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Career Choice of Health Workforce in Khyber Pakhtunkhwa

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Abstract

Planning a workforce in the health sector of Khyber Pakhtunkhwa requires assessment of demand and supply of the healthcare services. The epidemiological mix shows the number of doctors needed in a specific field, which determines the demand for doctors in that area. This paper aims to study the supply of doctors and understand the trend of career choice of the postgraduate medical trainees, choosing different specialities. Data for this purpose is collected from Postgraduate Medical Institute (PGMI), by retrieving the doctors' records through their induction notifications, issued bi-annually. The supply of doctors is operationalized with the help of the career choice they make by opting for a particular speciality. The variables thus studied are the number of trainees inducted every year by PGMI, the number of doctors inducted against each speciality, and the gender of the doctor opting for a specific speciality. The sample consists of doctors inducted for postgraduate training from 2014 to 2019. It includes twelve induction sessions, with approximately 500 inductions in every session, depending on several variables. There are a total of 6,743 doctors that satisfy these conditions and are included in the study. The distribution of doctors is assessed using descriptive statistics, and the relationship of gender with speciality selection is tested using Chi-Square Analysis. The results show a skewed trend toward some specialities that the students have been choosing throughout the years. Simultaneously, the association of gender with the speciality selection of doctors is also empirically proven. Male students have inclination towards Medicine and Surgery, whereas females tend to choose gynaecology more than any other speciality. Similarly, Anaesthesia and Radiology are suffering due to the shortage of doctors.The paper also reports these findings in details with the annual trends for each of these specialities. It indicates that the policymakers would need to take steps to match the epidemiological demands in the future. The findings of this paper can be helpful in pre-emptively highlighting the shortage of workfoce in some specialities and their abundance in others. Various steps can be taken timely to handle the issues that can hinder service provision in the health sector, especially in the pandemic when the uncertainties are increasing.

Keywords: *Career Choice; Career Trends; Planning; Health; Workforce; Speciality Selection; Chi-square; Human Resource for Health*

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1. Introduction

Planning a workforce in the health sector is essential in providing timely healthcare services (Domagała & Klich, 2018). The number of doctors trained in a specific field of expertise should reflect the population's demand (Birch et al., 2007). Besides the number of staff, proper training, recruitment, and retention are necessary to ensure effective healthcare services. Human Resource for Health Planning emphasizes the right number of personnel available to provide the required services at the right time to the right people, and predicting future requirements and taking steps accordingly (Birch et al., 2009). Analysing the present and predicting the future would help deal with upcoming demands. Different methods can be used to forecast Human Resource for Health. O'Brien-Pallas et al. (2001) divide them into three basic categories, i.e. demand-based approach, supply/utilisation based approach and econometrics approach. The lengthy process of recruitment and training medical staff can result in long delays in healthcare management. So, to forecast the future needs of the health personnel, the current situation needs attention (Teljeur, Thomas, Kelly, & Dowd, 2010).

In Zambia, when an extreme shortage of workforce is observed by Tjoa et al. (2010), they analysed the annual entry of students in medicine and their attrition levels to identify the gap between the demand and supply of the workforce. They then suggested supplemental interventions from the government to discourage attrition and fill the supply-demand gaps in the health sector of Zambia. Several studies explore the career choice of doctors (Jabeen, Ashraf, Mahmood, Shah, & Riaz, 2018; Lambert, Smith, & Goldacre, 2017; Lambert, Smith, & Goldacre, 2018; Svirko, Goldacre, & Lambert, 2013; Zia, Abbas, Sulaiman, & Sheikh, 2017) to understand the supply trends among the health workforce. This paper studies the medical workforce supply through the number of doctors available (Birch et al., 2009) and their distribution in different fields (Ahmed, Hossain, Chowdhury, & Bhuiya, 2011). It is also noteworthy that even if demand is felt and a speciality is introduced among the students, they may not choose it for specialization. It may take years to create awareness about the importance of new fields, and then training the graduates in these specialisations may take additional time (Huda & Yousuf, 2006). A study is thus required in Pakistan, where the supply of doctors is observed that can help identify the gap in the demand for doctors in different specialities.

