

A nationwide survey of Turkish medical students' upon interest and decision for cardiovascular surgery as a future career: A cross-sectional survey

Türk tıp öğrencilerinin gelecek kariyerlerinde kalp ve damar cerrahisine olan ilgileri ve kararlarına ilişkin ülke çapında bir araştırma: Kesitsel bir çalışma

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ABSTRACT

Background: In this study, we aimed to investigate the current interest of Turkish medical students to pursue a career in cardiovascular surgery and to identify possible factors which positively or negatively affected their decisions.

Methods: Between January 2022 and August 2022, a cross-sectional survey of 34 questions was created using the Google Forms online survey platform. Questions were directed to participants to evaluate demographic features, interest level in cardiovascular surgery, interest in other specialty programs, and interest in residency abroad using five-point Likert scales.

Results: A total of 5338 Medical Students were reached who were balanced to 7 geographical regions across Türkiye and 1233 (23%) medical students participated in the questionnaire. Of the respondents, 544 were males and 689 were females with a mean age of 21.2±0.5 (range, 17 to 28) years. More than half of the students (56.2%) considered residency training programs in Türkiye. Cardiology had the highest preference rate for residency training (8.3%), followed by cardiovascular surgery (7.5%). More than one-third of students (36.5%) who were interested in pursuing a career in cardiovascular surgery decided to be trained abroad. Achieving a prestigious job, motivation for life saving, prioritizing innovations, and high academic studies were the main factors that positively affected the perspective of students on cardiovascular surgery, while stressful surgeries, intense and tiring night shifts, and a relatively poor social life/work balance were the main deterrent factors. Attendance to cardiovascular surgeries positively affected the decisions of students (p=0.008).

Conclusion: Although it is thought that the interest in pursuing a career in cardiovascular surgery has reduced in recent years all over the world, our study shows that cardiovascular surgery still continues to be a popular specialty among Turkish medical students. Therefore, we believe that guiding medical students by using their current potential and encouraging the students to attend cardiovascular surgeries more frequently throughout their education life are essential in choosing cardiovascular surgery as a future career option.

Keywords: Career choice, cardiac surgery, cardiovascular surgery, medical students, residency.

ÖZ

Amaç: Bu çalışmada, Türk tıp fakültesi öğrencilerinin kalp ve damar cerrahisi alanında kariyer yapmalarına ilişkin mevcut ilgileri incelendi ve kararlarını olumlu ve olumsuz etkileyen muhtemel faktörler tespit edildi.

Çalışma planı: Ocak 2022 - Ağustos 2022 tarihleri arasında, Google Formlar online araştırma platformu kullanılarak 34 soruluk kesitsel bir anket oluşturuldu. Katılımcılara demografik özellikleri, kalp ve damar cerrahisine olan ilgi düzeyleri, diğer uzmanlık programlarına olan ilgileri ve yurt dışında ihtisas eğitimine olan ilgilerini değerlendirmek üzere beşli Likert ölçekleri ile değerlendirilen sorular yöneltildi.

Bulgular: Türkiye genelinde 7 coğrafi bölgeye dağılmış toplam 5338 tıp öğrencisine ulaşılmış ve 1233 (%23) tıp öğrencisi anket katılmıştır. Katılımcıların 544 erkek ve 689 kadın olup, ortalama yaşı 21.2±0.5 (dağılım, 17-28) yıl idi. Öğrencilerden yarısından fazlasının (%56.2) Türkiye'de ihtisas eğitimi almayı düşündüğü saptandı. Uzmanlık eğitimi açısından kardiyojloji branşı (%8.3) en fazla tercih edilirken, bunu kalp ve damar cerrahisi izledi (%7.5). Kalp ve damar cerrahisi alanında kariyer yapmak isteyen öğrencilerin üçte birinden fazlasının (%36.5) eğitimlerini yurt dışında sürdürmek istedikleri saptandı. Yüksek prestijli bir meslek olması, hayat kurtarma motivasyonu, yeniliklere açık olma ve akademik çalışmaların yüksek olması öğrencilerin kalp ve damar cerrahisine bakış açısını olumlu yönde etkileyen temel unsurlar olarak saptanırken, ameliyatların stresli, nöbetlerin yoğun ve yorucu olması ve nispeten zayıf olan sosyal yaşam/iş dengesi başlıca caydırıcı faktörler idi. Kalp ve damar cerrahisi ameliyatlarına girmek, öğrencilerin kararlarını olumlu yönde etkiledi (p=0.008).

