

# Medical Students' Perceptions Toward Pursuing a Career in Cardiothoracic Surgery

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## Abstract

This study is the first national-level multicentric study in Saudi Arabia to understand the experiences, perceptions, and attitudes toward cardiothoracic surgery. To assess the level of interest in cardiothoracic surgery (CTS) among medical students in Saudi Arabia, as well as potential motivators and obstacles to pursuing CTS training. A national cross-sectional study was conducted via an online survey platform (Google Forms). This study is based on a structured questionnaire that was developed by Samiullah Dost *et al.* The questionnaire was distributed by medical students via social media 30% of the respondents are currently considering a career in Cardiothoracic Surgery, while 35.7% are unsure. The most popular choices include Internal Medicine, Neurosurgery, Pediatrics, and Family Medicine. A significant number of respondents rated their knowledge as low, with 42.4% giving a rating of 1.0 and 26.1% giving a rating of 2.0. The score of perception of pursuing a CT career was 95%, which was evaluated for deterrents and only 5% for attractive factors. Regarding gender, the survey found that 66% of respondents were female, while 34% were male. The difference in the number of male and female students was found to be statistically significant ( $p$ -value=0.024). In conclusion, medical students' perceptions toward pursuing a career in cardiothoracic surgery in Saudi Arabia are shaped by a variety of factors, including personal interests, cultural norms, educational opportunities, and the healthcare system in the country. In our study, the majority of participants showed more deterrents than attractive factors regarding pursuing a CT career.

**Keywords:** Cardiothoracic surgery, Perceptions, Attitudes, Medical students

## INTRODUCTION

Cardiothoracic surgery involves major, technically demanding operations on patients who have diseases of the organs contained within the chest, including the heart, major blood vessels, and the lungs [1]. Dr. Daniel Hale Williams was the first surgeon who performed the first successful cardiac surgery in 1893 on a 24-year-old patient who had been stabbed in the heart. This patient recovered completely and died in 1943 [2]. A few years later, a couple of other surgeons actually sutured heart wounds, but the patients did not survive [3]. Then, Dr. Ludwig Rehn had amassed a series of 124 cases with a mortality rate of just 60% ten years after his first surgery in 1896, which was quite an accomplishment at the time [4]. Another significant event in the history of cardiac surgery happened during World War II when a US Army surgeon successfully removed 134 missiles from the mediastinum without a death [3]. Today, there are 12391 adult cardiac, 9328 thoracic, 3966 vascular, and 4145 congenital surgeons globally, amounting to 15.9 adult cardiac, 12 thoracic, 5.1 vascular, 0.4 critical care & 5.4 congenital surgeons per 10 million population [5]. Despite the fact that cardiovascular illness is responsible for one-third of all fatalities, there are only two cardiothoracic surgeons who are actively practicing for every 100,000 Americans [6].

Several studies have predicted a workforce shortage in cardiothoracic surgery in the US by the year 2035 [7]. A 2018 study conducted by R. Preece *et al.* shows deep concern that subgroup analysis of the final year cohort revealed a dramatic reduction in interest levels. The biggest decline in any of the surgical specialties evaluated was noted in the students choosing cardiothoracic surgery as their preferred career, which fell to less than 5% [8]. According to a study conducted in 2020 by Coyan *et al.*, first-year students showed higher attention than students in any other class (30% vs<15%,

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**How to cite this article:** Alotaibi Kh, Alsattam TA, Alasmari TF, Alhojailan RA, Gari AH, Binhussain MA, et al. Medical Students' Perceptions Toward Pursuing a Career in Cardiothoracic Surgery. Arch Pharm Pract. 2023;14(S):A06231525.

