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Factors Influencing The Choice Of Cardiac Surgery As A Career After Graduated In Saudi Arabia: A Cross-Sectional Study

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ABSTRACT

Cardiac surgery is one of the least popular specialties among medical graduates in Saudi Arabia. We sought to explore this further by estimating medical students' and interns' interest in the field at Umm Al-Qura University in Saudi Arabia. Further, we aimed to determine the factors that influence medical interns and students in Saudi Arabia to pursue a career in cardiac surgery. A descriptive cross-sectional study was conducted among third- to sixth-year medical students and medical interns at Umm Al-Qura University through a self-administered electronic questionnaire. In addition to evaluating various factors that may influence a student's choice to pursue cardiac surgery as a future career choice, the questionnaire evaluated previous participation and experience in cardiothoracic surgery and current career preferences. A total of 428 medical students and interns completed the questionnaire. Only 17% reported that they were serious about pursuing a career in cardiac surgery, while 71% had no idea about the current training pathway for cardiac surgery, and 83% had not spent any time in a cardiac surgery placement. The majority (81%) of the participants perceive that they need more exposure to cardiac surgery in their medical curriculum, while 90% have never scrubbed into a cardiac operation, which is a significant percentage. The main determinant factor of whether to pursue cardiac surgery as a future career was job satisfaction, and the main deterrent factor was the perceived high work intensity of cardiac surgery as a specialty. Increased exposure and close mentoring are required to encourage more students to pursue a career in cardiac surgery.

Keywords: Cardiac Surgery, Medical Student, Influencing Factors, Medical Careers.

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INTRODUCTION

Medical students in Saudi Arabia study for six years and complete one internship year before graduating. Clinical rotations for students begin in their fourth year of medical school. After graduation, each student selects a specialty for further residency study to become a fully qualified specialist in that field. Medical students and interns can find it challenging to choose a future medical profession given the wide array of considerations.[1] Many factors influence the career specialty decisions made by medical students, including individual characteristics such as personality, and the anticipation of specialty-related income.[2]

One specialty available after graduation is cardiac surgery, a seven-year program that qualifies medical graduates to become cardiac surgery specialists.[3] One study showed that many factors might deter interest in cardiothoracic surgery, including fewer caseloads because of the expansion of interventional cardiology,[4] length of training, and a lack of engagement with the specialty both within undergraduate curricula and through extracurricular events.[5] Cardiac surgery is generally distinct from thoracic surgery, which many students do not know; thoracic surgeons work on the pleural membranes, lungs, and mediastinal tissues outside the heart, whereas cardiac surgeons work on the heart and major vessels - the aorta and pulmonary artery. While cardiac and thoracic surgery are mostly separate fields, cardiothoracic surgeons specialize in both areas.[6]

There is no published study on the cardiac surgery program specifically, but most published studies have been interested in the study of cardiothoracic surgery. One of the elements that stimulates undergraduate medical students towards a profession in cardiothoracic surgical operation is workshops.[7] We aimed to determine the influencing factors when choosing cardiac surgery specialty as a future career among medical students and interns at Umm Al-Qura University in Saudi Arabia.

MATERIALS AND METHOD

Ethical approval:

Ethical approval was obtained from the institutional research board of Umm Al-Qura University (registration number HAPO-02-K-012). Contact details and names were not involved in the survey.

Study design and participants:

We conducted a descriptive cross-sectional study with 428 participants from Umm Al-Qura University with the following inclusion criteria: pre-clinical and clinical years from the third to the sixth year, interns, and both genders. We excluded students who were ineligible or declined to participate, as well as students from outside Umm Al-Qura University. We

ensured consent from all participants and notified them about the study objectives and response confidentiality.

Sample size:

The average number of medical students at Umm Al-Qura University during the 2021-2022 academic year is 1200. With a confidence level of 95%, a margin of error of 5%, and a response distribution of 50%, the minimum recommended sample size for this study is 292, according to Sample Size Calculator software[8]. However, 428 responses were collected to ensure reliability in case of data loss. Equal distribution of the study sample occurred across the different academic years. We obtained permission to use a questionnaire used by another study exploring the same idea [4].