Human Resource for Health usually accounts for the total number of doctors and nurses available per 1000 in the population. Moreover, the doctors in a field should reflect the epidemiological mix of the diseases present in the target population (Birch et al., 2007). Forecasting the population's changing epidemiology can help determine the training and recruitment requirements of the health workforce in the future. This paper attempts to provide empirical findings regarding the number of

doctors choosing different specialities. Further research will be needed to explore the epidemiological mix in the population in order to gauge the demand of the doctors.

As each province in Pakistan is responsible for its healthcare planning, they induct the doctors through their autonomous institutions. This study focuses on the doctors in Khyber Pakhtunkhwa and their career choices concerning their speciality selection. The frequency of doctors opting for different specialities is studied, followed by the trend throughout the years. Chi-Square test of association explores any relationship between the gender of the doctors and their choice of speciality. The trends remain the same throughout the years, with some anomalies duly explained in the paper. In the end, the results are discussed critically to comment on the reasons behind the career choices of the doctors.

2. Literature Review

Several researchers have studied the distribution of doctors in different specialities, and it is evident that doctors around the world prefer some specialities over others. Similarly, urban surroundings attract a more significant number of doctors as compared to rural areas. Some of these studies are presented in Table 1 that show the speciality selection of doctors. Some of the specialities are over-saturated as many graduates choose to specialise in them. Others face a shortage of doctors because not enough doctors decide to specialise in them. The specialities that are favourites among doctors are termed as favoured specialities, and those that enough doctors do not choose are named Unfavoured specialities in the table (Shahab, Hussain, Inayat, & Shahab, 2013). The studies are conducted in different countries that show the situation of different types of health systems. It is interesting to note that Surgery and Medicine are favourite among doctors all over the world. The Unfavoured specialities, on the other hand, differ in many countries. In NHS, General Practice is facing a shortage, and in Pakistan, it is the non-clinical specialities like Radiology and Basic Sciences.

The choice of the speciality may be related to the location of the practice of the

Sr. No.	Favoured specialities	Unfavoured Specialities	Country of Study	References
1.	Surgery & Allied followed by internal medicine	Ophthalmology, Laboratory medicine	Pakistan	(Rehman et al., 2011)
2.	Medicine and Allied followed by Surgery and Allied	Non Clinical specialities like Radiology and Basic Sciences	Pakistan	(Zia et al., 2017)

3.	Medicine and surgery are the top preferred specialities among males; for females, it is Gynaecology and Paediatrics	Neurosurgery, Pulmonology, Urology, Ophthalmology, Orthopaedics	Pakistan	(Jabeen et al., 2018)
4.	Surgery and Radiology are the most popular among UK graduates	Psychiatry; Paediatrics	England	(Fazel & Ebmeier, 2009)
5.	Hospital Surgical and Medical specialities	General Practice is under-represented in NHS	United Kingdom	(Svirko et al., 2013)
6.	General Surgery, Paediatrics, Internal Medicine, Obstetrics and Gynaecology	Legal Medicine, Infectious diseases, Paediatric Surgery, Otorhinolaryngology	11 Countries of Latin America	(Ng-Sueng et al., 2016)
7.	Surgery; Internal Medicine; General Practice	Non Specialist Hospital Practice, Rehabilitative Medicine, Public Health Medicine, Occupational Medicine	Australia	(Kaur, Carberry, Hogan, Roberton, & Beilby, 2014)
8.	Surgery, Internal Medicine, Paediatrics, Orthopaedics	Anesthesiology, Radiology, Emergency Medicine	Saudi Arabia	(Mehmood, Kumar, Al-Binali, & Borleffs, 2012)
9.	Surgery, Medicine, Paediatrics	Anaesthesiology	Sudan	(Ali et al., 2015)
10.	Paediatrics, General Surgery, Cardiology	Public Health, Rheumatology, Haematology	Kuwait	(Al-fouzan, Al-ajlan, Marwan, & Al-saleh, 2012)
11.	Surgery, Paediatrics, Obstetrics and Gynaecology, Internal Medicine	Pathology, Anaesthesia, ENT	Nigeria	(Ossai et al., 2016)

doctor. For instance, the doctors who prefer to work in rural areas would choose General Practice to serve the community at large. Those practising in urban areas would choose specialities to be accommodated in the hospitals. The choice of location to practice is also associated with the doctor's background, i.e. if a doctor is from a rural or urban background, they may choose to work in a similar, rural or urban, setting (Stagg, Greenhill, & Worley, 2009).