$P=0.02$ ) [9]. A 2022 study by Samiullah Dost *et al.* found that as one progressed through medical school, interest in pursuing CTS waned. 16.8% of students in the final year were interested, compared to 45.1% of students in the first year, potentially suggesting a negative correlation between CTS exposure and interest [10]. A 2021 study by Axiaq *et al.* revealed that interest in cardiothoracic surgery was seen in 45.3% of participants, with the second leading factor for pursuing this career being career opportunities (42.9%) and the aid of mentors (31%) [11]. Many cardiac surgeons are expanding the scope of their work. Assuming that heart surgery would soon become extinct is both premature and incorrect [12]. The outcomes for patients needing urgent surgical interventions will be improved, and the growth of the specialty will be ensured if qualified cardiothoracic surgeons are accessible at more hospitals, particularly in remote places. It is crucial to take action to draw students to the cardiothoracic surgery specialty. This study is the first national-level multicentric study in Saudi Arabia to understand the experiences, perceptions, and attitudes toward cardiothoracic surgery. The influence of demographic factors, including gender, past experience, interest in the specialty, and stereotypes, on perceptions of cardiothoracic surgery in Saudi Arabia will be investigated. In order to close the human resource health gap, this study will guide efforts to make cardiothoracic surgery a greater priority among incoming medical graduates. Our aim is to assess the level of interest in cardiothoracic surgery (CTS) among medical students in Saudi Arabia, as well as potential motivators and obstacles to pursuing CTS training. Additionally, it will examine the impact of gender on CTS interests.

## MATERIALS AND METHODS

### Study Design

A national cross-sectional study was conducted via an online survey platform (Google Forms). This study is based on a structured questionnaire that was developed by Samiullah Dost *et al.*

### Study Setting: Participants, Recruitment, and Sampling Procedure

The study's population consisted of medical students in Saudi Arabia across all year groups. The questionnaire was distributed by medical students via social media to widen outreach to all of Saudi Arabia's medical schools. This involved posts on platforms including Snapchat, Twitter, and Instagram with an anonymous link to the questionnaire.

### Inclusion Criteria

Currently active male and female medical students at all levels in Saudi Arabia.

### Exclusion Criteria

Any medical students studying outside Saudi Arabia across all year groups were excluded.

### Sample Size

The sample size was calculated by (Raosoft, Inc., Seattle, WA, USA) (22) at 384 individuals using the following formula and applying means and standard deviation. Considering standard deviation ( $=1.96$ ) for a 95% Confidence interval and the maximum acceptable marginal error ( $=0.05$ ). Therefore, the calculated minimum sample size required for this study is  $n = (1.96)^2 \times 0.50 \times 0.50 / (0.05)^2 = 384$  participants. We managed to collect even more than the recommended sample size as we reached 409 medical students.

### Method for Data Collection and Instrument (Data Collection Technique and Tools)

There are five main sections of the questionnaire. Section one covered the basics of demographics. The second part addresses interest in medical specialties. The third section focuses on interest in and exposure to cardiothoracic surgery. The fourth section explores motivators and barriers. The last section evaluates perceptions. The participant's consent was obtained before the survey was carried out.

### Scoring System

Survey respondents were asked to rate 11 statements regarding a career in CTS on a 5-point Likert scale, with 1 representing strongly agree and 5 representing strongly disagree. The statements covered stereotypes of a career in CTS, their general perception of CTS, as well as motivations and deterrents to choosing a career in CTS. Students were asked to rate 9 statements on a scale of attractiveness to the CTS pathway, with 1 being attractive and 5 being deterring. Statements rated above 3 on average will be considered deterrents, while statements that scored less than 3 on average were considered attractive factors for students.

Analysis and entry method: Data was entered on the computer using the "Microsoft Office Excel Software" program (2016) for Windows. Data was transferred to the Statistical Package of Social Science Software (SPSS) program, version 20 (IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp.) to be statistically analyzed.

