ORİJİNAL ARAŞTIRMA ORIGINAL RESEARCH

DOI: 10.5336/ophthal.2025-109307

Factors Influencing Preferences in International Ophthalmology Subspecialty Fellowships Among Young Ophthalmologists in Türkiye: A Descriptive Study

Türkiye'de Genç Oftalmologların Uluslararası Oftalmoloji Yandal Eğitimi Tercihlerini Etkileyen Faktörler: Tanımlayıcı Araştırma

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ABSTRACT Objective: This study explores the interest in international ophthalmology subspecialty fellowship training among young ophthalmologists in Türkiye, focusing on demographic factors, motivations, and barriers. **Material and Methods:** A cross-sectional study was conducted using an anonymous online survey from April to July 2024. A total of 232 ophthalmologists from 14 institutions were included. Participants were categorized into 3 groups: no interest (Group 1), interested but not applied (Group 2), and active applicants or past participants (Group 3). Factors associated with interest and application were assessed using Pearson's chi-square test in bivariate analyses and multinomial logistic regression analysis in multivariate analyses. **Results:** The mean age was 28.9±3.6 years; 48.3% were female. Group 1 included 43 participants (18.5%), Group 2 had 126 (54.6%), and Group 3 had 63 (27.2%). The most preferred subspecialties were cataract and refractive surgery (72%), cornea and ocular surface diseases (52.6%), and oculoplastic surgery (52.6%), with the latter significantly higher among residents. Most preferred destinations were the United Kingdom, the United States, Germany, and Canada. Career development was the primary motivator, while familial obligations were the main barrier. Specialists, those knowledgeable about opportunities, and those proficient in foreign languages were more likely to apply ($p<0.05$). Multivariate analysis revealed foreign language proficiency as a key differentiating factor between interest and non-interest groups ($p<0.001$). **Conclusion:** There is a strong interest in international ophthalmology subspecialty fellowships among young ophthalmologists in Türkiye. This study highlights significant demographic, sociological, and academic factors influencing this interest.

Keywords: International fellowship training; career development; young ophthalmologists

ÖZET Amaç: Türkiye'deki genç göz doktorları arasında uluslararası oftalmoloji yandal eğitimine olan ilgiyi ve bunu etkileyen demografik faktörleri, motivasyonları ve engelleri araştırmaktır. **Gereç ve Yöntemler:** Bu kesitsel çalışma, Nisan-Temmuz 2024 tarihleri arasında anket başvuru formu ile yürütülmüştür. 14 kurumdan toplam 232 göz doktoru çalışmaya dâhil edilmiştir. Çalışmamızda; bireyleri uluslararası yandal eğitimine olan ilgilerine göre 3 gruba ayırdık: Grup 1'in ilgisi yok, Grup 2 ilgileniyor ancak başvurmadı ve Grup 3, geçmişte bir yurtdışı yandal programına dâhil olmuşlar ve/veya aktif başvuru sürecinde olanları içermektedir. İlgi duyma ve başvurma ile ilişkili etmenler 2 değişkenli analizlerde Pearson ki-kare testi ve çok değişkenli analizlerde multinominal lojistik regresyon analizi ile değerlendirilmiştir. **Bulgular:** Katılımcıların ortalama yaşı 28,9±3,6 yıldı ve %48,3'ü kadındı. 1. Grupta 43 katılımcı (%18,5), 2. Grupta 126 katılımcı (%54,6) ve 3. Grupta 63 katılımcı (%27,2) vardı. En çok tercih edilen alt uzmanlıklar katarakt ve refraktif cerrahi (%72), kornea ve oküler yüzey hastalıkları (%52,6) ve oküloplastik cerrahi (%52,6) idi; oküloplastik cerrahi asistanlar arasında anlamlı derecede daha yüksekti. En çok tercih edilen lokasyonlar Birleşik Krallık, Amerika Birleşik Devletleri, Almanya ve Kanada idi. Kariyer gelişimi birincil motivasyon kaynağı iken, ailesel faktörler ana engeli oluşturuyordu. Uzmanlar, fırsatlar hakkında bilgi sahibi olanlar ve yabancı dillerde yeterlilik sahibi olanlar daha fazla başvurma eğilimindeydi ($p<0,05$). Çok değişkenli analiz, yabancı dil yeterliliğinin ilgi duyan ve duymayan gruplar arasında önemli bir ayırt edici faktör olduğunu ortaya koydu ($p<0,001$). **Sonuç:** Bu çalışma, Türkiye'deki genç oftalmologların uluslararası oftalmoloji yandal eğitimine yoğun ilgisi olduğunu göstermektedir. Ayrıca çalışmamız bu durumu etkileyen demografik, sosyolojik ve akademik faktörler üzerine önemli bulguları sunmaktadır.

Anahtar Kelimeler: Uluslararası yandal eğitimi; kariyer geliştirme; genç oftalmologlar

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Peer review under responsibility of Turkiye Klinikleri Journal of Ophthalmology.

Received: 06 Feb 2025 ***Received in revised form:*** 29 Mar 2025 ***Accepted:*** 28 Apr 2025 ***Available online:*** 16 Jul 2025

Ophthalmology's rapid growth has made it difficult for practitioners to stay current in every subdiscipline in the field. As a result, for ophthalmologists to acquire the in-depth knowledge and skills required in various ophthalmic subspecialties, sub-specialization in ophthalmology has become essential. Reflecting that trend, interest in subspecialty training among young ophthalmologists has considerably increased in recent years.[1]

Choosing a subspecialty for education and training ranks among the most important decisions made by ophthalmology residents during their professional careers. Various factors motivating the pursuit of residencies in ophthalmology have been identified, including the chance to integrate medicine and surgery, intellectual stimulation, mentorship, teaching and research opportunities, and flexibility.[2,3] However, because those factors may vary depending on the demographic, social, and economic conditions of the country where physicians reside, analyzing the factors and trends in the choice of ophthalmological subspecialties in light of each country's unique dynamics has become crucial as well.