Sonuç: Son yıllarda tüm dünyada tıp fakültesi öğrencileri arasında kalp ve damar cerrahisi alanında kariyer yapma isteğinin azaldığı düşünülse de çalışmamız Türkiye'deki tıp fakültesi öğrencileri arasında kalp ve damar cerrahisinin halen popüler bir uzmanlık alanı olmaya devam ettiğini göstermektedir. Bu nedenle, mevcut potansiyeli kullanarak tıp fakültesi öğrencilerine rehberlik edilmesi ve öğrencilerin eğitim hayatları boyunca daha sık ameliyatlara katılmalarının teşvik edilmesinin, kalp ve damar cerrahisi uzmanlığını tercih etmede olumlu yönde etkileyeceğini düşünmekteyiz.

Anahtar sözcükler: Meslek seçimi, kalp cerrahisi, kalp ve damar cerrahisi, tıp fakültesi öğrencileri, ihtisas.

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In recent years, there has been a decline among medical students to become cardiovascular/thoracic surgeons as a future career plan.^[1] In particular, in the United States (USA), United Kingdom (UK), European countries, and other parts of the world, there is a significant decline in the preference for cardiovascular surgery specialization among newly graduated physicians. The increased number of cardiac and vascular cases which are performed percutaneously by cardiologists and interventional radiologists, the decreased number of surgeries despite the increase in population, significant advances in technology, limited job opportunities after graduation, and the burden of patients with high comorbidities can be considered as responsible reasons.^[1-6]

Since 2003, the widespread use of drug-eluting stents for the treatment of coronary artery disease leading to a decrease in coronary artery bypass grafting (CABG) have greatly affected the preference of students. In the near future, non-CABG surgeries such as arrhythmia surgeries, cardiac remodeling, and other open or minimally invasive procedures may increase. Declining interest in cardiovascular surgery may lead to a shortage of cardiovascular surgeons in the upcoming decades. Since the number of cardiovascular surgeons has dropped for the first time over the past two decades, there is a significant future concern about the number of surgeons. In addition, more than half of active surgeons are older than 55 years and are about to retire.^[7]

In the present study, we aimed to investigate the current interest of Turkish medical students to pursue a career in cardiovascular surgery and to identify possible factors which positively or negatively affected their decisions, motivations, satisfaction, and ambitions.

PATIENTS AND METHODS

Study population

This nationwide, cross-sectional study was conducted at 20 medical schools across Türkiye, between January 2022 and August 2022. As of 2022, there were 96,935 medical students in 107 Medical Faculties in Türkiye. Using a type 1 error of 0.05 and a study power of 95%, the number of medical students required to be recruited was determined as 1,226. Invitations were sent to a total of 5,538 students, divided into seven geographical regions in Türkiye. A self-administered online survey specifically designed in web-based Google form. Voluntary and anonymous participation was taken into account. No specific exclusion criteria were applied, except for incomplete responses.

The questionnaire was consisted of 34 questions and directed to the participants including demographic features, future career expectations, willingness to be specialized, residency abroad, thoughts about cardiovascular surgery residency, and factors affecting students' decision to choose cardiovascular surgery as a future career option were investigated via multiple choice questions and Likert scale. Demographic data including age and sex, current career intentions, previous cardiovascular surgery exposure, experiences, and perspective of cardiovascular surgery were analyzed.

Study endpoints

Twenty-one multiple choice questions were designed to deter and encourage according to the Likert scale specific to cardiovascular surgery. The Likert ranking scale was scored as follows: (i) strongly deterring (ii) deterring (iii) neither deterring nor attractive (iv) attractive (v) strongly attractive.^[1] A factor was determined whether to be either attractive or deterring in case of more than 60% of the cohort reported in favor.

In addition to entire cohort analyses, a distinct subgroup analysis was performed regarding final-grade medical students, first-grade medical students, male and female students, students having a physician family member, and those having a cardiovascular surgery mentor or ever attended a surgery.

Statistical analysis

Statistical analysis was performed using the IBM SPSS for macOS version 28.0 software (IBM Corp., Armonk, NY, USA). The Kolmogorov-Smirnov test was used to analyze normally distributed continuous variables. Continuous variables were presented in mean \pm standard deviation (SD), while categorical variables were presented in number and frequency. Continuous data were compared using the t-test and the Mann-Whitney U test. Categorical data were analyzed using the chi-square test or Fisher exact test. A *p* value of <0.05 was considered statistically significant.

RESULTS

Sample sizes, demographics

Of 5,538 medical students, 1,233 (23%) from 20 medical schools across Türkiye completed the survey. Of the respondents, 544 were males and 689 were females with a mean age of 21.2 ± 0.5 (range, 17 to 28) years. Most of the participants (96.7%) considered a post-graduate residency program and 25.3% of the participants had a physician family member.

Outcomes in total

Most of the medical students (57.5%) considered residency training programs in Türkiye. In addition, the USA, Germany, and UK were the most preferred countries among medical students who desired to go abroad for residency training programs (Figure 1).