## RESULTS AND DISCUSSION

**Table 1** shows that the majority of students are in their 2nd year (Basic Science Years) and 4th year (Basic Science Years), comprising 30.3% and 20.0% of the total, respectively. Western region has the highest number of students at 29.8%, followed by the Central region at 24.6%. Furthermore, the data also reveals the distribution of students across various colleges, with King Saud University, King Abdulaziz University, and King Saud bin Abdulaziz University for Health Sciences having a notable number of students. In terms of gender, the data shows that there are more female students (66.0%) than male students (34.0%) in the medical program. Lastly, the cumulative grade point average (GPA) distribution shows that the majority of

students have an excellent GPA, comprising 60.6% of the total.

**Table 1.** Sociodemographic characteristics of participants (n=406)

	Parameter	No.	Percent
Current year	Intern	47	11.6
	2nd year (Basic Science Years)	123	30.3
	3rd year (Basic Science Years)	54	13.3
	4th year (Basic Science Years)	81	20.0
	5th year (Clinical Knowledge Years)	46	11.3
	6th year (Clinical Knowledge Years)	55	13.5
Location	Central Region	100	24.6
	Eastern Region	66	16.3
	Northern region	36	8.9
	Southern region	83	20.4
	Western Region	121	29.8
	Al Baha University	19	4.7
	Al Jouf University	1	.2
University	Al-Imam Muhammad Ibn Saud Islamic University	4	1.0
	Alfaisal University	2	.5
	Almaarefa University	1	.2
	Batterjee Medical College	1	.2
	Bisha University	7	1.7
	Hail University	1	.2
	Ibn Sina National College for Medical Studies	6	1.5
	Imam Abdulrahman Bin Faisal University	39	9.6
	Jazan University	12	3.0
	Jeddah University	21	5.2
	King Abdulaziz University	18	4.4
	King Faisal University	16	3.9
	King Khalid University	30	7.4
	King Saud bin Abdulaziz University for Health Sciences	40	9.9
	King Saud University	16	3.9
Majmaah University	18	4.4	
Prince Sattam Bin Abdulaziz University	3	.7	
Princess Nora bint Abdulrahman University	6	1.5	
Qassim University	50	12.3	
Shqra University	2	.5	

	Taibah University	9	2.2
	Taif University	7	1.7
	Umm Al-Qura University	35	8.6
	University of Tabuk	35	8.6
	Vision Colleges	7	1.7
Gender	Male	138	34.0
	Female	268	66.0
Cumulative grade point average (GPA)	Satisfactory	6	1.5
	Good	36	8.9
	Very good	109	26.8
	Excellent	246	60.6
	Other	9	2.2

**Table 2** shows that 30% of the respondents are currently considering a career in Cardiothoracic Surgery, while 35.7% are unsure, and 34.2% have no interest in pursuing this career path. In terms of other potential career choices, the data shows a diverse range of specialties that students are considering. The most popular choices include Internal Medicine, Neurosurgery, Pediatrics, and Family Medicine. It is also worth noting that a significant percentage of students (18.7%) are still unsure about their future career path. For those interested in Cardiothoracic Surgery, the data indicates that Cardiac Surgery is the most preferred sub-specialty, with 62.3% of respondents expressing an interest in this area. Other sub-specialties, such as Congenital Cardiac Surgery, Esophageal Surgery, and Transplantation and Heart Failure Surgery, also garnered some interest among the respondents. 78.1% indicate that they have had no exposure to CT surgery. Additionally, a majority of the respondents (60.3%) reported that their medical college does not offer a dedicated CT surgery placement, highlighting a potential gap in the educational opportunities available to students in this field. Furthermore, when asked to rate their knowledge of the CT surgery training pathway, a significant number of respondents rated their knowledge as low, with 42.4% giving a rating of 1.0 and 26.1% giving a rating of 2.0. Interestingly, for those who have had exposure to CT surgery, the majority reported that their exposure had changed their view of the field, with 69.7% indicating a positive change in their perception.