In Türkiye, sub-specializations in ophthalmology remain in development, and information about the future career goals and preferred subspecialties of resident ophthalmologists remains scarce. Many ophthalmology departments have subspecialty sections such as anterior segment, medical/surgical retina and oculoplastic surgery. However, these clinics do not have established subspecialty education programs. In response, international fellowship programs offered by organizations including strive to enhance the delivery of ophthalmic care and eye health in low-resource countries by fostering the professional development of young leaders and improving overall eye care.[4,5] Many young ophthalmologists in developing countries such as Türkiye seek opportunities to attend international fellowship programs in well-established ophthalmological centers in the United States and several European countries, including the United Kingdom (UK).[4,6]

Against that background, in our study we aimed to gauge the importance and impact of international fellowship programs in ophthalmological subspecialties for young ophthalmologists in Türkiye. In this article, we also discuss the various demographic, social, economic, and academic factors influencing their decisions to pursue such opportunities.

MATERIAL AND METHODS

STUDY DESIGN AND PARTICIPANTS

Our descriptive, cross-sectional study involved ophthalmology residents and specialists less than 40 years old in Türkiye. We excluded foreign ophthalmologists (who are not holders of official Turkish citizenship) were excluded as their motivations may differ from Turkish citizens. Following the study's ethics approval (date: May 3, 2024, no: KAEK/24.04.2024.279), we gathered data between April and July 2024 from ophthalmologists practicing in Türkiye, all selected via convenience sampling. Participants' involvement was entirely voluntary, and prior to participating in the study, all ophthalmologists provided their informed consent. This study was conducted in accordance with the 1964 Declaration of Helsinki and its subsequent amendments.

For comparative analysis, we clustered participants into 3 groups according to their interest in applying for international fellowship training. Group 1 comprised individuals without any interest, Group 2 encompassed interested individuals who had nevertheless not acted to apply to any fellowship programs, and Group 3 included interested individuals who had acted to apply to at least one fellowship program. Actions taken to apply to such programs included previously attending a program or actively preparing for or applying to a program. The "post hoc" power (1-β) for the chi-square test was calculated as 96.6%, based on the current sample size (n) of 232, an effect size (w) of 0.27, a significance level (α) of 0.05, and degrees of freedom of 2.

DATA COLLECTION

Based on the literature review, 54 fundamental questionnaire items were identified. Twelve ophthalmologists assessed content validity, rating each item on a 3-point scale (not necessary, useful but not essential, essential). Given the total of 12 reviewers, the minimum required content validity ratio (CVR) for each item was 0.56.[7] Items with a CVR below 0.56

(n=28) were eliminated. Experts then evaluated relevance using a 4-point scale, and items with a content validity index (CVI) below 0.79 were removed. A pilot test with 15 ophthalmology residents assessed face validity for the remaining 21 items. Based on their feedback, revisions improved clarity. The final questionnaire showed strong internal consistency (Cronbach alpha=0.87).

An online questionnaire in Turkish created using Google Forms (Google, USA) was distributed to all participants via preexisting WhatsApp Messenger (WhatsApp Inc., Menlo Park, CA, USA) groups for ophthalmologists (Appendix 1). The questionnaire contained 3 parts. The 1st part gathered participants' demographic information; the 2nd part gathered data about their potential interest in ophthalmological specialties, their preferred countries for fellowship training, and the factors influencing their decisions; and the 3rd part gathered data regarding participants' academic background and level of knowledge about the fellowship application process. Participants anonymously submitted their responses by completing the questionnaire online, which remained accessible for 45 days. We sent 2 reminders to the ophthalmologists during the 2nd and 4th weeks after the questionnaire's activation, respectively.

STATISTICAL ANALYSIS

Descriptive findings in this article are presented as numerical counts and percentage values. In bivariate analyses, we evaluated factors associated with considering education abroad and taking action using Pearson's chi-squared test. Next, we created a multinomial logistic regression model with the variables found to be associated with considering education abroad and taking action and performed multivariate analysis using the backward stepwise method. To analyze the data, we used SPSS (version 24.0; IBM Corporation, Armonk, NY, USA), and descriptive and supplementary results were visualized in Excel (Microsoft, USA). All p values less than 0.05 were interpreted as indicating statistical significance.

RESULTS

Of the 447 young ophthalmologists invited to participate in the study, 246 (55.0%) ophthalmologists from 14 institutions in Türkiye (i.e., 12 tertiary care hospitals and 2 secondary care hospitals) completed the questionnaire. However, because 14 responses had to be excluded due to missing responses and/or missing data, the sample ultimately included 232 participants: 176 residents (75.9%) and 56 specialists (24.1%).

The participants' demographics and demonstrates the relationship between demographic factors and interest in international fellowship programs are summarized in Table 1. Group 1 had 43 ophthalmologists (18.5%), Group 2 had 126 (54.6%), and Group 3 had 63 (27.2%). By age, participants were 28.94±3.6 years old on average (range: 24-40 years); by sex, 112 participants were female (48.3%) and 120 were male (51.7%). No significant difference in sex, marital status, existence of caregiving responsibilities, and years with the most recent academic degree emerged between groups (all p>0.05). However, significant differences in age (24-29 vs 30-40) and academic degree (i.e., specialists versus residents) did surface between the groups (p=0.007 and p=0.022, respectively).