Attaur-Rasool, Hasan, and Bhatti (2015) provided empirical evidence from

Pakistan, who reported 16.4% among 256 respondents as willing to work in rural areas of the country. The rest, 83.6%, wanted to work in the city. Consistent with the literature, as most doctors wanted to serve in cities, only 7.8% of doctors were interested in primary care. Factors affecting the decision of working in rural areas are divided into four categories, i. Personal and lifestyle factors (being a male, rural background, proximity to family, lower socio-economic background indicate a higher chance of working in rural vicinities; lack of educational facilities, housing, recreational facilities, and sense of isolation indicate lower chance of working there); ii. Medical training and curriculum factors (community-based curriculum encourage practice in rural areas); iii. Medical School-related factors (selection of students from rural areas, affordable fee structure); and iv. policy-related factors (shorter contracts, scholarships to encourage serving in the rural area). These findings are from multiple lower-income and upper-middle-income countries (Budhathoki, Zwanikken, Pokharel, & Scherpbier, 2018).

The characteristics of students inclined towards surgery are studied across eight countries, and it is noted that the students were primarily male and single except Austria and Germany, where a considerably higher number of female students were interested in the field (Baschera, Taylor, Masilonyane-Jones, Isenegger, & Zellweger, 2015). Following the business world example, researchers have suggested improving the role of women in medicine (Reed & Buddeberg-Fischer, 2001). Flexible hours or part-time options can be helpful to females who may have to balance work with other responsibilities. The absence of such possibilities drives females towards the private sector from public sector practice in Pretoria (Kruger & Bezuidenhout, 2015). Evidence from Sweden, however, shows no segregation in speciality preference between males and females. The only difference is seen in the number of working hours correlating with work-life balance for women and not for men. This homogeneity of gender representation in the workforce is not observed in many countries and indicates gender equality in Sweden healthcare system; it can be an excellent example to follow their gender-friendly policies (Diderichsen, Johansson, Verdonk, Lagro-Janssen, & Hamberg, 2013). Personal elements like gender, ethnicity and social background are also associated with selecting different specialities (Santana & Chalkley, 2017).

In comparison, evidence from the Psychiatry department shows no such association between the personal traits and their decision to work in the field (Farooq et al., 2014). Figure 1. shows that women tend to be more people-oriented and prefer a plan-able career trajectory. It may be because female doctors assume additional responsibility to take care of their families and their jobs (Sturesson, Palmgren, Öhlander, Nilsson, & Stenfors, 2021).

Surgery is a male-dominated speciality in South Africa, which may affect the female

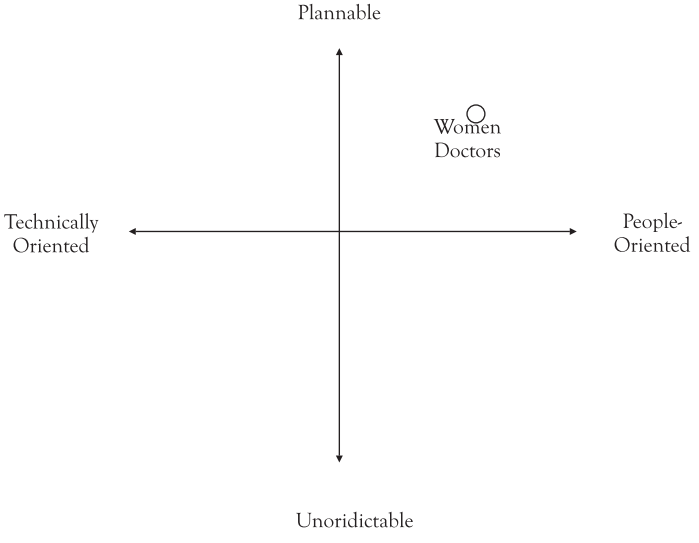

Figure 1: Considerations Of Female Doctors While Choosing A Career (Source: Elston, 2009)