**Table 2.** Medical students' perceptions and interests toward pursuing a career in cardiothoracic surgery (n=406).

	Parameter	No.	%
Currently considering a career in Cardiothoracic Surgery	Yes	122	30.0
	Unsure	145	35.7
	No	139	34.2

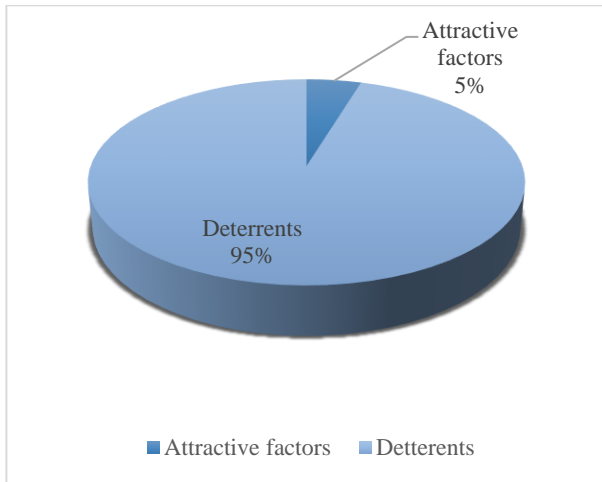
What career are you likely to pursue in the future?	Dermatology	16	5.6
	Emergency medicine	10	3.5
	Family medicine	21	7.4
	General surgery	21	7.4
	Internal medicine	32	11.3
	Neurosurgery	27	9.5
	Obstetrics and Gynecology	11	3.9
	Ophthalmology	15	5.3
	Orthopedics	20	7.0
	Otorhinolaryngology	5	1.8
	Pathology	5	1.8
	Pediatrics	24	8.5
	Psychiatry	13	4.6
	Radiology	8	2.8
	Unsure	53	18.7
	Urology	3	1.1
	If choosing Cardiothoracic Surgery, Which sub-specialty would you like to choose?	Advanced lung cancer resections	2
Cardiac surgery		76	62.3
Congenital cardiac surgery		14	11.5
Esophageal surgery		6	4.9
Thoracic surgery		6	4.9
Transplantation and heart failure surgery		6	4.9
Unsure		12	9.8
Have you had any exposure to CT surgery?	Yes	89	21.9
	No	317	78.1
Does your medical college offer a dedicated CT surgery placement?	Yes	56	13.8
	No	105	25.9
	I don't know	245	60.3
How would you rate your knowledge of the CT surgery training pathway?	1.0	172	42.4
	2.0	106	26.1
	3.0	89	21.9
	4.0	21	5.2
	5.0	18	4.4
Has your exposure changed your view of CT surgery? (n= 89)	Yes	62	69.7
	No	27	30.3

The survey responses in **Table 3** were categorized into five levels of agreement: strongly disagree, disagree, neutral, agree, and strongly agree. The first parameter listed is the intellectually stimulating and challenging nature of the field. Out of the 406 respondents, 28.1% strongly disagreed, 22.2% disagreed, 33.3% were neutral, 9.4% agreed, and 7.1% strongly agreed. The second parameter listed is the ability to make a direct impact on the patient's life. A larger portion of respondents, 44.1%, strongly disagreed with this statement, while 20.9% disagreed, 21.2% were neutral, 6.4% agreed,

and 7.4% strongly agreed. The third parameter listed is the skillful nature of the surgery. 38.2% of respondents strongly disagreed, 21.2% disagreed, 25.4% were neutral, 8.1% agreed, and 7.1% strongly agreed. The fourth parameter listed is the research and innovation opportunities available in the field. 24.4% of respondents strongly disagreed, 22.4% disagreed, 33.7% were neutral, 10.1% agreed, and 9.4% strongly agreed. The fifth parameter listed is the length of training required. 12.8% of respondents strongly disagreed, 11.6% disagreed, 25.6% were neutral, 20.0% agreed, and 30.0% strongly agreed. The sixth parameter listed is the competitive nature of gaining a training position in the field. 16.5% of respondents strongly disagreed, 16.7% disagreed, 35.2% were neutral, 17.2% agreed, and 14.3% strongly agreed. The seventh parameter listed is work-life balance. 19.0% of respondents strongly disagreed, 14.5% disagreed, 32.8% were neutral, 16.5% agreed, and 17.2% strongly agreed. The eighth parameter listed is the belief that CT surgery is a growing field that will continue to thrive. 35.2% of respondents strongly disagreed, 22.9% disagreed, 27.8% were neutral, 7.4% agreed, and 6.7% strongly agreed. The final parameter listed is the belief that CT surgeons have a good work-life balance. 12.8% of respondents strongly disagreed, 18.2% disagreed, 39.4% were neutral, 16.5% agreed, and 13.1% strongly agreed.