The distribution between residents and specialists regarding interest in the subspecialties are illustrated in Figure 1. The specialty with the greatest interest was cataract and refractive surgery (72%), followed by cornea and ocular surface disease (52.6%), oculoplastic surgery (52.6%), medical and surgical retina care (38.8%), glaucoma (19.8%), uveal diseases (13.4%), pediatric ophthalmology (12.1%), and neuro-ophthalmology (8.2%). However, no significant difference in interests arose between the groups (p>0.05 for Group 1, 2 and 3). Although oculoplastic surgery was of significantly greater interest to residents than specialists (p=0.022), no significant differences surfaced for the remaining subspecialties (all p>0.05).

The 4 most preferred countries for fellowship training among participants were the United Kingdom (42.2%), the United States (41.4%), Germany (16.4%), and Canada (13.8%). The preference for the United Kingdom and the United States was greater among specialists than residents (43.8% vs. 37.5% and 43.8% vs. 33.9%, respectively), whereas the pref-

APPENDIX

SURVEY

Research topic: Factors Influencing Preferences in International Ophthalmology Subspecialty Fellowships Among Young Ophthalmologists in Türkiye

Hi,

This survey is designed to understand the opinions and expectations of ophthalmologists regarding international subspecialty fellowship training. By completing the survey, you can share your thoughts on this topic with us. The survey consists of 5 sections and 30 questions, and it takes approximately 5 minutes to complete. Your data will be kept completely confidential. Thank you in advance for your participation.

Part 1: Demographic Information

Please specify your age.

Please specify your sex.

-Female

-Male

Please specify your marital status.

-Single

-Married

Do you have any caregiving responsibilities (e.g., children, elderly, disabled persons)?

-Yes

-No

How would you describe your balance of income and outgoings?

-My income exceeds my outgoings

-My income matches my outgoings

-My income is less than my outgoings

What is your academic degree?

-Resident

-Specialist

Which of the following best describes the institution where you currently work?

-Secondary care private hospital, private medical/specialty center, or foundation hospital

-Secondary care state hospital

-Tertiary care private hospital or foundation hospital

-Tertiary care public university hospital

-Tertiary care public training and research hospital

-Tertiary care public city hospital

-Private clinic

-Other

Part 2: Plans for International Subspecialty Fellowship Program Training

Which areas of ophthalmology are you currently developing in or would like to develop in? (You can select multiple options.)

-Cornea and ocular surface diseases

-Cataract and refractive surgery

-Medical and surgical retina

-Oculoplastic surgery

-Pediatric ophthalmology

-Glaucoma

-Neuro-ophthalmology

-Uveal diseases

-Other

Do you consider your current or ongoing ophthalmology training to be sufficient?

-Yes

-No

-Hesitant

Please indicate which of the following best describes your current situation with regard to applying for training abroad.

-I am not interested

-I am interested but haven't applied

-I have applied (already or soon)

Which country are you considering for subspecialty fellowship training? (You can select multiple options.)

- The United States

- Canada

- The United Kingdom

- Australia

- Germany

-Other: _____

What factors motivate you to pursue training abroad? (You can select multiple options.)

-There are no motivating factors

-I believe it would be beneficial for my current or future career

APPENDIX *(contunied)*

-I think I can benefit more from educational/research opportunities and resources abroad
-I believe experiencing a different culture and language will help me develop personally
-I believe having international experience will financially benefit me in the future.
-Positive feedback from colleagues who have been abroad
-My family's positive attitude towards education abroad
-Other

What factors do you see as barriers to pursuing training abroad? (You can select multiple options.)

- I do not see any barriers.
-I think it would be detrimental to my current or future career.
-I believe I won't be able to benefit from the education/research opportunities and resources in Türkiye
-I think adapting to a different culture and language would be challenging.
-I think the economic conditions abroad will be challenging.
-Negative feedback from colleagues who have been abroad
-I think the process of education abroad will negatively impact my family life.
-Others

Part 3: Academic Backround and Preparation

How do you perceive your level of knowledge regarding international fellowship training?

-Insufficient
-Sufficient

What are your sources of information about education abroad? (You can select multiple options.)

-I am not knowledgeable on this topic
-Mentor
-Social media
-Internet (non-social media)
-Colleague
-Other

What kind of preparations have you made or are you making/planning for your education abroad plans? (You can select multiple options.)

-I have not made any preparations.
-I am tracking announcements for education, projects, scholarships, etc., abroad.
-I am preparing the necessary documents (e.g., CV, visa, permissions, equivalency certificates, etc.) for applications to education, projects, scholarships, etc. abroad.
-I have communicated with a professional or institution abroad.
-I am trying to adjust my family and financial status.
-I am learning a foreign language.
-Other

How would you describe your level in the target foreign language?

-Insufficient
-Sufficient

Which of the following scholarship providers do you have information about? (You can select multiple options.)

-I have no information.
-International Council of Ophthalmology (ICO)
-International Ophthalmology Fellowship Foundation (IOFF)
-European Cataract and Refractive Surgery (ESCRS)
-American Academy Ophthalmology (AAO)
-TUBITAK 2219 program
-Other

Do you have any success in the following international ophthalmology board exams? (You can select multiple options.)

-I do not have any success in international board exams.
-ICO - Visual Science
-ICO - Optics & Refraction and Instruments
-ICO - Clinical Ophthalmology
-ICO - Advanced
-ICO - Subspecialty
-Fellow of the Royal College of Physicians and Surgeons of Glasgow (FRCS)
-Fellow of European Board of Ophthalmology (FEBO)
-Other

Regardless of the order of authorship, have you ever published academic papers in international peer-reviewed journals?

-Yes
-No

Regardless of the order of authorship, have you ever published academic papers in national peer-reviewed journals?