trainees' training experience. There is evidence of bullying from male colleagues and patients they have treated (Umoetok, Van Wyk, & Madiba, 2017). Females are in low proportion in surgery in Norway as well, and the reasons are complex, as they do not seem able to manage childcare with long working hours, "nights on call", and heavy workload in surgery. The disparity in the number of females is not related to a lack of interest of females in surgery but to the difficulty of completing their training. On the other hand, when the lady doctors shift to Gynaecology and Obstetrics, which have a similar training structure as surgery, it does not seem to affect the influx of women (Gjerberg, 2002). As surgery is a "male dominant" speciality, gynaecology and Obstetrics can be called a "female dominant" speciality. This gender disparity in specialities is also evident in Japan (Kawamoto et al., 2016) and India (Devanand, Anuja, Sangeetha, Thanalakshmi, & Doss, 2021). Lambert, Goldacre, and Turner (2006) report that although Gynaecology has increased opportunities, not many males apply for training in the field. Due to many females in Gynaecology, women might feel at ease while managing their work-life balance. It needs to be studied further to realise the reason for such an attitude of women, i.e. in the gynaecology department, they tend surgery like working hours but cannot achieve the balance elsewhere (Levaillant, Levaillant, Lerolle, Vallet, & Hamel-Broza, 2020).

The literature shows that there is a disparity in the demand and supply of doctors around the world. Similarly, some specialities are over-saturated with trainees, while others are underrepresented. In different regions, these specialities differ depending

on several factors that are context-specific. Therefore, an empirical study needs to be conducted to explore the frequency of doctors in different fields. If the trends of such behaviour are identified, the future can be forecasted, and the policymakers can be assisted with relevant interventions (Childs-Kean, Edwards, & Smith, 2020).

This paper attempts to fill in these gaps identified in the literature. In Khyber Pakhtunkhwa, the factors studied empirically are the supply of doctors, their distribution in different specialities, the association of gender of doctors with their speciality selection through the following hypothesis, and the resulting trends of these factors:

In the next section the hypothesis is tested whether any such relationship exists or not:

H_0 *There is no association between gender and speciality choice of a doctor*

H_1 *There is a significant association between gender and speciality choice of a doctor*

The literature indicates that the gender of the doctors may have an association with the doctors' speciality selection. It is explored in the next sections for any association between the two.

3. Methodology

The supply of the doctors in the field is operationalized with the help of the number of trainees inducted every year by the PGMI, the number of doctors inducted against each speciality (Liu, Goryakin, Maeda, Bruckner, & Scheffler, 2017; Maisonneuve, Pulford, Lambert, & Goldacre, 2014). The postgraduate trainees are the population of interest as they represent the doctors specialising in a specific area. The data for these doctors is collected from Postgraduate Medical Institute (PGMI) of KP, by retrieving the doctors' records from their induction notifications following Koehler and McMenamin (2015). The number of doctors inducted is extracted from the bi-annual notifications of induction obtained from PGMI. These notifications are made public to keep the transparency during the induction process, so it was not an ethical issue to access those records and obtain the required information.

The sample is drawn using the Simple Random Sampling technique. Details about the doctors are collected from PGMI, and the sample constitutes doctors inducted for postgraduate training from 2014-2019. It includes twelve induction sessions. In every session, approximately 500 doctors are inducted depending on slots availability and candidates' ability. There are a total of 6,743 doctors that satisfy these conditions and are included in the study. Several statistical techniques are used to analyse the data like descriptive statistics calculate frequencies for the number of doctors against each

speciality and the percentage of doctors in every field. Chi-square analysis tests the association between gender and the speciality choice of doctors. Some of the specialities have a minimum number of doctors in them, whereas others have several doctors selecting these fields. Cross-tabulation between the fifty-four specialization areas and two genders, Male and Female, may not yield reliable results. Some categories had zero females in them, whereas others would have them in hundreds, which sometimes leads to results showing association where one may not exist. So the specialities are categorized into seven categories, i.e. Elderly Specific specialities, Feminine issue specialities, Operative Specialties, Medicine and Allied specialities, Diagnostic Specialties, General Medicine, and Emergency Medicine. These specialities are categorized after discussion with a medical expert. This categorization is based on the type of diseases and patients the doctor has to treat. It solved the issue of the extreme cases of the frequencies in some specialities. After the categorization, cross-tabulation between the number of doctors in these categories and the gender of doctors is carried out, and Chi-Square analysis is performed to test the hypothesis of an association between the two variables, as theory suggests (Kruger & Bezuidenhout, 2015; Ng-Sueng et al., 2016; van Tongeren-Alers et al., 2011). Finally, the trend of selection of speciality and sub-speciality among doctors against time is checked. If any anomalous behaviour is noted, PGMI is contacted for a follow-up to confirm the reasons behind the anomaly. The research methodology used in the paper is summarized in Table 2.