When we compared the first- and sixth-grade medical students in terms of residency training programs abroad, a statistically significant difference was revealed in favor of the first-grade students (56.5% vs. 21.4%, respectively; $p=0.001$). In other words, there was a significant tendency among the first-grade students in terms of training residency abroad rather than the sixth-grade medical students (Figures 2-4).

Outcomes related to cardiovascular surgery

Cardiology was the most considered residency training program (8.3%), followed by cardiovascular surgery (7.5%). Furthermore, cardiovascular surgery was most considered by the second-grade (31.2%), followed by the fourth-grade (26.9%), and the lowest by the fifth-grade (7.5%) medical students. When we

compared the results of the second- and fifth-grade medical students, a statistically significant difference was identified ($p=0.014$), while no significant difference was observed between the second- and sixth-grade students ($p=0.082$). In addition, among the pre-clinical and clinical students, no significant difference was seen ($p=0.13$). More than one-third of medical students decided to choose cardiovascular surgery training programs abroad (51.4% female). Germany, the USA, and UK were the most preferred countries, respectively. Almost half of the students (48.9%) attended any surgery, whilst only 17.8% of the students previously participated in cardiovascular surgery before. Almost half of the participants (44.7%) had a cardiovascular surgery mentor, while one-third of the participants attended a cardiovascular surgery congress or seminar before. Participation in cardiovascular surgeries anytime during medical education positively affected the decisions of students (11.8% vs. 6.6%, respectively; $p=0.008$).

The main factors that positively influenced students to choose cardiovascular surgery were

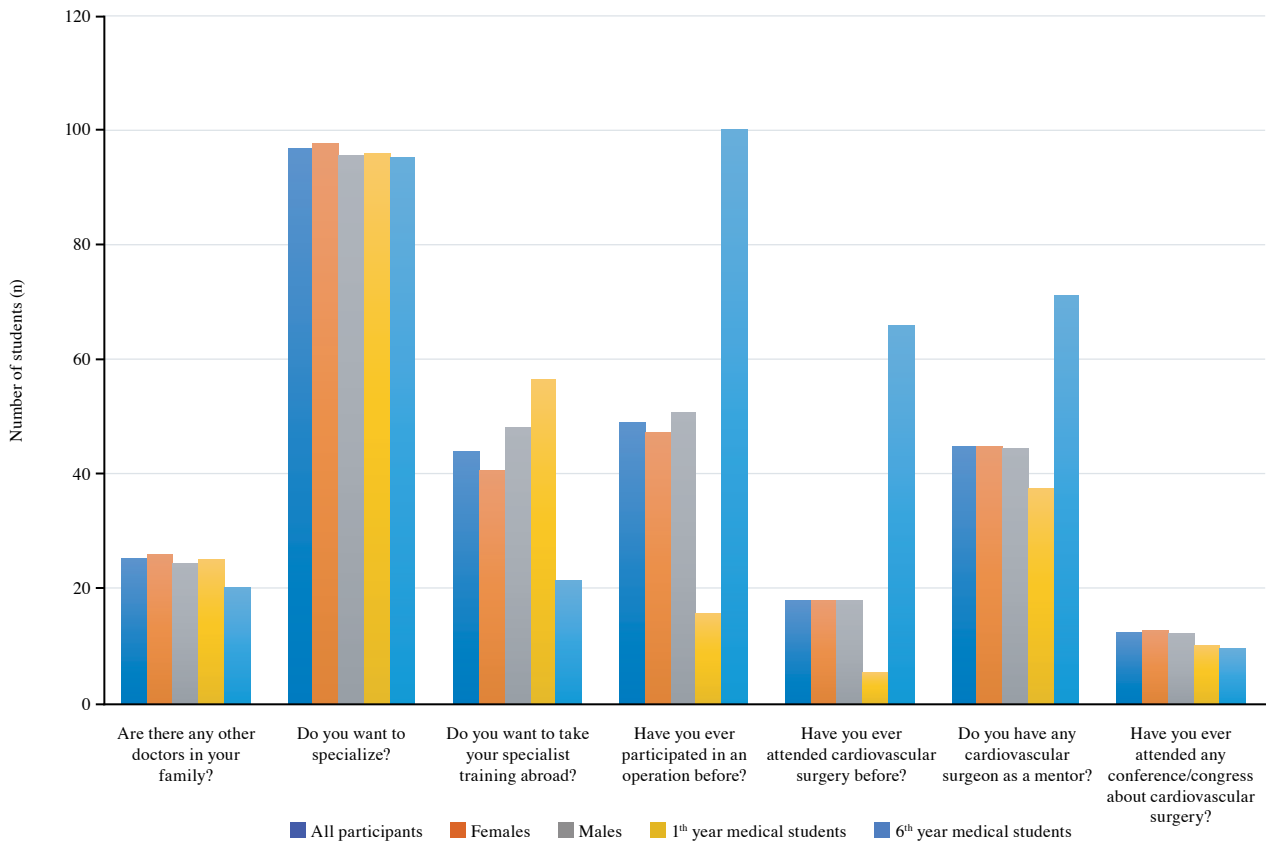


Figure 1. Participants' answers to questions about cardiovascular surgery and future plans.

