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Factors affecting physicians' specialty selection: A demographic and socioeconomic perspective

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ABSTRACT

Objectives: The medical field is advancing toward increasing specialization in knowledge, technology, and expertise. To meet the demands of quality health care, a practical, pragmatic, and well-balanced enrollment and distribution of physicians among specialties is crucial. The process of selecting a specialty as an ultimate future career is sensitive and conveys multidimensional implications on physicians, the health systems and society as a whole. Numerous complex and miscellaneous factors contribute to the development and adjustment of that decision that needs rigorous efforts to understand and hopefully control.

Material and Methods: This is a cross-sectional and descriptive study, conducted through a comprehensive questionnaire encompassing demographic information, socioeconomic indicators, and components of the modified Kuppuswamy and MacArthur Scales. Data were collected using simple random sampling with considering design efficiency. Two-variable analysis with Pearson correlation and Chi-squared test was used to identify the associations and their significance. $P < 0.05$ was considered statistically significant.

Results: A total of 389 respondents completed the questionnaire: 58.87% females, 41.13% males. Among them, 67.8% were internship physicians, and 32.2% were general practitioners. The mean Kuppuswamy score was 15.17, and the mean subjective socioeconomic status (SES) score was 4.28. Female physicians presented a critical propensity toward choosing obstetrics and gynecology, and pediatrics as their primary future career ($P \leq 0.01$), whereas male physicians were more willing to specialize in surgical specialties ($P \leq 0.01$). Obstetrics, gynecology, and family medicine correlated with below-average Kuppuswamy scores ($P = 0.010359$), while surgical specialties correlated with higher scores ($P < 0.01$). Physicians with above-average subjective SES scores preferred surgical specialties ($P = 0.036596$). Family medicine, obstetrics, gynecology, and pediatrics correlated with below-average subjective SES scores ($P = 0.041828$).

Conclusion: Demographic and socioeconomic factors have a significant influence on physicians' specialty preferences and selection.

Keywords: Socioeconomic status, Medical specialties, MacArthur Scale, Modified Kuppuswamy scale, Specialty selection

INTRODUCTION

The medical field is expanding rapidly in the direction of meticulous specialization and fine fragmentation of knowledge, research, technology, methods, diagnosis, and treatment. Medical specialization options have diversified and expanded since the gradual development of the modern specialty system in the 19th century,[1] which in some cases reached staggering numbers, as in the case of the United States medical training system, where more than 150

specialties are accredited by the American Board of Medical Specialties.

Global and regional statistics indicate that most medical graduates go on to pursue specialist training rather than practice general medicine after obtaining their license.[2,3] According to the latest data, the Republic of Sudan has more than 66 medical schools, with around 5000 doctors graduating every year,[4] while the Sudan Medical Specialization Board currently enrolls over 4000 residents in more than 33 different specialties.[5]

The progressing nature of the field necessitates a well-adjusted, practical distribution of physicians among specialties to achieve quality healthcare. Certain specialties face persistent workforce shortages, and some are highly competitive and oversaturated. Understaffed specialties will inevitably encounter difficulties in health-care provision and scientific progress, and overstaffed specialties will lead to financial implications and suffer health-care provision obstacles such as increased competition for jobs and reduced opportunities for professional development.

Each specialty offers a diverse spectrum of trade-offs that befits the variable preferences of physicians. While some specialties are considered to be high demanding and stringent, like in the case of orthopedic surgery and emergency medicine,[6,7] they still endure significantly high enrollment competition rate.[8] On account of this, it is evident that individual factors play a key role in the process of specialty selection.

The decision to undergo a particular specialty training is fundamentally unstable and depends on many influencing factors. This decision reshapes the lives of physicians and impacts the performance of the medical specialties. Ultimately, the impact can be far-reaching and affect society as a whole. To achieve optimal health care across all specialties, we must look for the factors that influence this decision and seek to optimize accordingly.