-Yes
-No

TABLE 1: Participants' demographic characteristics and interest in international fellowship programs in Group 1 (43, 18.5%), Group 2 (126, 54.6%), and Group 3 (63, 27.2%).

	Group 1¥		Group 2¥		Group 3¥		Total¤		p value*
Age									
24-29	29	(18,8)	93	(60,4)	32	(20,8)	154	(66,4)	0,007
30-40	14	(17,9)	33	(42,3)	31	(39,7)	78	(33,6)	
Sex									
Female	22	(19,6)	65	(58,0)	25	(22,3)	112	(48,3)	0,278
Male	21	(17,5)	61	(50,8)	38	(31,7)	120	(51,7)	
Marital status									
Single	23	(16,7)	78	(56,5)	37	(26,8)	138	(59,5)	0,618
Married	20	(21,3)	48	(51,1)	26	(27,7)	94	(40,5)	
Existence of caregiving responsibilities									
No	32	(17,1)	108	(57,8)	47	(25,1)	187	(80,6)	0,100
Yes	11	(24,4)	18	(40,0)	16	(35,6)	45	(19,4)	
Academic degree									
Resident	33	(18,8)	103	(58,5)	40	(22,7)	176	(75,9)	0,022
Specialist	10	(17,9)	23	(41,1)	23	(41,1)	56	(24,1)	
Total	43	(18,5)	126	(54,3)	63	(27,2)	232	(100,0)	

*Pearson chi-square test; ¥Row percentage; ¤Column percentage; Bold font indicates statistical significance (p<0.05)

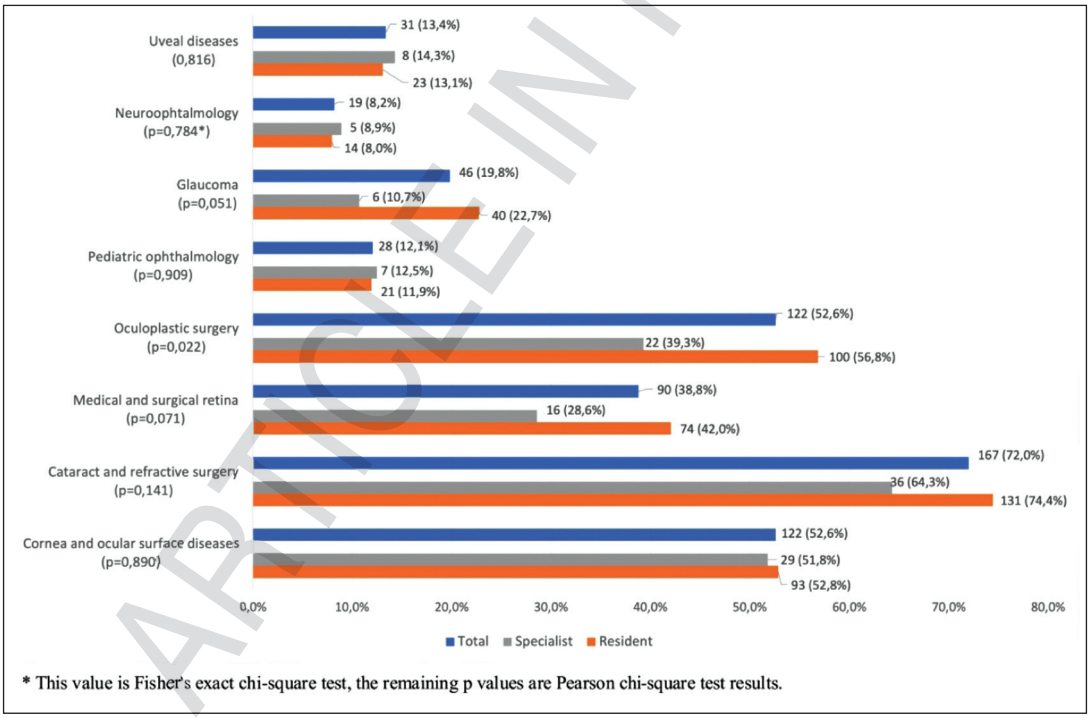

FIGURE 1: Distribution of potential interest in ophthalmological subspecialties between residents and specialists

erence for Germany was greater among residents than specialists (23.2% vs. 16.4%). However, considering all countries, no significant difference arose between specialists and residents (all p>0.05), as shown in Figure 2.

The factors motivating and deterring action in pursuit of international fellowship programs were evaluated in 6 categories (Figure 3). For all participants, the category of positive effects on current and future career plans emerged as the most significant