Outcome measurement tool:

A self-administered online survey designed on Google Forms was distributed electronically via social media apps to medical students (third to sixth year), with a total sample size of 428 participants.

The questionnaire contains the following sections: consent form, socio-demographic data, current career intentions, previous exposure to Cardiac surgery, experiences and perceptions of cardiac surgery, and factors affecting student interest in cardiac surgery. The survey covered 28 items and included two types of questions: multiple-choice questions and a 5-point Likert scale: a) strongly deterring; b) deterring; c) neither deterring nor attractive; d) attractive; e) strongly attractive. Only the researchers have access to the data. Microsoft Excel was used to analyze the data obtained from the questionnaire. The socio-demographic and academic characteristics of the participants were summarized using descriptive parameters. Tables were used for descriptive purposes. Multiple logistic regression analysis and chi-square analysis were used to measure the association of distinct factors with chosen cardiac surgery. We used odds ratios and their associated 95 percent confidence intervals (CIs) to measure effect size. A p-value is considered significant if it is less than 0.05.

RESULTS AND DISCUSSION

Demographics:

A total of 428 students participated in the study, of whom 242 (57%) were female and 186 (43%) were male. The mean age of participants was 22. Demographic data of all participants can be seen in **Table 1**.

Table 1: Participant's sociodemographic characteristics

Test Score	**All (No. = 428)**	
	No.	**%**
Gender		
- Male	186	43
- Female		57

		242	
Age group			
-	< 20 Y.O.	10	2
-	20 to 25 Y.O.	412	96
-	> 25 Y.O.	6	1
Academic year			
-	Third year	47	11
-	Fourth year	85	20
-	Fifth year	110	26
-	Sixth year	123	29
-	Intern	63	15
GPA score			
-	3.5 – 4	302	71
-	2.75 – 3.49	114	27
-	1.75 – 2.74	11	3
-	< 1.75	1	0

Abbreviations: Grade Point Average (GPA)

Career path and residency area preference:

At present, only 25 (6%) of the participants believe cardiac surgery is the career path that they are most likely to pursue, while 73 (17%) are seriously considering a career in cardiac surgery. Of these 73 participants, 26 (36%) expressed an interest in undertaking adult cardiac surgery as a subspecialty, while 12 (16%) sought to undertake thoracic surgery, 8 (11%) wanted to undertake pediatric cardiac surgery, and the remaining 27 (37%) participants still have not made a decision about undertaking cardiac surgery as a subspecialty in Table 2.

Table 2: Participant's current beliefs about their career path and their preference for cardiac surgery subspecialty

Test Score	**All (No. = 428)**	
	No.	**%**
Participant's current beliefs about their career path		
Cardiac surgery	25	6
General surgery	56	13
Neurosurgery	27	6
Trauma & orthopedics	14	3
ENT surgery	11	3
Plastic surgery	18	4
Pediatric surgery	18	4
Urology	7	2
Vascular surgery	3	1
Obstetrics & Genecology	16	4
Internal medicine	80	19
General practice	4	1
Psychiatry	23	5
Family medicine	22	5
Radiology	9	2
Emergency medicine	20	5
others	75	18
Participant's preference of cardiac surgery subspecialty		
Adult cardiac surgery	26	36

Thoracic surgery	12	16
Pediatric cardiac surgery	8	11
Not decided	27	37

Females are significantly more interested than males in surgical specialty as a career path, with a P value of 0.0004, as shown in Table 3.

Table 3: The difference in the desired specialty either surgical or medical between female and male groups

Test Score	**All (No. = 428)**	
	No.	**%**
Surgical specialty		
Male	51	12
Female	107	25
Medical specialty		
Male	135	32
Female	135	32

Most of the participants in our study are planning to work in Saudi Arabia 393 (92%) in the future, with only a small percentage intending to work in other countries in **Table 4**.