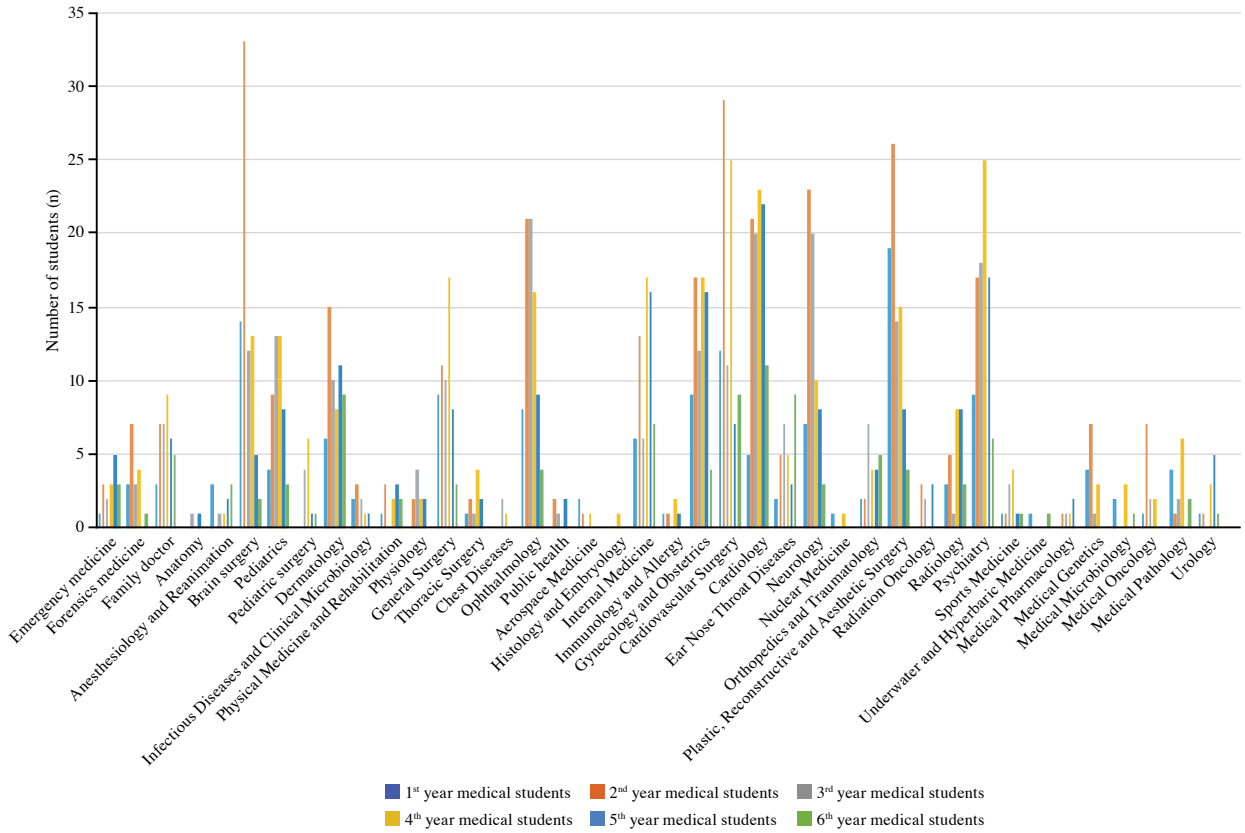


Figure 2. Future career plan of medical students for residency training.