**Table 3.** Medical students' perceptions regarding motivators and barriers (n=406).

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Intellectually stimulating and challenging field	114 28.1%	90 22.2%	135 33.3%	38 9.4%	29 7.1%
Ability to make a direct impact on the patient's life	179 44.1%	85 20.9%	86 21.2%	26 6.4%	30 7.4%
Skillful nature of the surgery	155 38.2%	86 21.2%	103 25.4%	33 8.1%	29 7.1%
Research/innovation opportunities available	99 24.4%	91 22.4%	137 33.7%	41 10.1%	38 9.4%
Length of training (years)	52 12.8%	47 11.6%	104 25.6%	81 20.0%	122 30.0%
Competitive nature of gaining a training position	67 16.5%	68 16.7%	143 35.2%	70 17.2%	58 14.3%
Work-life balance	77 19.0%	59 14.5%	133 32.8%	67 16.5%	70 17.2%
CT surgery is a growing field and will continue to thrive	143 35.2%	93 22.9%	113 27.8%	30 7.4%	27 6.7%
CT surgeons have a good work/life balance	52 12.8%	74 18.2%	160 39.4%	67 16.5%	53 13.1%



**Figure 1.** Motivations and Deterrents Scores Toward Pursuing a Career in Cardiothoracic Surgery

**Table 4** shows that regarding gender, the survey found that 66% of respondents were female, while 34% were male. The difference in the number of male and female students was found to be statistically significant ( $p$ -value=0.024). In terms of location, the Western region had the highest number of respondents (29.8%), followed by the Central region (24.6%). The Eastern region had the lowest number of respondents (16.3%). However, the differences in the number of respondents across regions were not statistically significant ( $p$ -value=0.618). Finally, the survey asked students to indicate which college of medicine they attended. The results show that the majority of respondents (12.3%) attend Qassim University, followed by King Saud bin Abdulaziz University for Health Sciences (9.9%) and Imam Abdulrahman Bin Faisal University (9.6%). The least represented colleges were Al Jouf University, Alfaisal University, Almaarefa University, and Batterjee Medical College. The university parameter was not statistically significant ( $p$ -value=0.698).

**Table 4.** Association between sociodemographic characteristics and deterrents and attractive factors (n=406).

Parameter	Motivations and Deterrents Scores		Total (N=406)	P value	
	Deterrents	Attractive factors			
Current year	Intern	42 10.3%	5 1.2%	47 11.6%	<b>0.247</b>
	2nd year	116 28.6%	7 1.7%	123 30.3%	
	3rd year	53 13.1%	1 0.2%	54 13.3%	
	4th year	77 19.0%	4 1.0%	81 20.0%	
	5th year	45 11.1%	1 0.2%	46 11.3%	
	6th year	54 13.3%	1 0.2%	55 13.5%	
marital status	Satisfactory	6 1.5%	0 0.0%	6 1.5%	<b>0.686</b>
	Good	34 8.4%	2 0.5%	36 8.9%	
	Very good	106 26.1%	3 0.7%	109 26.8%	
	Excellent	232 57.1%	14 3.4%	246 60.6%	
Gender	Other	9 2.2%	0 0.0%	9 2.2%	0.024
	Male	127 31.3%	11 2.7%	138 34.0%	
Location	Female	260 64.0%	8 2.0%	268 66.0%	<b>0.618</b>
	Central Region	96 23.6%	4 1.0%	100 24.6%	
	Eastern Region	62 15.3%	4 1.0%	66 16.3%	
	Northern region	35 8.6%	1 0.2%	36 8.9%	
	Southern region	81 20.0%	2 0.5%	83 20.4%	