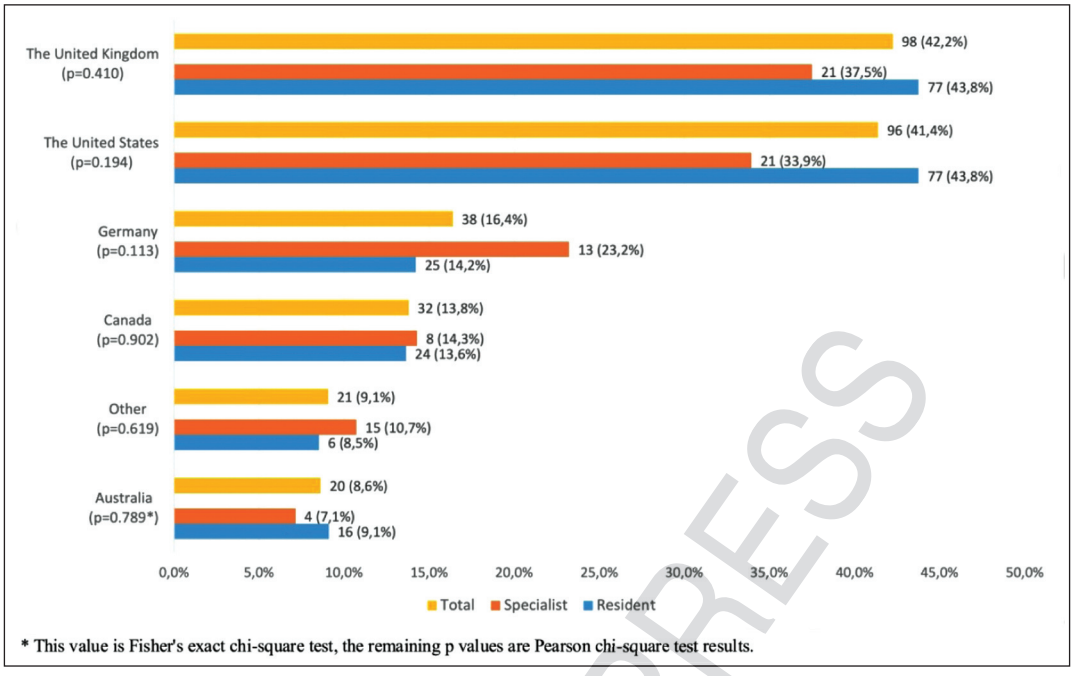

FIGURE 2: Most-preferred countries for international ophthalmology fellowships by academic degree

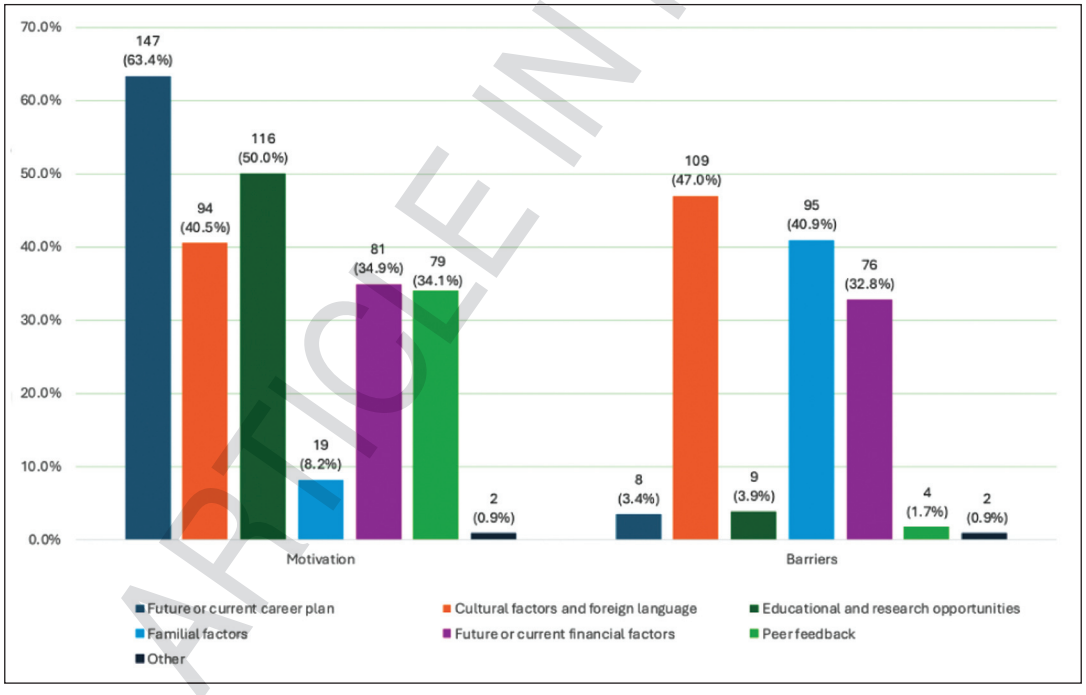

FIGURE 3: Factors motivating and deterring action in pursuit of international fellowship programs

motivating factor (63.4%) and familial factors as the most prominent deterring factor (40.9%). Meanwhile, similar proportions emerged for the categories of cultural factors and foreign-language proficiency (40.5% vs. 47.0%, respectively) and for the categories of future and current financial considerations (34.9% vs. 32.8%, respectively). For all categories, no significant difference arose between ophthalmology specialists and residents (all p>0.05).

The participants' academic background and how it relates to interest in international fellowship programs are shown in Table 2. Significant differences

TABLO 2: Participants' academic background and how it relates to interest in international fellowship programs. Significant differences emerged between groups in their level of knowledge regarding international fellowship programs, the level of proficiency in foreign languages, and having authored work in international peer-reviewed publications (p<0.001, p<0.001, and p=0.002, respectively).

	Group 1[¥]		Group 2[¥]		Group 3[¥]		Total[α]		p value*
Current or past institutional status in residency									
University	19	(22,9)	41	(49,4)	23	(27,7)	83	(35,8)	0,384
Ministry of Health	24	(16,1)	85	(57,0)	40	(26,8)	149	(64,2)	
Perception of sufficiency in ophthalmology education									
No	15	(27,3)	26	(47,3)	14	(25,5)	55	(23,7)	0,105
Yes	18	(18,0)	50	(50,0)	32	(32,0)	100	(43,1)	
Hesitant	10	(13,0)	50	(64,9)	17	(22,1)	77	(33,2)	
Level of knowledge regarding international fellowship training									
Insufficient	40	(19,2)	120	(57 ,7)	48	(23,1)	208	(89,7)	**<0,001**
Sufficient	3	(12,5)	6	(25,0)	15	(62,5)	24	(10,3)	
Level of foreign language									
Insufficient	33	(21,0)	98	(62,4)	26	(16,6)	157	(67,7)	**<0,001**
Sufficient	10	(13,3)	28	(37,3)	37	(49,3)	75	(32,3)	
Level of knowledge regarding scholarship foundations									
No	18	(17,0)	66	(62,3)	22	(20,8)	106	(45,7)	0,065
Yes	25	(19,8)	60	(47,6)	41	(32,5)	126	(54,3)	
Ophthalmology board exams									
No	36	(19,4)	105	(56,5)	45	(24,2)	186	(80,2)	0,125
Yes	7	(15,2)	21	(45,7)	18	(39,1)	46	(19,8)	
Existing of peer-reviewed international publications									
No	31	(19,5)	96	(60,4)	32	(20,1)	159	(68,5)	**0,002**
Yes	12	(16,4)	30	(41,1)	31	(42,5)	73	(31,5)	
Existing of peer-reviewed national publications									
No	32	(19,0)	94	(56,0)	42	(25,0)	168	(72,4)	0,489
Yes	11	(17,2)	32	(50,0)	21	(32,8)	64	(27,6)	