Less is known about the role of socioeconomic factors in shaping the career choices of medical graduates, particularly in terms of their choice of medical specialty. In this study, we investigate the potential role of socioeconomic factors in influencing the career trajectories of future physicians, health system in general. Ultimately, this research has the potential to inform efforts to promote greater diversity, equity, and practicality within the medical specialty domain.

MATERIAL AND METHODS

This is a cross-sectional and descriptive study.

Instruments

We utilized an online-based 32 items questionnaire. The questionnaire was divided into four sections. The first section was concerned with the demographic data of the participants.[9] The second section included questions about the principle socioeconomic indicators and a pre-tested, modified Kuppuswamy scale that we adjusted to match the consumer price index in Sudan to represent and categorize the income scale.[10-12] The third section contained the components of MacArthur Scale of Subjective Social Status.[13] Finally, the fourth section investigated the educational particulars and the details of specialty selection process and decision.

Sampling criteria, study subjects and data collection

Data collection was performed through an online-based simple random sampling, and the sample size was calculated for a 95% confidence level while taking the design effect into account. Sample size was calculated using the sample size formula for estimating a proportion ($n = Z^2{}^*p^*(1-p)/E^2 = 1.69^2{}^*0.5^*(1-0.5)/0.05^2 \approx 385$). We circulated the questionnaire using invitational messages distributed through email and social media to Sudanese doctors who did not enroll in a specialty training program. The questionnaire distribution and data collection were carried out by collaborators allocated to each state in Sudan. The data were collected from January 2023 to April 2023. The questionnaire was online-based, and participation was fully voluntary. Participants were permitted to respond in their own time and privacy. The study protocol was reviewed and approved by the Research Ethics Committee of the University of Sinnar (Approval No. 3227 SN-RE) in accordance with the ethical standards outlined in the Declaration of Helsinki. All participants provided informed consent before their inclusion in the study.

Analysis of data

Data were collected using Microsoft Excel software and all statistical analyses were performed using IBM Statistical Package for the Social Sciences statistics software, version 29. After categorizing the qualitative questions, descriptive statistics were utilized to summarize and illustrate the result variables. To identify and demonstrate the relationship between the relevant outcomes and various socioeconomic and demographic variables, bivariate analysis with Pearson correlation and Chi-square independence test was used. $P < 0.05$ was deemed statistically significant.

RESULTS

Study sample

A total of 389 respondents completed the questionnaire, of which 58.87% ($n = 229$) were female and 41.13% ($n = 160$) were male. All of the participants were Sudanese with diverse ethnic backgrounds. The majority of the participants were

internship physicians (67.8%, *n* = 264), while the rest were general practitioners (32.2%, *n* = 125). The most significant demographic characteristics of the participants are shown in Table 1.

Socioeconomic status indicators

All study participants have at least a bachelor's degree, and some possess master's degrees (16.9%, *n* = 66). Bachelor's degree was the most common highest education level attained by the fathers of the participants (22.6%, *n* = 88), with 11.3% (*n* = 44) reported a PhD, while only 1.5% (*n* = 6) were reported to be illiterate. Secondary school was the most common highest educational level among the participants' mothers (34.2%, *n* = 133), bachelor's degree being second (25.2%, *n* = 98), while 2.8% (*n* = 11) reported illiteracy of the mother. Educational data are further detailed in Table 2.

Most of the respondents are living in a house owned by their nuclear family (69.9%, *n* = 272), (8.2%, *n* = 32) live with their extended family, (12.1%, *n* = 47) pay rent, while (3.9%, *n* = 15) do not have a permanent residence. The number of individuals that reside within the participants' household ranged from 2 to 25 people with a mean of 7.50. Housing data are further detailed in Table 3.

Among the married and divorced respondents, 8.5% (*n* = 33/389) reported having children. Most of the participants do not have a medical insurance (71.2%, *n* = 277).

