure a broader and more diverse perspective was obtained. A large sample size was also achieved, adding greater statistical power and credibility to the results. Furthermore, before the survey was launched, it was tested with a small group of students to ensure that the questions were clear and easy to understand. This helped improve the questionnaire and ensured that accurate and meaningful responses were obtained.

Despite these strengths, a few limitations should be acknowledged. First, since this is a cross-sectional study, only a snapshot in time is captured, and conclusions about causality between the influencing factors and students' interest in pathology cannot be drawn. Second, the data was collected using an online self-administered questionnaire, which may be subject to response bias or misinterpretation of questions by some participants. Third, although multiple universities were included, certain regions or institutions might still be underrepresented, which could affect how generalizable the findings are to all medical students in Saudi Arabia. Lastly, this study did not include multivariate analysis or regression

modeling, which limits our ability to identify independent predictors of interest in pathology. Factors such as GPA, gender, and year of study may be interrelated, and without controlling for these confounders, the findings should be interpreted with caution. Future studies should include regression analysis to better understand these relationships.

Conclusion

In conclusion, this study provides valuable insights into the factors influencing the choice of pathology as a specialty among medical students in Saudi Arabia. While nearly half of the students expressed interest in pathology, only a minority considered it a viable career path. Female students showed greater interest than males, and engagement with pathology-related activities was associated with increased interest. The study identified lifestyle, research opportunities, and fewer on-call duties as primary attractors, while perceived difficulty, limited job opportunities, and competing career interests served as deterrents. Efforts to promote pathology both as a specialty and as a career should consider these factors, particularly the interests and values of the students. Future research might explore strategies to increase the visibility and appeal of pathology, such as providing more exposure to the field early in the medical curriculum, clarifying misconceptions about job opportunities, and showcasing the impact and importance of pathology in patient care.

Data Sharing Statement

The datasets generated and/or analyzed during the current study are not publicly available due to respondents' confidentiality but are available from the corresponding author on reasonable request.

Ethics Approval and Informed Consent

This study was approved by the King Abdullah International Medical Research Center (KAIMRC) institutional review board (Study protocol NRJ24/002/7). All responses were kept fully confidential with authorized access only. Informed consent was obtained from all the study participants for participation in this study, and they were informed that no identifier information was to be asked. The authors declare that it conforms to the Declaration of Helsinki.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors report no conflicts of interest in this work.

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