Table 2: Summarizing Empirical Plan for the Research Objectives

Objective	Approach	Population	Sample	Data collection Instrument	Variables	Analysis
To determine the distribution of healthcare employees in different departments	Quantitative	Postgraduate Trainees	6,743 trainees Inducted during 2014-19 drawn by simple random sampling	Archival Data	Number of doctors inducted in a speciality and their gender	Descriptive Statistics Chi-Square test of Association

4. Results

Results from the analysis are presented in the following sections, each focusing on a specific analytical technique. These include simple frequency calculation, chi-square analysis, trend identification, anomalies in the trend, and the justifications

for those anomalies.

4.1.Speciality selection by postgraduate medical trainees

A total of 6,734 doctors are observed concerning their choice of speciality in FCPS-II. The number of doctors choosing a specific field is presented in the form of the frequency presented in Table 3. The percentage of each speciality is also shown in the table; it helps us compare each speciality's representation among the doctors. The most frequently selected specialities are Medicine and Allied Specialties (17.5%), Gynaecology and Obstetrics (15%), General Medicine (13.7%) and Surgery and Allied specialities (13.6%)

Tabel 3: Speciality Choices of Doctors Between 2014-2019

Sr. No.	Speciality	Frequency	Percent	Valid Percent	Cumulative Percent
1.	Anaesthesia	46	.7	.7	.7
2.	Anatomy	1	.0	.0	.7
3.	Breast Surgery	1	.0	.0	.7
4.	Cardiac Anaesthesia	1	.0	.0	.7
5.	Cardiac Surgery	1	.0	.0	.8
6.	Cardiology	17	.3	.3	1.0
7.	Chemical Pathology	1	.0	.0	1.0
8.	Clinical Cardiac Electro-physiology	11	.2	.2	1.2
9.	Comm. Medicine	8	.1	.1	1.2
10.	Critical Care	1	.0	.0	1.3
11.	Dentistry	180	2.7	2.7	4.0
12.	Dermatology	10	.1	.1	4.1
13.	Diagnostic Radiology	33	.5	.5	4.6
14.	Emergency Medicine	12	.2	.2	4.8
15.	Endocrinology	31	.5	.5	5.3
16.	ENT	100	1.5	1.5	6.8
17.	Forensic Medicine	1	.0	.0	6.8
18.	G. Medicine	920	13.7	13.7	20.4
19.	G. Surgery	578	8.6	8.6	29.0
20.	Gastroenterology	6	.1	.1	29.1

21.	Gynae & Obst.	1008	15.0	15.0	44.1
22.	Haematology	62	.9	.9	45.0
23.	Histopathology	2	.0	.0	45.0
24.	Interventional Cardiology	4	.0	.0	45.1
25.	Med. & Allied	1180	17.5	17.5	62.6
26.	Medical Oncology	4	.1	.1	62.7
27.	Microbiology	3	.0	.0	62.7
28.	Nephrology	13	.2	.2	62.9
29.	Neurology	5	.1	.1	63.0
30.	Neurosurgery	7	.1	.1	63.1
31.	Operative Dentistry	40	.6	.6	63.7
32.	Ophthalmology	123	1.7	1.7	65.4
33.	Oral & Maxillofacial Surgery	130	1.9	1.9	67.4
34.	Orbit & Ocuplasty	1	.0	.0	67.4
35.	Orthodontics	55	.8	.8	68.3
36.	Orthopaedics	21	.3	.3	68.6
37.	Paediatric Cardiology	4	.0	.0	68.6
38.	Paediatric Neonatology	1	.0	.0	68.6
39.	Paediatrics	678	10.1	10.1	78.7
40.	Paediatric Ophthalmology	3	.0	.0	78.7
41.	Pathology	17	.3	.3	79.0
42.	Periodontology	8	.1	.1	79.1
43.	Plastic Surgery	7	.1	.1	79.2
44.	Prosthodontics	81	1.2	1.2	80.4
45.	Psychiatry	65	1.0	1.0	81.4
46.	Pulmonology	5	.1	.1	81.5
47.	Radiology	251	3.7	3.7	85.2
48.	Renal Transplant	1	.0	.0	85.2
49.	Rheumatology	9	.1	.1	85.3
50.	Surg. & Allied	915	13.6	13.6	98.9
51.	Thoracic Surgery	1	.0	.0	98.9
52.	Urology	35	.5	.5	99.5
53.	Vascular Surgery	1	.0	.0	99.5