Household income ranged from 10,000–30,000 Sudanese Pound (SDG) to >1,000,000 SDG. The most common income range was (201,000–400,000 SDG) accounting for 20.3% of the sample. Personal income ranged from 10,000–30,000 SDG to >1,000,000 SDG, with the range (10,000–30,000 SDG) being the most frequently reported (58.9%, *n* = 229). Furthermore, 17.5% (*n* = 68) of respondents are the sole source of income in their household. Table 4 provides additional details on income data.

Kuppuswamy scale findings

Kuppuswamy scale is a SES measurement tool that is based on a composite score that takes into account education and occupation of the head of the household as well as with the family's monthly income producing a score that ranges from 3 to 29, which, then, is used to classify the populations studied into high, medium, and low SES.[10] Table 5 illustrates the modified Kuppuswamy scale that we utilized in this study. The mean Kuppuswamy score of the participants was 15.17 with a range of 5–29 and a standard deviation of 6.68.

Subjective socio-economic status findings

The MacArthur Scale of Subjective Social Status is an extensively validated subjective SES measurement tool that depicts social status as a 10 steps ladder, asking individuals

Table 1: The demographic characteristics of the participants.

	Percent/Frequency
Age	
Mean	25.76
Range	22–37
Gender	
Male	45.5/177
Female	54.5/212
Ethnicity	
Western tribes	39.1/152
Central tribes	19.3/75
Northern tribes	18.8/73
Southern tribes	13.6/53
Eastern tribes	9.3/36
Residence	
Urban	63.7/248
Rural	36.3/141
Marital status	
Single	87.7/341
Married	11.1/43
Divorced	1.3/5
Job title	
Internship physician	67.8/264
General practitioner	32.2/125

Table 2: The educational characteristics of the participants and their parents.

	Percent/Frequency
Level of participants' highest education	
Bachelor's degree	83.0/323
Master's degree	17.0/66
Level of father's highest education	
Bachelor's	22.6/88
Secondary school	21.1/82
Master's degree	12.9/50
Diploma	12.1/47
PhD	11.3/44
Primary school	10.0/39
Middle school	4.6/18
Khalwa (Elementary Islamic school)	3.9/15
Illiterate	1.5/6
Level of mother's highest education	
Secondary school	34.2/133
Bachelor's	24.9/97
Middle school	10.5/41
Diploma	8.7/34
Primary school	6.7/26
PhD	5.1/20
Master's degree	3.9/15
Khalwa (elementary Islamic school)	3.1/12
Illiterate	2.8/11

to rank themselves on this ladder relative to the society to obtain a score from 1 to 10.[13,14] The scores mean was 4.28

Table 3: The housing conditions of the participants.

	Percent/Frequency
Housing terms	
Owned by the nuclear family	69.9/272
Rented	12.1/47
The extended family's house	8.2/32
No Permanent residence	3.9/15
Friend's residence	3.1/12
Rent without payment	2.8/11
Number of people in the household	
Mean	7.50
Range	2–25

Table 4: Income data of the participants.

	Percent/Frequency
Personal income range	
10,000–30,000	58.9/229
31,000–50,000	12.9/50
51,000–80,000	13.6/53
81,000–120,000	9.3/36
121,000–150,000	2.1/8
151,000–200,000	2.6/10
>1,000,000	0.8/3
Household income range	
10,000–30,000	13.6/53
31,000–50,000	2.3/9
51,000–80,000	6.9/27
81,000–120,000	13.1/51
121,000–150,000	14.7/57
151,000–200,000	17.5/68
201,000–500,000	20.6/80
501,000–>800,000	6.2/24
>1,000,000	5.1/20
The household's source of income	
The participant alone	17.5/68
Members of the nuclear family	74.8/291
Members of the extended family	7.1/28
Government assistance program or/charity	0.5/2

Table 5: Modified Kuppuswamy scale.