*Pearson chi-square test; [¥]Row percentage; [α]Column percentage; Bold font indicates statistical significance (p<0.05)

arose between groups in the level of knowledge about international fellowship programs, the level of foreign-language proficiency, and having authored work in international peer-reviewed publications (p<0.001, p<0.001, and p=0.002, respectively).

The fellowship foundations most familiar to participants were the International Council of Ophthalmology (ICO) (48.3%), the European Society of Cataract & Refractive Surgeons (ESCRS) (26.7%), the American Academy of Ophthalmology (AAO) (25.4%), the International Ophthalmological Fellowship Foundation (IOFF) (18.5%), and the Scientific and Technological Research Council of Türkiye (TUBITAK) 2219 program (12.9%) (Figure 4A). How participants have prepared for international fellowship programs are shown in Figure 4B; learning a foreign language was the most common activity (8.6%). The primary sources of information about fellowship programs for all participants were colleagues (61.2%), social media (37.5%), the Internet (i.e., non-social media) (32.3%), and mentors (13.8%); respectively (Figure 4C). The international ophthalmology board examinations passed by all participants, the most common being the one to become a Fellow of the European Board of Ophthalmology (FEBO), with a rate of 16.4% (Figure 4D).

Lastly, the factors associated with international fellowship programs processed via multinomial logistic regression analysis are demonstrated in Table 3. We identified several factors associated with an interest in pursuing international fellowship training. These factors included being aged 30-40 years, having sufficient knowledge about international fellowship opportunities, possessing adequate foreign

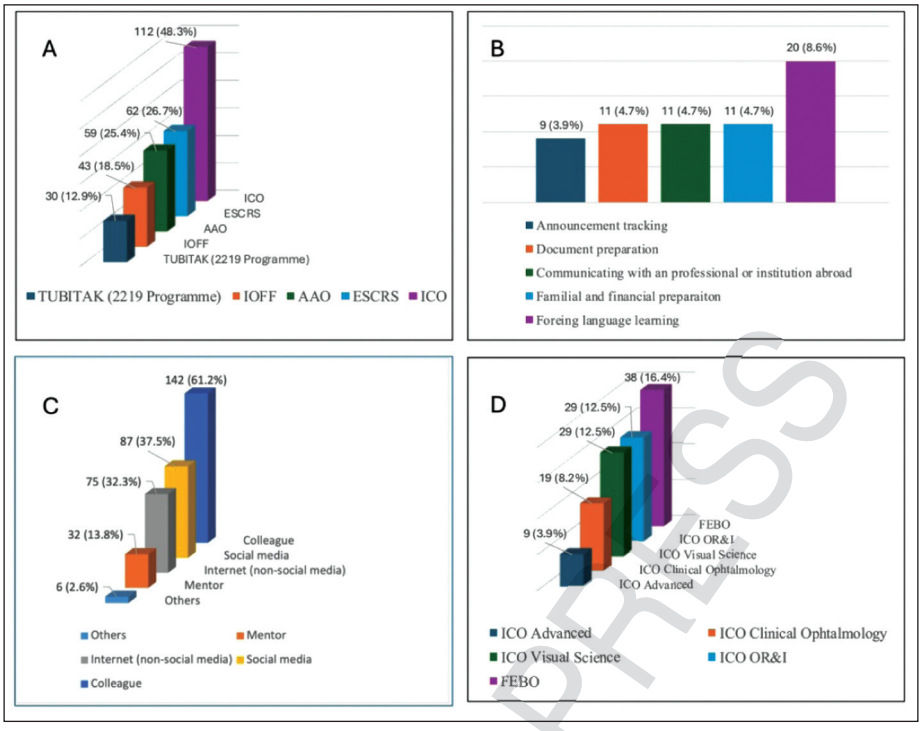

FIGURE 4: Familiarity with fellowship foundations, preparation for fellowship training, sources of information, and board examinations passed. **(4A)** Among participants, the most familiar fellowship foundations were the ICO (48.3%), ESCRS (26.7%), AAO (25.4%), IOFF (18.5%), and TUBITAK 2219 program (12.9%). **(4B)** In preparation for fellowships, foreign-language learning was the most common activity (8.6%). **(4C)** Participants primarily sourced information from colleagues (61.2%), social media (37.5%), the Internet (32.3%), mentors (13.8%), and others (2.6%). **(4D)** The most frequently passed board examination was the FEBO exam (16.4%).

TABLE 3: Factors associated with international fellowship programs according to multinomial logistic regression analysis. Sufficient foreign-language proficiency also increased the likelihood of being in Group 3 (OR=4.95, 95% CI [1.97-12.43]).