54.	Vitreoretina	35	.5	.5	100.0
	Total	6734	100.0	100.0	

Some specialities are more frequently chosen as compared to others. It can be seen clearly with the help of a bar chart presented next in Figure 2. The chart reiterates the previous findings, i.e. Medicine and Allied Specialties are the most popular choice among postgraduate trainees. Some specialities have attracted only a single trainee in six years and twelve inductions. It needs further research to understand the deficiencies in these fields and the gap created in the required human resources.

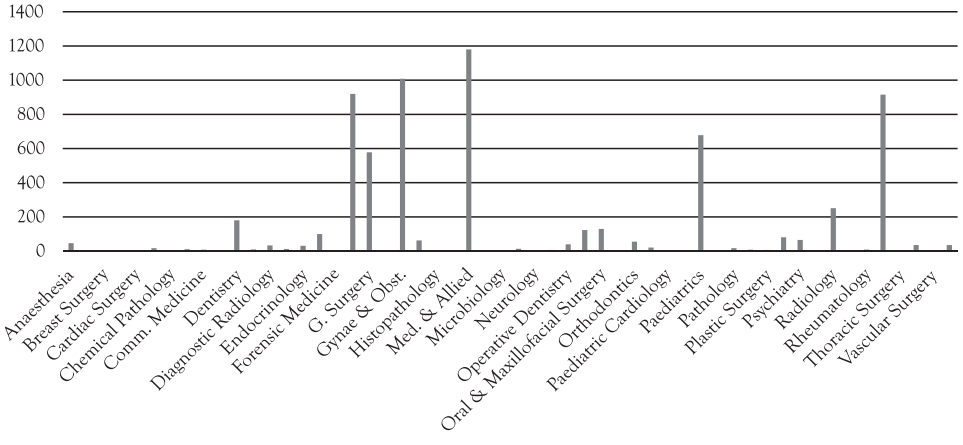

Figure 2: Bar Chart: Frequency of Speciality Selection

4.2. Gender distribution of postgraduate medical trainees

The doctors applying for postgraduate medical training were divided into male and female doctors. The gender distribution of the trainees is also uneven, i.e. males are almost double (4,211) the number of females (2,523) qualifying for postgraduate training. A pie chart can best serve the purpose of visual representation of such division. It can help us visualize the division of doctors into two groups and compare the share of one group with the frequency of the other. Figure 3 shows the aggregate distribution of male and female trainees in the period of six years. Further division of the genders per induction is demonstrated with the help of the trend line in Figure 4.

The line chart in Figure 4 presents the trend of gender distribution in each induction from January 2014 to July 2019. Males mostly outnumber female trainees in the placements. However, the detailed trend shows that there have been instances when females either came at par (Jan-19) with male trainees or even exceeded them (July-17). The most significant gap between the two genders can be observed in July-16 and July-19, when the overall number of trainees increases compared to other periods.