	Score
Education of head of family	
PhD or post Doctorate	7
Graduate or postgraduate	6
Intermediate or post high school diploma	5
High school certificate	4
Middle school certificate	3
Primary school certificate	2
Literate	1
Occupation of head of family	
Profession	10
Semi-profession	6
Clerical	5
Skilled worker	4
Semi-skilled worker	3
Unskilled worker	2
Unemployed	1
Monthly income of family	
>1,000,000	12
501,000–>800,000	10
201,000–500,000	8
151,000–200,000	6
121,000–150,000	5
81,000–120,000	4
51,000–80,000	3
31,000–50,000	2
10,000–30,000	1

	Total score
Socioeconomic class	
Upper	26–29
Upper middle	16–25
Lower middle	11–15
Lower upper	5–10
Lower	<5

with a range of 2–9. The most frequent score was 6 (43.18%, $n = 168$).

Specialty selection

Of all the participants, only two respondents reported the lack of clear decision concerning specialty selection at the moment. None of the physicians chose general practice as a future career path.

Most of the respondents chose more than one specialty as a possible career choice (65.63%, $n = 254/387$). Non-surgical specialties were chosen more frequently (72.09%, $n = 279/387$), as opposed to surgical specialties (27.91%, $n = 108/387$). The most prevalent chosen specialties as mainline choice were internal medicine ($n = 161$), pediatrics ($n = 113$), and obstetrics and gynecology ($n = 102$).

Some physicians were able identify their subspecialty choices (30.84%, $n = 120/387$). Most of which have chosen non-surgical specialties as their specialty of preference (70.00%, $n = 84/120$). Most of the respondents reported having uncertainties and doubts regarding their specialty decision (68.99%, $n = 267/387$). Almost half of the participants have changed their specialization choices at least once through their college years (52.18%, $n = 203/389$), while few changed their choices after graduation.

The reasons behind the specialty choice differed greatly between the physicians, with salary, work/life balance, and clinical interest being the most common reported reasons ($n = 301$, $n = 260$, $n = 242$, respectively). Table 6 shows the frequency analytics of the participants' rationale behind their specialization decision in further detail.

Table 6: The participants' reasons for their specialty choice.

	Frequency
Salary	301
Work/life balance	260
Clinical interest/stimulation	242
Practice and patient characteristics	232
Job market	211
Research	168
Social status	142
Duration of training	83
Elder's wish or recommendation	66
Practice expenses	13

The associations between the demographic and socioeconomic status indicators and specialty preferences

Female physicians exhibited a significant tendency toward choosing obstetrics and gynecology, and pediatrics as their main line future career preference, while male physicians were more abundant among those who are willing to specialize in surgical specialties, as illustrated in Figures 1 and 2 (P=.000579, $P \leq 0.01$ respectively). There was no significant relationship between age nor ethnicity and chosen specialties. The majority of the married and divorced physicians chose family medicine and/or its' branches as their specialty of interest ($P \leq 0.01$).

Family income was found to be associated with the rationale of the physicians behind their specialization path decision, where we found that those with family income below mean have salary as their main reason behind their decision while the ones whom reported family income above mean had clinical interest/stimulation and work/life balance as their main reason along with other reasons ($P \leq 0.01$). The majority of the physicians who were able identify their subspecialty choices had higher family income.

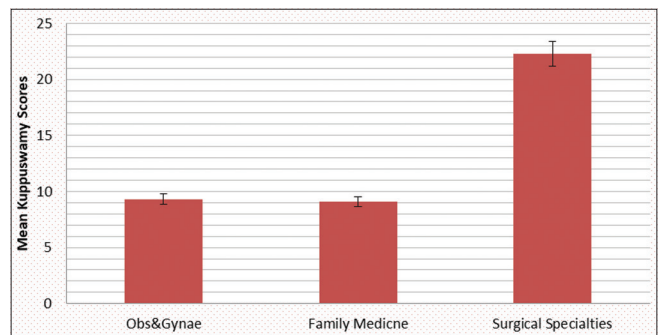### The associations between Kuppuswamy scale findings and specialty preferences