Table 4: Participant's preference for their working place in the future

Test Score	**All (No. = 428)**	
	No.	**%**
Saudi Arabia	393	92
Europe	19	4
North America	13	3
South America	1	0
Oceania	2	0

Cardiac surgery experience:

A total of 305 (71%) of the participants reported that they do not know about the current cardiac surgery training pathway. In comparison, 128 (30%) of the participants are aware of the training pathway for cardiac surgery, 67 (16%) have a vague understanding, and 56 (13%) have a thorough understanding of the training pathway. It was observed that time spent on cardiac surgery placement could have been higher, as 354 (83%) of the participants had not yet undergone such placement in Table 5. Using the Chi-squared test, a significant difference was noted in the training period between surgical placement (any subspecialty) and cardiac surgery, with a P value < 0.001.

Table 5: The difference in the training period between surgical placement (any subspecialty) and cardiac surgery

Test Score	**All (No. = 428)**	
	No.	**%**

Training weeks on surgical placement (any subspecialty)		
0 weeks	208	49
<2 weeks	52	12
2-8 weeks	137	32
>8 weeks	31	7
Training weeks on cardiac surgery		
0 weeks	354	83
<2 weeks	54	13
2-8 weeks	20	5
>8 weeks	0	0

Most of the participants 347(81%) felt they needed more exposure to cardiac surgery in their medical curriculum, with 385 (90%) reporting that they had never scrubbed into a cardiac operation.

A total of 382 (89%) of the participants have no mentor in cardiac surgery. In contrast, in specialties other than cardiac surgery, the percentage of the participants who have a mentor is 123 (29%), as shown in Table 6.

Table 6: The distribution in the specialties that the participants had mentor in

Test Score	**All (No. = 428)**	
	No.	**%**
Ear, Nose & throat surgery	3	2
Emergency medicine	5	4
Family medicine	3	2
General practitioner	1	1
General surgery	23	19
Internal Medicine	16	13
Neurosurgery	11	9
Obstetrics & gynecology	7	6
Pediatric surgery	8	7
Pediatrics	5	4
Plastic surgery	6	5
Psychiatry	4	3
Radiology	2	2
Trauma & Orthopedics	6	5
Urology	7	6
Vascular surgery	1	1
Others:…….	15	12

Regarding the time spent on undergraduate placements and its effect on determining a medical student's future career intentions, 283 (66%) of the participants feel the importance and the benefit of this time, while 145 (34%) reporting no sense of importance.

Out of 428 participants, 348 (81%) have no contact details for a cardiac surgeon in their area if they want to find out more about the specialty or get involved in research, while only 80 (19%) reported having access to these details. In addition, 345 (81%) of the participants did not know about the opportunities to become involved in cardiac surgery research, with only 83 (19%) being aware.

A total of 359 (84%) participants have yet to attend a cardiac surgery conference or careers day, which is a significant percentage. The remaining 69 (16%) participants have attended such an event. The main reason for not attending was a lack of interest in cardiac surgery 182 (51%), followed by the need for more awareness of any courses being run for students 116 (32%). The other reasons were the absence of cardiac surgery conferences or careers days in the participant's locality 19 (5%) or the cost being prohibitively expensive 15 (4%). The remaining participants did not give an explanation for lack of attendance 27 (8%).

Factors that affect a medical student's decision to undertake a future career in cardiac surgery:

Of the total participants, 360 (84%) were not aware of the surgeon-specific mortality data (SSMD) that are publicly published by cardiac surgeons, while 68 (16%) expressed knowledge of the SSMD. However, most participants 314 (73%) said that even if they were aware of such publication, this was not something that had deterred them from pursuing a career in cardiac surgery if they were interested in it. In comparison, the remaining 114 (27%) said this publication might deter them from pursuing a career in cardiac surgery. Former scandals such as the Bristol heart scandal from the 1990s may scare medical students from that specialty. However, 365 (85%) were unaware of that scandal, while only 63 (15%) knew about it. Further, 337 (79%) did not link an awareness of the scandal and selection of cardiac surgery as a specialty, while the remaining 91 (21%) made such a connection.

Participants were asked to consider the phrase "cardiac surgery is a dying specialty," with 251 (59%) reporting that they had not heard this before. Of the remaining participants who had heard the phrase, 97 (23%) disagreed with it, and 80 (19%) agreed with it. A total of 291 (68%) participants said that opinion is not that important in deterring them from a career in cardiac surgery. In comparison, the remaining 137 (32%) think that opinion can affect their decision about cardiac surgery.