College of Medicine attended	Western Region	113 27.8%	8 2.0%	121 29.8%	<b>0.698</b>
	Al Baha University	19 4.7%	0 0.0%	19 4.7%	
	Al Jouf University	1 0.2%	0 0.0%	1 0.2%	
	Al-Imam Muhammad Ibn Saud Islamic University	4 1.0%	0 0.0%	4 1.0%	
	Alfaisal University	2 0.5%	0 0.0%	2 0.5%	
	Almaarefa University	1 0.2%	0 0.0%	1 0.2%	
	Batterjee Medical College	1 0.2%	0 0.0%	1 0.2%	
	Bisha University	7 1.7%	0 0.0%	7 1.7%	
	Hail University	1 0.2%	0 0.0%	1 0.2%	
	Ibn Sina National College for Medical Studies	6 1.5%	0 0.0%	6 1.5%	
	Imam Abdulrahman Bin Faisal University	37 9.1%	2 0.5%	39 9.6%	
	Jazan University	12 3.0%	0 0.0%	12 3.0%	
	Jeddah University	20 4.9%	1 0.2%	21 5.2%	
	King Abdulaziz University	17 4.2%	1 0.2%	18 4.4%	
	King Faisal University	15 3.7%	1 0.2%	16 3.9%	
	King Khalid University	28 6.9%	2 0.5%	30 7.4%	
	King Saud bin Abdulaziz University for Health Sciences	38 9.4%	2 0.5%	40 9.9%	
	King Saud University	14 3.4%	2 0.5%	16 3.9%	
	Majmaah University	18 4.4%	0 0.0%	18 4.4%	
	Prince Sattam Bin Abdulaziz University	3 0.7%	0 0.0%	3 0.7%	
	Princess Nora bint Abdulrahman University	6 1.5%	0 0.0%	6 1.5%	
	Qassim University	50 12.3%	0 0.0%	50 12.3%	
	Shqra University	2 0.5%	0 0.0%	2 0.5%	
	Taibah University	8 2.0%	1 0.2%	9 2.2%	
	Taif University	6 1.5%	1 0.2%	7 1.7%	
	Umm Al-Qura University	30 7.4%	5 1.2%	35 8.6%	
	University of Tabuk	35 8.6%	0 0.0%	35 8.6%	
	Vision Colleges	6 1.5%	1 0.2%	7 1.7%	

Medical students' perceptions toward pursuing a career in cardiothoracic surgery in Saudi Arabia are influenced by a variety of factors, including personal interest, cultural norms, educational opportunities, and the healthcare system in the country. Cardiothoracic surgery is a highly specialized and demanding field that requires a significant commitment of time and resources, and as such, it is important to understand the factors that influence medical students' perceptions toward pursuing a career in this field [2-5]. Some of the primary factors that influence medical students' perceptions toward pursuing a career in cardiothoracic surgery are personal interest, aptitude, and gender. Many medical students are drawn to the field of surgery due to a passion for working with their hands and a desire to make a direct impact on patients' lives. Cardiothoracic surgery, in particular, offers the opportunity to work on complex and challenging cases, and many students are attracted to the intellectual and technical challenges that this field presents. Cultural norms and expectations also play a significant role in shaping medical students' perceptions toward pursuing a career in cardiothoracic surgery in Saudi Arabia. In many cultures, there is a strong emphasis on family and community, and as a result, medical students may feel pressure to pursue specialties that are perceived as more stable or family-friendly, such as internal medicine or family medicine. Additionally, there may be cultural stigmas or misconceptions surrounding surgery, which can deter some students from considering a career in cardiothoracic surgery [1, 9].