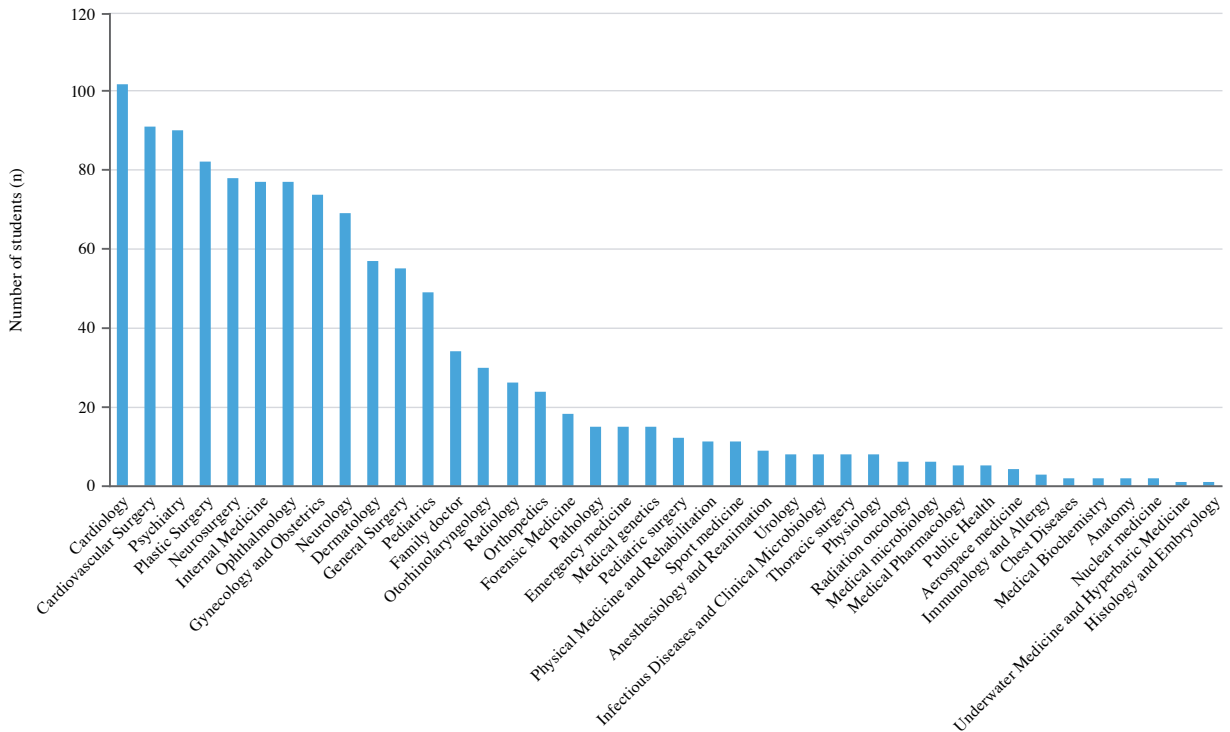


Figure 3. Overall future career plans for residency of medical students.

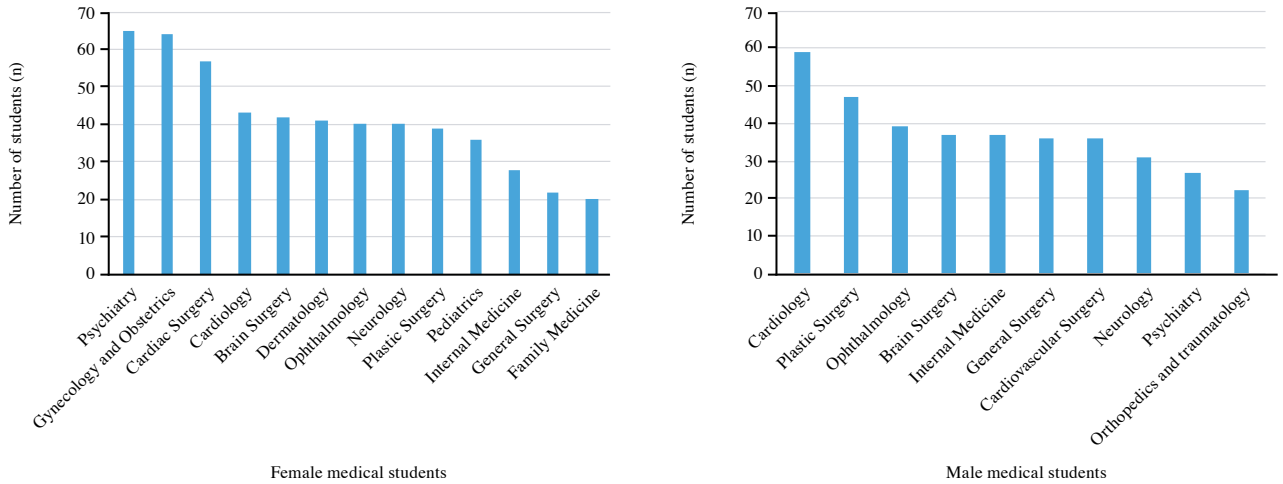


Figure 4. Distribution of female and male medical students according to residency training preference.