Many distinct factors can either attract or deter medical students from undertaking a future career in cardiac surgery in Table 7.

Table 7: Factors that affect medical students' decision for undertaking a future career in cardiac surgery

	Strongly attractive		Attractive		Strongly deterring		Deterring		Neither deterring nor attractive	
	No.	%	No.	%	No.	%	No.	%	No.	%
Intellectual challenge	33	8	60	14	84	20	95	22	156	36
Skillful / artistic nature of the surgery	39	9	88	21	86	20	100	23	115	27
High intensity / pressure	14	3	25	6	161	38	130	30	98	23
Prestige associated with the specialty	39	9	89	21	70	16	62	14	168	39
Job satisfaction (ability to influence / Save lives)	79	18	102	24	68	16	70	16	109	25
Length of training (>7 years)	11	3	23	5	152	36	137	32	105	25
Increasing sub-specialization to either Practice cardiac or thoracic surgery	23	5	75	18	65	15	89	21	176	41
Opportunity for innovation and research	31	7	91	21	65	15	63	15	178	42
Competition for jobs / training posts	13	3	33	8	101	24	124	29	157	37
Opportunity for meaningful work / Life balance	32	7	72	17	96	22	100	23	128	30
Publication of SSMD	9	2	48	11	65	15	85	20	221	52
Previous scandals (e.g., Bristol Heart)	11	3	23	5	71	17	92	21	231	54
Opportunity to practice across the world	70	16	93	22	73	17	60	14	132	31
Limited geographical location of Cardiac surgery centers in KSA	16	4	45	11	81	19	150	35	136	32
Perception of cardiac surgery to be a male – dominated specialty	29	7	32	7	74	17	84	20	209	49
Perception that cardiac surgeons are arrogant/ narcissistic	12	3	31	7	64	15	106	25	215	50
Pay / financial reward	65	15	90	21	65	15	60	14	148	35

Abbreviations: surgeon specific mortality data (SSMD), Bristol Heart occurred in England during the 1990s. At the Bristol Royal Infirmary, babies died at high rates after cardiac surgery

As we see in Tables 7 and 8, job satisfaction (the ability to influence/save lives) was the most significantly and strongly attractive factor for undertaking a future career in cardiac surgery, with a P. value <0.001 for both. In contrast, the high intensity/pressure of cardiac surgery as a specialty was the most significant and strong factor deterring participants from undertaking a future career in cardiac surgery, with a P. value < 0.001. Further, the limitation of the geographical location of cardiac surgery centers in Saudi Arabia was the factor that most significantly deterred participants from the cardiac surgery specialty, with a P. value <0.001. The existence of previous scandals, such as the Bristol Heart scandal, was the most significant factor that was neither deterring nor attractive for undertaking a future career in cardiac surgery, with a P. value <0.001.

Table 8: P. value of each factor that affects medical students' decision for undertaking a future career in cardiac surgery

	Strongly attractive	Attractive	Strongly deterring	Deterring	Neither deterring nor attractive
Intellectual challenge	0.692	1.00	0.924	0.955	0.855
Skillful / artistic nature of the surgery	0.121	< 0.001	0.877	0.511	< 0.001
High intensity / pressure	< 0.01	< 0.001	< 0.001	< 0.001	< 0.001
Prestige associated with the specialty	0.121	< 0.001	0.0649	< 0.001	0.290
Job satisfaction (ability to influence / Save lives)	< 0.001	< 0.001	0.0361	< 0.01	< 0.001
Length of training (>7 years)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Increasing sub-specialization to either Practice cardiac or thoracic surgery	0.127	0.0313	0.0135	0.507	0.0597
Opportunity for innovation and research	0.991	< 0.001	0.0135	< 0.001	0.0366
Competition for jobs / training posts	< 0.001	< 0.001	0.0424	< 0.001	0.937
Opportunity for meaningful work / Life balance	0.839	0.0850	0.160	0.511	< 0.01
Publication of SSMD	< 0.001	0.0850	0.0135	0.252	< 0.001
Previous scandals (e.g., Bristol Heart)	< 0.001	< 0.001	0.0853	0.761	< 0.001
Opportunity to practice across the world	< 0.001	< 0.001	0.141	< 0.001	< 0.01
Limited geographical location of Cardiac surgery centers in KSA	< 0.01	0.0313	0.638	< 0.001	0.0246
Perception of cardiac surgery to be a male – dominated specialty	0.709	< 0.001	0.178	0.206	< 0.001
Perception that cardiac surgeons are arrogant/ narcissistic	< 0.001	< 0.001	< 0.01	0.168	< 0.001
Pay / financial reward	< 0.001	< 0.001	0.0135	< 0.001	0.313