Obstetrics and gynecology and family medicine were found to be significantly associated with below mean Kuppuswamy score ($P = 0.010359$) and surgical specialties were associated with relatively high score ($P \leq 0.01$). Most of the physicians whom were able to identify their future subspecialty and further choices had above mean scores ($P = 0.022179$). Salary and work/life balance as reasons behind the physicians' specialization decision were associated with physicians with blew mean scores ($P = 0.015037$). Figure 3 illustrates the significant associations between mean Kuppuswamy scores and different main line specialization choices.
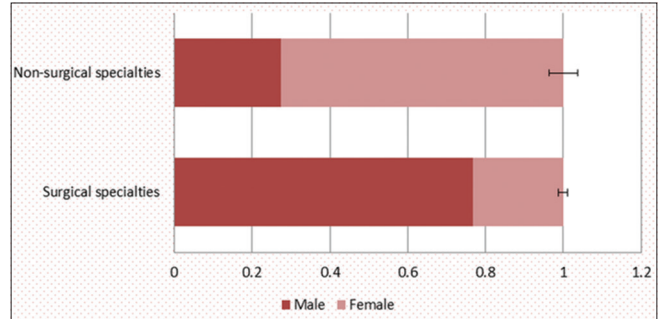
Figure 1: The distribution of genders among surgical and non-surgical specialties.
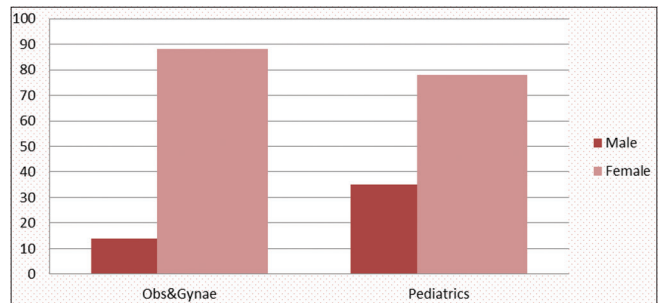
Figure 2: The distribution of genders among obstetrics and gynecology and pediatrics as main specialty path.

Figure 3: Specialties with significant associations with mean Kuppuswamy scores.

The association between the subjective socioeconomic status and specialty preferences

Most of the physicians with above mean subjective socioeconomic status (SES) chose surgical specialties as their main preference ($P = 0.036596$). Family medicine, obstetrics and gynecology, and pediatrics as main line preferences were found to be significantly associated with below mean subjective SES ($P = 0.041828$).

DISCUSSION

Specialization in the practice of medicine became an essential obligation to compensate and manage the great expansion of

medical knowledge and technologies. Since the unification of medicine with surgery, the medical field, like other scientific fields, is heading toward the direction of increasing specialization of labor, knowledge, and expertise.

Specialization conveys fundamental advantages to the medical practice, including higher quality care and focused, thus more efficient medical research. However, some scholars find the rapid increase in specialization to have potential serious drawbacks, challenges and limitations like the fragmentation and discontinuity of care, higher healthcare costs, coordination difficulties between specialties, and increased length and cost of training.[3] As our study illustrated, almost all of the physicians are willing to undergo specialty training instead of practicing general medicine or providing primary health care in general, which coincide with a lot of recent regional and national studies that discovered a significant decline in the number of general practitioners despite the rising number of physicians.[15,16]

The diversity and variance of specialization options inevitably result in differing degrees of favorability and preference among physicians along with their individual circumstances. Specialization preferences influence workforce staffing and consequentially, the quality and development of particular specialties. Specialization trends vary from one country to another, and sometimes from region to another within the same country. Obstetricians and gynecologists are in limited supply in Ireland, whereas anesthesiologists and psychiatrists are in low supply in Bulgaria and Turkey,[17] and the United States of America is facing severe shortages in critical care medicine and endocrinology among other specialties that are overstaffed in other countries.[18]

Undertaking a certain specialty as an ultimate career development path is governed by numerous variables that scholars are still trying to identify and find methods to control. One study found that a potential specialization preference was expressed by less than half of the students 40.2%, while, in our study, only 0.5% of physicians did not express any preference, which can be attributed to factor of seniority, which the aforementioned study found that senior students and having background about specialties were the significant factors for career choices.[19]