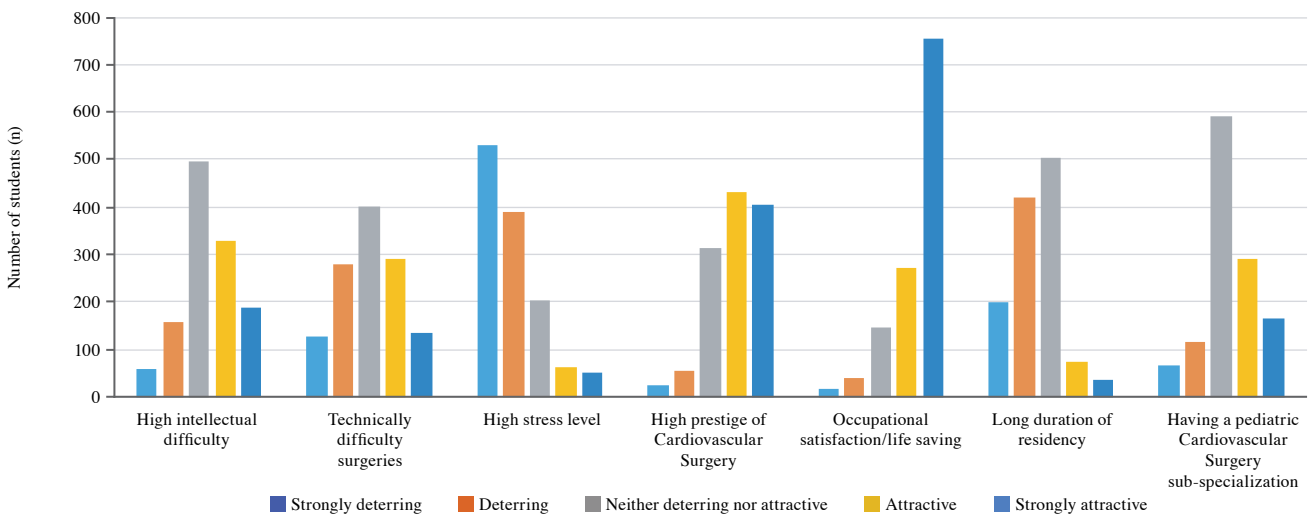


Figure 5. Factors affecting medical students' preference for cardiovascular surgery training.

detected as achieving a prestigious job, saving a life, prioritizing innovations, and high academic studies while stressful surgeries, intense and tiring night shifts, and the relatively poor social life/work balance were the main deterrent factors (Figures 5-7).

Overall outcomes for preferring specialty

Plastic surgery, neurosurgery, ophthalmology, and cardiovascular surgery were most considered by the first-, second, third- and fourth-grade students,

respectively. Furthermore, cardiology was most considered by the fifth- and sixth-grade students.

According to specialties, pediatrics, obstetrics and gynecology, psychiatry, and pathology were more considered by females ($p=0.03$, $p=0.001$, $p=0.001$, and $p=0.001$, respectively), while cardiology, plastic surgery, and internal medicine were most considered by male students ($p=0.002$, $p=0.018$, and $p=0.02$, respectively). Interestingly, cardiovascular surgery was