The educational opportunities available to medical students in Saudi Arabia also play a role in shaping their perceptions toward pursuing a career in cardiothoracic surgery. Access to high-quality training programs, mentorship opportunities, and exposure to the field during medical school can greatly influence students' interest in pursuing a career in cardiothoracic surgery. Additionally, the availability of resources and support for aspiring cardiothoracic surgeons, such as research opportunities and professional development programs, can impact students' perceptions of the field [13].

Our study showed that nearly one-third of the participants are considering a career in cardiothoracic surgery. When asked about what career to pursue in the future, the answers were (from most selected to least) unsure what to choose yet, internal medicine, neurosurgery, pediatrics, surgery, family medicine, orthopedics, dermatology, ophthalmology, and psychiatry, respectively. Another study in the US showed that only 13% of the participants showed intention to pursue cardiothoracic surgery as a career [9]. Based on the results of another study, it was observed that 48.2% of students identified pediatric surgery as the suitable specialty for managing congenital heart disease in neonates. This suggests a prevailing misconception regarding the scope of cases handled by cardiac surgery compared to other subspecialties within the surgical field. Furthermore, it was shown that a significant proportion of respondents, specifically 39.2%, identified General Surgery as the suitable medical

specialization for the management of chest injuries that require cardiothoracic surgical intervention. Furthermore, it is worth noting that a significant proportion of the participants (34.7%) hold the belief that cardiac surgery is the sole approach for addressing all types of heart ailments. Additionally, a majority of the respondents (55.3%) are of the opinion that an open technique is invariably required for cardiac surgical procedures. Consequently, enhancing the level of medical students' exposure to the topic of cardiac surgery over the entirety of the medical school curriculum has the potential to stimulate their interest in this specialty and rectify any misunderstandings they may have regarding it [14].

As in our study, results highlighted the rate of knowledge of the CT surgery training pathway. Unfortunately, about 43% of participants rated their knowledge with 1 (on a scale of 1-5, where 1 is the lowest and 5 is the highest), and 26% rated their knowledge with 2, indicating that the majority of participants exhibited low knowledge. Similar to a study conducted among medical students in the western region of Saudi Arabia found that a significant proportion of the participants (75.2%) acknowledged having low knowledge of cardiac surgery [14].

Our study found that around 78% of the participants had no exposure to CT surgery. This is consistent with a study that revealed that a significant proportion of participants (88.3%) expressed a perceived lack of adequate exposure to cardiothoracic surgery during their medical rotations [13]. The potential explanation for the lack of interest in cardiothoracic surgery among medical students, as indicated by over 90% of them not participating in cardiothoracic surgery procedures, may be attributed to the limited exposure to the various technical problems associated with this specialty. Such exposure has been highlighted as a significant factor in the decision-making process when selecting a surgical specialty. Notably, the aspects of experience and mentorship were deemed vital in shaping the decision-making process for career selection within the field of cardiothoracic surgery [15]. It is noteworthy that almost 89% of the participants exhibited either a lack of awareness or expressed disagreement with the aforementioned statement [16, 17].

Around half of the participants agreed that the length of training is a barrier to pursuing such a career. Similarly, a study showed that the primary issue among individuals aspiring to pursue a career as a cardiac surgeon (45.2%) pertains to the considerable commitment of time required for learning and professional engagement [14]. The results of our study also align with those of a study conducted in Saudi Arabia, where medical students identified the extended duration of program years and inadequate availability of training facilities as the primary factors discouraging them from pursuing a career in heart surgery [13]. In contrast to a separate study, contrasting outcomes were noted, wherein the primary concern for general surgery residents was job

availability. This was found to be influenced by early exposure to the cardiothoracic surgery specialty and the presence of high-quality mentorship. These findings suggest that the educational background of participants plays a role in shaping their career choices [16].

Our study showed that more than half of the participants disagreed that CT is an intellectually stimulating and challenging field. In contrast, a study done in the US found that the majority of the participants agreed that CT is an intellectually stimulating and challenging field [9].