*Red color= Significant *Black color= Insignificant

DISCUSSION:

Of the 428 participants who took part in our study, only 73 (17%) reported that they are seriously considering a career in cardiac surgery. Of these, the majority (36%) favored adult cardiac surgery as their chosen subspecialty. However, when participants were asked about

their current career path beliefs among different medical specialties, cardiac surgery was chosen by only 6% of participants. This is a small percentage when compared with general surgery (13%) and internal medicine (19%). Further, 347 (81%) of the participants do not feel there is enough exposure to cardiac surgery in their medical curriculum, and 385 (90%) have never scrubbed into a cardiac operation, which is a significant percentage. Mentorship is crucial, as it influences medical students' career choices in cardiothoracic surgery, yet 382 (89%) of the participants have no mentor in cardiac surgery.[10,11] Such findings may explain one or more of the causes for declining recruitment rates in cardiac surgery training, as reported by the Thoracic Surgery Residents Association.[12]

Early exposure to a medical field is a pivotal influencing factor for medical students when choosing a career.[13] Among our participants, awareness of the cardiac surgery training pathway is poor and vague, with the majority reporting no knowledge of the process at all (71%). As demonstrated by our results, the training period in cardiac surgery is significantly lower than the training period in any other surgical placement, and we found that 83% of participants receive no training weeks in the field of cardiac surgery. Another study conducted in Saudi Arabia revealed related results, finding that 88.3% of their participants did not feel they received enough exposure to cardiac surgery rotations.[4] In another study conducted in the United Kingdom, which aimed to assess British medical students exposure to the field of cardiothoracic surgery, researchers found that 71% of participants were exposed to the field because it was included in their medical school curriculum.[13] Our divergent findings are concerning since ischemic heart disease is one of the leading causes of death in Saudi Arabia.[12]

Our results on the factors that influence the decision to pursue a career in cardiac surgery align with another study conducted in Saudi Arabia.[4] These include the finding that the main determinant factor of whether to pursue cardiac surgery as a future career was job satisfaction, and the most deterrent factor was the high working intensity of cardiac surgery as a specialty, along with the limited cardiac surgery centers in Saudi Arabia.[4] Compared with the British study, exposure to cardiothoracic surgery and having a mentor were the most influencing factors for medical students.[13]

LIMITATIONS:

Our study has some limitations. Although our measurement tool has been used in previously published articles,[4,5] the validity and reliability of the study questionnaire were not evaluated. Hence, we suggest that our findings should be interpreted thoughtfully. Plus, the sample area was restricted to one institution, Umm Al-Qura University in Saudi Arabia, so our findings may be ungeneralizable

RELEVANCE AND IMPLICATIONS:

To approximate the gap between our participants with the cardiac surgery specialty, we suggest adding cardiothoracic surgery to the medical school curriculum (theory, organizing rotations, and research opportunities).

CONCLUSION:

Several factors influence whether a medical student or an intern chooses to specialize in cardiac surgery. The purpose of the current study was to determine factors that influence the choice of cardiac surgery as a career. The study showed that the most crucial factor for students to choose heart surgery as a future specialty was the ability to influence and save lives. Factors deterring them from choosing a specialty were the high pressure of specialization and the small number of centers that offer a cardiac surgery program in Saudi Arabia.

DECLARATIONS:

CONFLICT OF INTEREST:

The authors have no conflict of interest to declare.

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