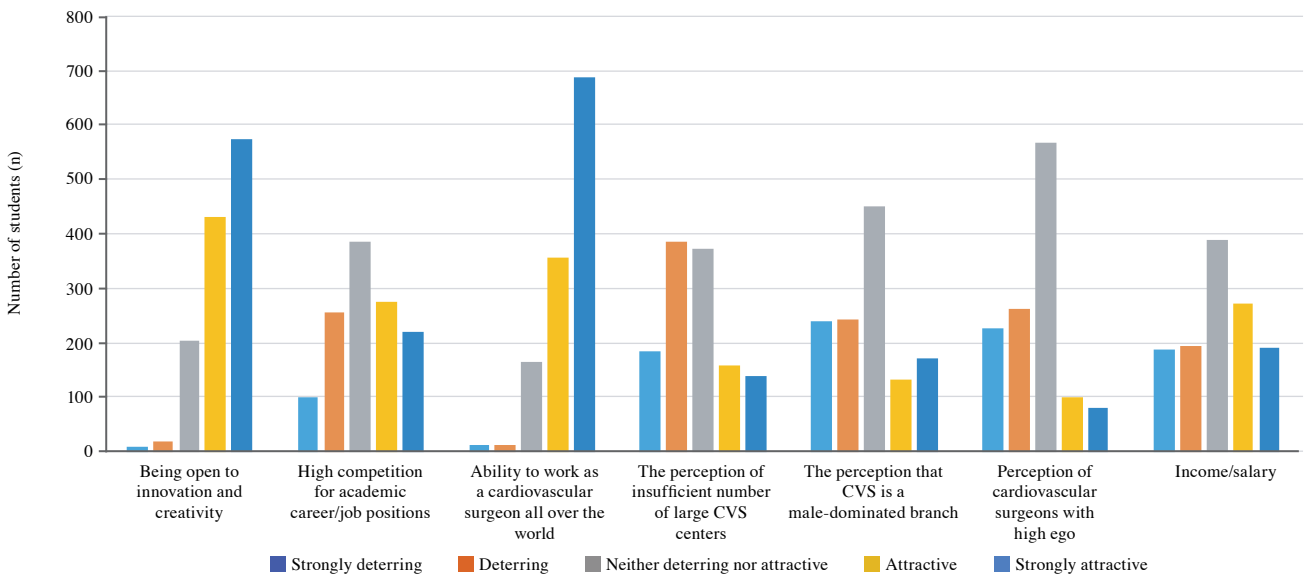


Figure 6. Factors Affecting Medical Students' Preference For Cardiovascular Surgery Training cont'.

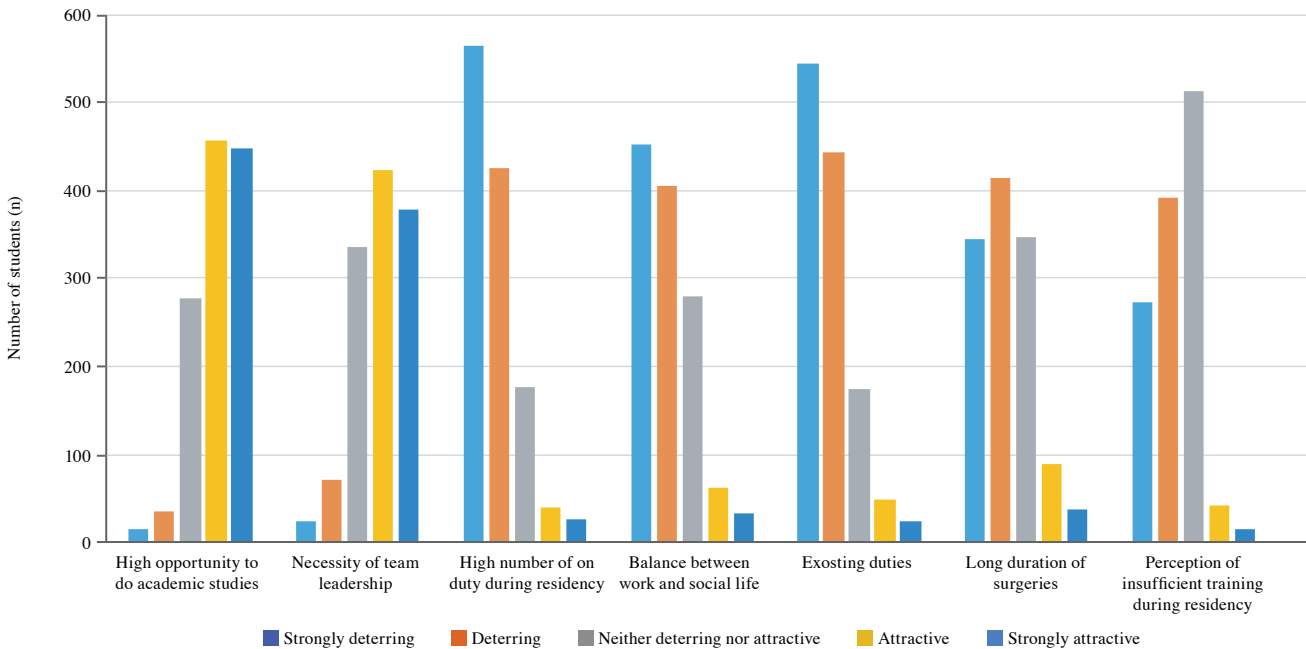


Figure 7. Factors affecting medical students' preference for cardiovascular surgery training cont'.

more considered by females without a statistically significant difference (57 females, 34 males; $p=0.21$).

DISCUSSION

In this study, we evaluated the perception of medical students about cardiovascular surgery and other specialties all over Türkiye. This cross-sectional

survey revealed that cardiovascular surgery is still the second most preferred specialty after cardiology among medical students, while more than one-third of these students decided to pursue residency training programs abroad. In addition, cardiovascular surgery was more preferred by female students rather than male students. Achieving a prestigious job, motivation

for of life saving, and prioritizing innovations were considered as the main factors, while stressfulness, exhausting night shifts, and poor work/life balance were considered the main deterring factors for considering cardiovascular surgery residency training programs. Attendance to cardiovascular surgery was found to be a significant factor for preference. The current interest in cardiovascular surgery was higher among the second- and fourth-grade medical students.

In total, 42.5% of the medical students (more than half of first-grade students) decided to pursue residency training abroad, and Germany, the USA, and UK were the most preferred countries. Pediatrics, psychiatry, and pathology were more considered by females, while cardiology, plastic surgery, and internal medicine were more considered by males. Furthermore, one-fourth of students had a physician family member.