Regarding gender, our study found that gender exhibited a statistically significant association ( $p$ -value=0.024), as twice female as much as males voted for deterrents in pursuing CT as a career. Similarly, a study showed that the percentage of females expressing interest in cardiothoracic surgery (2.2%) was significantly lower compared to their male counterparts (6.6%). The unexpected nature of females' lack of interest was met with reluctance. The observed gender difference may be attributed to a combination of insufficient mentorship and limited exposure to the specialty. This data might potentially be elucidated by considering the increasing exposure to various specialties as medical students move through their clinical rotations [13]. Another study showed that the decrease in interest could also be attributed to the significant presence of female respondents (62.5%) in the poll, who would have had more unfavorable impressions of these obstacles due to the absence of support for representation and work-life balance [10]. Multiple cross-sectional research studies have demonstrated that these elements serve as impediments for women who aspire to pursue surgical careers [18-20].

Finally, the healthcare system and college training in Saudi Arabia also play a role in shaping medical students' perceptions toward pursuing a career in cardiothoracic surgery. The demand for cardiothoracic surgeons, the availability of job opportunities, and the financial incentives for pursuing a career in this field can all impact students' perceptions. Additionally, the overall quality of the healthcare system and the level of support for surgical specialties can influence students' perceptions of the feasibility and desirability of pursuing a career in cardiothoracic surgery [6].

### Limitations

The study provides valuable insights into the attitudes and perceptions of medical students in Saudi Arabia toward pursuing a career in cardiothoracic surgery. However, it is important to acknowledge the limitations of the study in order to provide a comprehensive understanding of its findings. Firstly, the study's cross-sectional design limits the ability to establish causality or temporal relationships between variables. Cross-sectional studies are snapshots in time and do not allow for the examination of changes in attitudes and perceptions over time. Therefore, the findings of the study

should be interpreted with caution, as they may not accurately represent the long-term attitudes of medical students toward pursuing a career in cardiothoracic surgery.

Additionally, the study's sample size of 409 students may not be fully representative of all medical students in Saudi Arabia. The demographics and characteristics of the sample may influence the findings, which may not be generalizable to the entire population of medical students in the country. Furthermore, the study may not have captured the perspectives of students from diverse backgrounds, such as those from rural areas or underrepresented minority groups.

Moreover, the study's reliance on self-reported data introduces the potential for response bias and social desirability bias. Medical students may have provided responses that they believed were socially acceptable or aligned with societal expectations rather than their true attitudes and perceptions toward pursuing a career in cardiothoracic surgery. This may have impacted the validity and reliability of the study's findings.

Finally, the study's focus on Saudi Arabia may limit the generalizability of its findings to other countries or regions. Cultural, societal, and healthcare system differences may influence the attitudes and perceptions of medical students toward pursuing a career in cardiothoracic surgery in different contexts. Therefore, the study findings may not be applicable to other settings.

### CONCLUSION

In conclusion, medical students' perceptions toward pursuing a career in cardiothoracic surgery in Saudi Arabia are shaped by various factors, including personal interests, cultural norms, educational opportunities, and the healthcare system in the country. In our study, the majority of participants showed more deterrents than attractive factors regarding pursuing a CT career. Understanding these factors is important for identifying barriers to entry into the field and for developing strategies to attract and retain talented individuals in cardiothoracic surgery. By addressing these factors, it may be possible to increase interest and engagement in this critical specialty, ultimately leading to improved patient care and outcomes in Saudi Arabia.

**ACKNOWLEDGMENTS:** We thank the participants who all contributed samples to the study.

**CONFLICT OF INTEREST:** None

**FINANCIAL SUPPORT:** None

**ETHICS STATEMENT:** Informed consent was obtained from each participant after the study was explained in full and clarification that participation was voluntary. Data collected were securely saved and used for research purposes only.

Written informed consent was obtained from all individual participants included in the study.

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