Gender appears to be a major factor in specialties' workforce distribution as we found in our study that female physicians exhibited a significant association with choosing obstetrics and gynecology, and pediatrics as their main line future career preference while majorly male physicians prefer surgical specialties. This coincides with the findings of a study concerning gender segregation in medical specialization in the United States of America, where they found that the fields of pediatrics and obstetrics and gynecology are female dominant, while surgical specialties are male dominant. They also found a strong negative correlation between the presence of female physicians in a specialty and its salary, which concur with our findings.[20]

In this study, we found that salary, work/life balance, and clinical interest were the most common reasons the physicians' specialty decision. Another study found that medical students tend to consider lifestyle factors more than other factors when choosing a specialty and the majority of which usually choose specialties that allow the physician to control the number of hours devoted to practicing the specialty.[21] Salary being the most prominent influencer in specialization raises many questions about the possibility of a major role of countries economic status and salaries system in physicians' specialty selection decision. One study found that the number of working hours, the duration of training, observed covariates, and unobserved skill differences do not explain the difference in average annual income between specialists and general practitioners.[22]

Some studies sought novel approaches to identify the factors behind the specialty selection decision, with some of them succeeding in discovering significant associations. Carol Elam applied Holland's theory of vocational personalities and work environments to find patterns of vocational personalities in various specialty decisions among medical students. Elam found that Investigative and Realistic students tend to choose surgical specialties as future careers and fewer Artistic and Social students tend to do so, while Realistic and Enterprising personalities tend to select radiology, among other findings.[23] Another study utilized marketing research models to examine the specialty selection process to find that male medical students considered surgical specialties to be interesting and challenging while deeming pediatrics and family medicine to be "boring." They also found that 70% of female students responded that the ability to have a manageable lifestyle was the most important selection criterion, and the majority of which chose obstetrics and gynecology to be their specialty if choice.[24]

Internal medicine was the most frequently chosen specialty as a possible main line career path. This could be explained by the fact that internal medicine is a generalized specialty that provides training in multiple specialty departments and represents a base ground for further particular specialization later on.

We found in this study that both subjective and objective SESes have significant associations with the physicians' specialty preferences. The physicians who chose surgical specialties had higher scores in both Kuppuswamy and subjective SES scales, while physicians who chose family medicine and obstetrics and gynecology had below mean scores in both scales. We attribute those findings to the cost of training, the adjustability to modifiable lifestyle factors and the potentiality of practicing privately in family medicine and obstetrics and gynecology, which might also explain the load of the married

and divorced physicians choosing family medicine as their main specialty choice as shown in our study.

CONCLUSION

As the results of this study shows, the demographic and socioeconomic factors have a potent impact on physicians' decisions on their future specialization paths. Identifying the significance and magnitude of such factors will facilitate an impartial and practical distribution of physicians on different specialties through the adjustment of specialties' characteristics to match to variables that affect the physicians' specialty selection decision.

Ethical approval

The study protocol was reviewed and approved by the Research Ethics Committee of the University of Sinnar (Approval No. 3227 SN-RE) in accordance with the ethical standards outlined in the declaration of Helsinki.

Declaration of patient consent

The authors certify that they have obtained all appropriate participant consent.

Conflicts of interest

There are no conflicts of interest.

Use of artificial intelligence (AI)-assisted technology for manuscript preparation

The authors confirm that there was no use of artificial intelligence (AI)-assisted technology for assisting in the writing or editing of the manuscript and no images were manipulated using AI.