Cardiovascular surgery, which has started to ascend since the 1950s, reduced its former popularity among newly graduated physicians.^[3,8-10] Physicians over the age of 65 years have a mortality rate of 80% and, in the next decade, most elderly cardiovascular surgeons are expected to be retired. In addition, aging population and increasing cardiovascular diseases have arisen the demand for cardiovascular surgeons.^[11] Therefore, a shortage of cardiovascular surgeons is expected in the next decades.^[7] The improvement of interventional cardiology and radiology increase the perception of a dying specialty for cardiovascular surgery.^[12,13]

Lebastchi and Yuh^[14] and Ghannam *et al.*^[6] previously reported that exposure and mentoring to cardiovascular surgery were the main determinants by respondents (98% and 89%, respectively). Mentoring and more exposure to cardiovascular surgery are considered to be encouraging factors for newly graduated physicians for preference. Furthermore, heavy working conditions should be improved and the importance of this unique specialty should be emphasized by national/international associations and medical faculties.^[5] Otherwise, it seems to be inevitable that there would be no qualified cardiovascular surgeons in the future at all.^[7]

Algethami *et al.*,^[1] Vaporciyan *et al.*,^[3] Kesieme *et al.*,^[15] Preece *et al.*,^[5] and Coyan *et al.*^[11] and reported that 4.5%, 6%, 8.4%, 10.8%, and 13% of medical students decided to choose cardiovascular/thoracic surgery training programs, respectively. Our study revealed that cardiovascular surgery was the second most considered specialty among medical students with a rate of 7.5%.

In their study, Coyan *et al.*^[11] reported that no sex difference among medical students who considered cardiovascular surgery, in contrast to male sex-weighted previous studies.^[3,6,16] In addition, females constituted less than 5% of cardiothoracic surgeons in previous studies. Family planning and motherhood are reported to be seen as obstacles to being a cardiothoracic surgeon.^[8,16,17] On the contrary, our results showed that female medical students were more interested in being a cardiovascular surgeon.

Additionally, Preece *et al.*^[5] investigated the tendency of interest in a future career in cardiothoracic surgery among 352 medical students from 32 medical schools. The main factor that affected students' choice was the enthusiasm for saving lives; however, high competition levels were negatively affected. Our results are similar in that achieving a prestigious job, saving a life, prioritizing innovations and academic studies were the encouraging factors, despite poor work/life balance being the main deterring factor. In addition, 75% of students did not attend cardiothoracic surgery adequately, and only 13% of students attended a cardiothoracic conference before.^[5] Our results are similar; as such, only 12.5% of the students attended a cardiovascular conference before, and 20% of the medical students attended cardiovascular surgery before.

Vaporciyan *et al.*^[3] conducted a study in the USA among 2,153 general surgery residents and investigated the factors and interests for cardiothoracic surgery residency. The authors reported that 71% of the students had a cardiothoracic surgery mentor. Long-term training was regarded as an important deterring factor and mentoring was thought to be a stimulant for choosing cardiothoracic surgery residency training programs.^[1] Foote *et al.*^[16] and Coyan *et al.*^[11] reported that 25.3% and 31% of medical students had a physician family member, respectively, and our results (25.2%) were similar to previous studies.

Nonetheless, there are some limitations to our study. First, previous surveys mostly investigated the current interest in cardiothoracic surgery, while we conducted a survey about the interest in cardiovascular surgery due to the medical structure of our country. Second, the low response rate of about 23% could have been improved among medical students. Third, due to the nature of this cross-sectional survey, decisions and interests of the students can change over time.

In conclusion, our study demonstrates that cardiovascular surgery is still the second most considered specialty among medical students in

Türkiye, despite a decline in interest all over the world. More attendance to cardiovascular surgery and mentorship are essential to increase the preference of students. Therefore, we believe that potential and motivation of medical students should be well handled, and it is crucial to be a role model for newly graduated physicians. Correctly directing this potential in Türkiye would prevent the potential shortage of qualified cardiovascular surgeons in the future other countries would experience.

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Ethics Committee Approval: The study protocol was approved by the Ondokuz Mayıs University, Medical Faculty Training and Research Hospital Ethics Committee (date/no: 30.05.2022. OMÜ KAEK 2022/134). The study was conducted in accordance with the principles of the Declaration of Helsinki.

Data Sharing Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Author Contributions: Idea/concept, data collection and/or processing: S.B.D., D.D.; Design: S.B.D., D.D., A.Y.; Control/supervision, materials: S.B.D.; Analysis and/or interpretation: S.B.D., M.A.; Literature review; writing the article: S.B.D.; Critical review, references and fundings: S.B.D., A.Y.

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