	Group 2			Group 3		
	β (SE)	OR (95% CI)*	p value	β (SE)	OR (95% CI)*	p value
Age						
25-29 (ref)	0,28	1,32	0,491	-0,81	0,45	0,079
30-40	(0,40)	(0,60-2,88)		(0,46)	(0,18-1,10)	
Level of knowledge regarding international fellowship training						
Insufficient (ref)	-0,23	0,80	0,758	1,15	3,16	0,113
Sufficient	(0,75)	(0,18-3,44)		(0,73)	(0,76- 13,12)	
Level of foreign language						
Insufficient (ref)	0,01	1,01	0,985	1,60	**4,95**	0,001
Sufficient	(0,43)	(0,43-2,35)		(0,47)	**(1,97-12,43)**	
Existing of international publications						
No (ref)	-0,37	0,69	0,381	0,64	1,89	0,170
Yes	(0,42)	(0,31-1,57)		(0,47)	(0,76-4,70)	

*Adjusted odds ratios according to multivariate analysis ("Group 1" as the reference category). Bold font indicates statistical significance (p<0.05).
The variables "sex" and "academic degree" initially included in the model were removed from the model using the backward stepwise method.
R^2=0,284 (Nagelkerke); Deviance test: p=0,368; OR: Odds ratio; CI: Confidence interval

language proficiency, and having prior international publications. A multinomial regression model was constructed using the variables in question, along with the fundamental variable of gender. A multivariate analysis was conducted using the backward stepwise method. As a result of the 2-step analysis,

the variables gender and academic degree were removed from the model, respectively. Notably, participants with sufficient foreign-language proficiency had a 4.95-fold higher probability (odds ratio, 95% confidence interval [1.97-12.43]) of being in Group 3 than participants with insufficient foreign-language proficiency.

DISCUSSION

The results of our study provide valuable insights into the interests, preferences, and challenges among participants regarding international fellowship training in subspecialty ophthalmological programs. Per our results, many young ophthalmologists in Türkiye are interested in international education in ophthalmological subspecialties. Moreover, to the best of our knowledge, our study was the first to address the topic.

A significant proportion of young ophthalmologists in Türkiye in our study expressed high interest in international fellowship programs, with approximately 82% of respondents indicating their willingness to pursue and take action toward such opportunities. Comparable trends have been observed in the United States, Canada, and East Africa, and those trends are encouraging given sub-specialization's association with enhanced patient care and a deeper scientific understanding of diseases.[3,6,8,9] No significant differences arose based on sex, marital status, or caregiving responsibilities; however, age and academic degree (i.e., specialist vs. resident) were associated with varying levels of interest.

In our sample of young ophthalmologists in Türkiye, the top specialties of interest were cataract and refractive surgery, cornea and ocular surface disease, oculoplastic surgery, and retina care, whereas only 8.7% were interested in neuro-ophthalmology. Those findings align with global trends in ophthalmic subspecialties and reflect the evolving needs of the Turkish population.[3,10-12] The growing preference for cataract and refractive surgery highlights the increasing demand for vision correction procedures driven by the high prevalence of refractive errors in the general population in the world. Also, the developing of advanced anterior segment surgical techniques, such as refractive surgeries and presbyopia-correcting intraocular lenses, may contribute to the rising interest in these fields.[13] By contrast, among ophthalmology residents in the United States, 64% chose subspecialty training, and of them, 35.6% chose vitreoretinal surgery-the most popular choice-whereas only 0.7% were interested in uveal diseases.[6] Similarly, among ophthalmology residents in Canada, medical retina care (36%) was the most popular choice and low vision rehabilitation the least popular.[3] In our study, medical and surgical retina care was the 4th-most-preferred subspecialty, following anterior segment and oculoplastic care. Surgical retina specialists are known to manage significantly more emergency surgical cases after typical work hours and have a heavier on-call burden than other ophthalmic subspecialists, and such a demanding workload may weaken young ophthalmologists' preference for the specialty.[12] Interestingly, residents showed greater interest in oculoplastic surgery than specialists, which indicates a potential shift in preferences concerning subspecialties among younger ophthalmologists. The preference may result from increased interest in cosmetic and reconstructive oculoplastic surgery in Türkiye and around the world.[14]

According to the World Health Organization (WHO), uncorrected refractive errors are the leading cause of moderate and severe visual impairment worldwide, while cataracts remain the primary cause of blindness in middle- and low-income countries. As the global population ages, more individuals are at risk of vision loss due to conditions such as macular degeneration, diabetic retinopathy, and glaucoma.[15] A study by Yurdakul reported a visual impairment prevalence rate of 1.4% in Türkiye. Consistent with WHO data, the study demonstrated that the most common causes of visual impairment include uncorrected refractive errors in children and young adults, glaucoma in adults aged 15-50, and age-related macular degeneration and diabetic retinopathy in individuals over 50.[16] Given the aging population in Türkiye, the demand for subspecialists in glaucoma and retinal diseases is expected to rise in the coming future. However, the current subspecialty preferences among Turkish young ophthalmologists may not be sufficient to meet this growing need.

Regarding preferred countries for fellowship programs, The United Kingdom and the United States emerged as the top choices, followed by Germany and Canada. Despite slight differences in preferences between residents and specialists, no significant disparities arose. Despite the lack of specific data from Türkiye, the trend of pursuing international fellowships aligns with the results of our study.[17] Numerous, diverse clinical and research fellowship opportunities are available in both the United Kingdom and the United States. Moreover, the ICO and many other scholarship foundations offer support for candidates seeking fellowship opportunities at institutions located in those countries.[4] Beyond that, Germany has recently become one of the most-preferred locations for young ophthalmologists in Türkiye, owing to factors such as location, lifestyle, and economic considerations. However, the preference might also be influenced by the potential for permanent work opportunities instead of education in a temporary ophthalmology fellowship.[18] Canada is another top consideration for candidates due to its extremely friendly work culture, hands-on training, reasonable patient volumes, and the availability of paid fellowships.