REFERENCES

1. Weisz G. The emergence of medical specialization in the nineteenth century. Bull Hist Med 2003;77:536-74.
2. The National Health workforce accounts database. World Health Organization, Geneva. Available from: https://apps.who.int/nhwaportal, https://www.who.int/activities/improving-health-workforce-data-and-evidence [Last accessed on 2023 Apr 07].
3. Detsky AS, Gauthier SR, Fuchs VR. Specialization in medicine: How much is appropriate? JAMA 2012;307:463-4.
4. Al Mahdi TA. The path of undergraduate medical education in Sudan. Sudan J Med Sci 2019;14:188-201.
5. Elsheikh B. Supporting medical specialty training in Sudan: A framework for systematic engagement of Diaspora. Int J Sudan Res 2016;6:103-12.
6. Zis P, Anagnostopoulos F, Sykioti P. Burnout in medical residents: A study based on the job demands-resources model. ScientificWorldJournal 2014;2014:673279.
7. Lee RT, Seo B, Hladkyj S, Lovell BL, Schwartzmann L. Correlates of physician burnout across regions and specialties: A meta-analysis. Hum Resour Health 2013;11:48.
8. Lefebvre C, Hartman N, Tooze J, Manthey D. Determinants of medical specialty competitiveness. Postgrad Med J 2020;96:511-4.
9. Magzob M, Mutasim A. The effect of socioeconomic status on medical graduates' decision to enroll in specialization training programs in Sudan questionnaire. Available from: https://shorturl.at/tyngb [Last accessed on 2024 Jan 24].
10. Kuppuswamy BJ. Manual of socioeconomic status (urban). Delhi: Manasayan; 1981. Available from: https://scaleupdate.weebly.com/real.html [Last accessed on 2024 Jan 24].
11. Wiggins S, Allen M, Barry B, Mami E, Patel N, Sulieman H. Food prices in Mali and Sudan: Changes, causes, consequences and responses. London: SPARC; 2023.
12. UN World Food Programme. Conflict in Sudan: Food security analysis and forecast. Available from: https://docs.wfp.org/api/documents/wfp-0000148784/download [Last accessed on 2023 May 15].
13. Adler NE, Epel ES, Castellazzo G, Ickovics JR. Relationship of subjective and objective social status with psychological and physiological functioning: Preliminary data in healthy, White women. Health Psychol 2000;19:586.
14. Tan JJ, Kraus MW, Carpenter NC, Adler NE. The association between objective and subjective socioeconomic status and subjective well-being: A meta-analytic review. Psychol Bull 2020;146:970.
15. Majeed A. Shortage of general practitioners in the NHS. BMJ 2017;358:j3191.
16. Stigler FL, Zipp CR, Jeitler K, Semlitsch T, Siebenhofer A. Comprehensive catalogue of international measures aimed at preventing general practitioner shortages. Fam Pract 2021;38:793-801.
17. Healthcare personnel statistics - physicians. Eurostat, the Statistical Office of the European Union. Available from: https://ec.europa.eu/eurostat/databrowser/view/hlth_rs_prs2/default/table?lang=en [Last accessed on 2023 Jul 12].
18. American Medical Association. AMA Physician Masterfile; Population data are from the U.S. Census Bureau, Population Division; 2020. Available from: https://www.aamc.org/data-reports/workforce/data/number-people-active-physician-specialty-2021 [Last accessed on 2021 Dec 31].
19. Abdulghani HM, Al-Shaikh G, Alhujayri AK, Alohaideb NS,

Alsaeed HA, Alshohayeb IS, *et al.* What determines the selection of undergraduate medical students to the specialty of their future careers? Med Teach 2013;35 (Suppl 1):S25-30.

20. Pelley E, Carnes M. When a specialty becomes "women's work": Trends in and implications of specialty gender segregation in medicine. Acad Med 2020;95:1499-506.

21. Schwartz RW, Haley JV, Williams C, Jarecky RK, Strodel WE, Young B, *et al.* The controllable lifestyle factor and students' attitudes about specialty selection. Acad Med 1990;65:207-10.

22. Bhattacharya J. Specialty selection and lifetime returns to specialization within medicine. J Hum Resour 2005;40:115-43.

23. Elam C. Application of Holland's theory of vocational personalities and work environments to medical student specialty selection. J Career Dev 1994;21:37-48.

24. Weissman C, Schroeder J, Elchalal U, Weiss Y, Tandeter H, Zisk-Rony RY. Using marketing research concepts to investigate specialty selection by medical students. Med Educ 2012;46:974-82.