Although innovations and research play an important role in shaping the future of eye care in any country, the motivations, career plans, and paths of young ophthalmologists will exert a significant impact on the future of ophthalmic practice.[3,19,20] We identified several motivating factors driving interest in international fellowship training, with positive effects on current and future career plans being the most significant motivator for participants. Past surveys of graduating residents in ophthalmology and practicing ophthalmologists have identified key factors influencing career choices, including the acquisition of special skills, challenging diagnostic problems, mentorship, residency rotations, and the types of clinical problems encountered. Intellectual stimulation, doctor-patient relationships, flexibility, mentorship, and earning potential are other significant motivators.[6,19] Our study's results are consistent with those findings. Although no significant difference in marital status or caregiving responsibilities emerged between groups, familial factors were cited as the most prominent barrier to pursuing a fellowship. Several studies have shown that familial factors such as marital status, lifestyle, location, and number of children can play a significant role in decision-making regarding career choices in ophthalmological subspecialties.[21-23] Because education in such subspecialties and other medical subspecialties requires great devotion, those familial factors may serve as limiting factors in decision-making about subspecialties.

Significant differences also surfaced in participants' academic backgrounds and interests in international fellowship programs. Higher levels of knowledge regarding fellowship opportunities, proficiency in foreign languages, and having authored work in international peer-reviewed publications were associated with a greater likelihood of expressing interest in fellowship training. Fluency in a foreign language doubtlessly ranks among the most important factors for obtaining an international fellowship; such fluency impacts not only the application process but also acceptance in the fellowships. Studies have additionally shown that having more 1st-authored publications is a significant factor in pursuing ophthalmology subspecialty fellowships among young ophthalmologists in the United States.[24] In that regard, we can consider academic preparation and research experience to be important factors in shaping career aspirations among young ophthalmologists in Türkiye.

In our study, participants were most familiar with the fellowship foundations of the ICO, the ESCRS, the AAO, the IOFF, and the TUBITAK-2219 program, respectively. In other work, Torres et al. recently published findings on how receiving ICO fellowships impacted 1,140 young ophthalmologists awarded such fellowships from 2001 to 2019.[4] The report indicated that of those ophthalmologists, 98.3% strongly or somewhat agreed that their knowledge in their subspecialty had improved considerably. Therefore, it is unsurprising that the ICO fellowship program is the best-known international fellowship program among young ophthalmologists in Türkiye. However, to be eligible to apply for short-term and long-term ICO fellowship programs, candidates have to pass the ICO examinations, which they can target

early after graduation.[25] Likewise, the IOFF provides 3-month and 1-year fellowship programs but requires candidates to pass the ICO examinations to be eligible to apply.[26] In our study, most participants indicated a strong interest in ophthalmology board examinations, including the one for the FEBO, ICO Optics and Refraction, and ICO Visual Science examinations. The ESCRS provides many research awards, short-term observership programs, and long-term fellowship programs (e.g., Peter Barry Fellowship program) to ophthalmologists under 40 years of age with at least 3 years of membership in the ESCRS. Meanwhile, the AAO and the Association for Research in Vision and Ophthalmology jointly provide and announce on their website various scholarship programs such as the Global Ophthalmology Fellowship Program for young ophthalmologists from low-resource countries.[27,28] Beyond that, the TUBITAK 2219 program provides scholarships for researchers in Türkiye with doctoral degrees; it also supports researchers in conducting research abroad as part of research projects with mentors highly experienced in the similar field.[29]

LIMITATIONS

Our study's findings have some limitations. Firstly, due to the cross-sectional design of this study, the direction of causality cannot be fully explained. Secondly, potential biases always associated with self-report data might have affected our results, along with the relatively small sample size from a limited number of institutions. Thirdly, the sampling method used may have led to greater participation of ophthalmologists interested in international ophthalmology subspecialty fellowship training, resulting in selection bias and limiting the generalizability of the study. Lastly, in preparing our questionnaire, we considered other similar studies conducted in middle and low-income countries, including Nigeria, Egypt, and Pakistan, as well as developed countries such as the United States, The United Kingdom, and Canada.[12,20-24] Each country's health care system, educational process, and facilities have their own dynamics, which might have influenced our results as well. Future research could aim to identify the specific impacts of fellowship training and culture on career trajectories within a broader participant pool.

CONCLUSION

In sum, we identified several factors associated with interest in fellowship training. Participants with sufficient proficiency in foreign languages were more likely to consider fellowship training, which underscores the importance of language skills for accessing and benefiting from such programs. There is a clear and significant interest among young Turkish ophthalmologists in pursuing subspecialty training. Understanding the factors influencing the pursuit of international subspecialty training is crucial for optimizing the design and implementation of fellowship programs, ensuring they better address the needs of this demographic.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: *Uğur Tunç, Yusuf Yıldırım;* ***Design:*** *Uğur Tunç, Yusuf Yıldırım;* ***Control/Supervision:*** *Yusuf Berk Akbaş, Ömer Faruk Peker;* ***Data Collection and/or Processing:*** *Ömer Faruk Peker, Atalay Aktuna;* ***Analysis and/or Interpretation:*** *Atalay Aktuna, Uğur Tunç;* ***Literature Review:*** *Uğur Tunç, Yusuf Berk Akbaş;* ***Writing the Article:*** *Uğur Tunç, Yusuf Berk Akbaş, Yusuf Yıldırım;* ***Critical Review:*** *Yusuf Yıldırım;* ***References and Fundings:*** *Yusuf Yıldırım.*

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