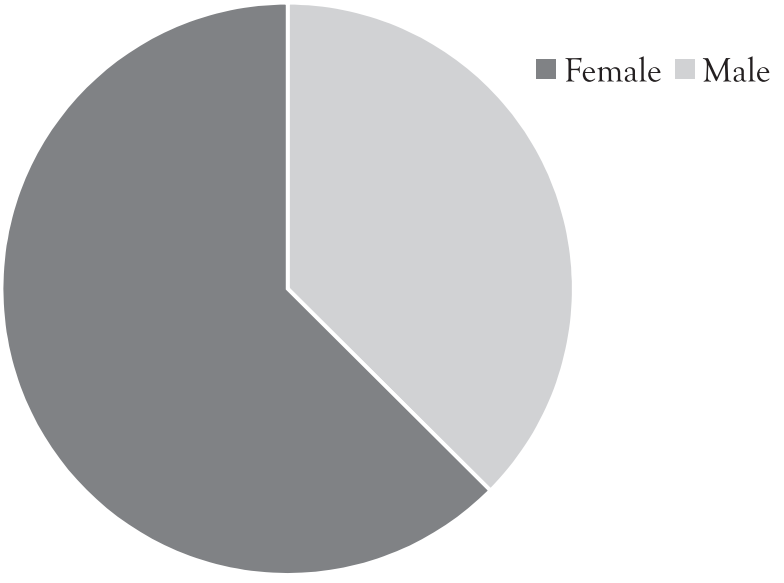

Figure 3: Pie Chart: Division by Gender

It is encouraging and points out that the gender gap can be decreased with the help of policy interventions if the need is felt in the future.

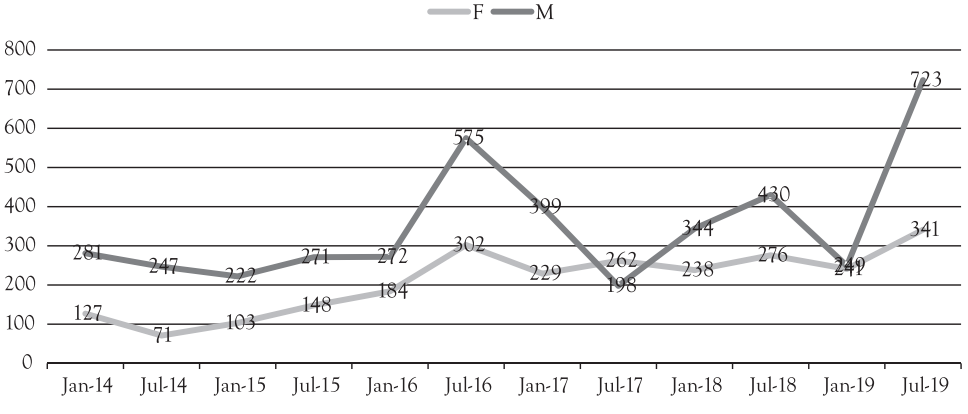

Figure 4: Line Chart: Gender Division Per Induction

4.2.1. Association of gender with speciality selection

The role of gender is further explored by studying its association with the speciality selection of doctors. This is done with the help of Chi-Square analysis, which helps find out the association between qualitative variables. The gender of the doctor and their selected specialities are both qualitative variables, so Chi-Square analysis can be used in this situation. The summary of the number of cases studied for this purpose

is presented in Table 4. Six thousand seven hundred thirty-four doctors are studied to investigate the association between the sex of the doctor and their preferred specialities.

Table 4: Case Processing Summary of Association Between Gender and Speciality Selection

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * Speciality	6734	100.0%	0	0.0%	6734	100.0%

Table 5 presents the results for the Chi-Square test of association between the gender and speciality selection of doctors. This was done for all 38 specialities previously mentioned in Table 3. The test shows a highly significant association between the two factors. It means that the choice of doctors to choose a particular field in the medical profession is highly influenced by their gender. The p-value of Pearson Chi-square is 0.000, which is below 0.01. It shows a highly significant association between the variables. The results also show that a large number of cells (59.7%) cells had less than a count of 5. It is mainly because there were many specialities that doctors did not select in different inductions. It was also noted that female doctors specifically chose a few specialities and were not evenly distributed throughout the 38 specialities; male doctors, comparatively, were more evenly distributed.

Table 5: Chi-Square Tests for Association Between Gender and Speciality Selection

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2618.655a	66	.000
Likelihood Ratio	2918.715	66	.000
N of Valid Cases	6734		

a. 80 cells (59.7%) have expected count less than 5. The minimum expected count is .37.

The misdistribution of female doctors in different specialities as indicated by cross-tabulation was confirmed with the help of the Bar Chart in Figure 5, which divides the doctors into two categories based on their gender and then plot them based on their preference of speciality. The observation is confirmed here, with females mostly choosing one area over others and males choosing several specialities. It may affect the results of the Chi-Square test of association because some specialities have zero female trainees. In contrast, others have a large number of females skewing the results artificially.

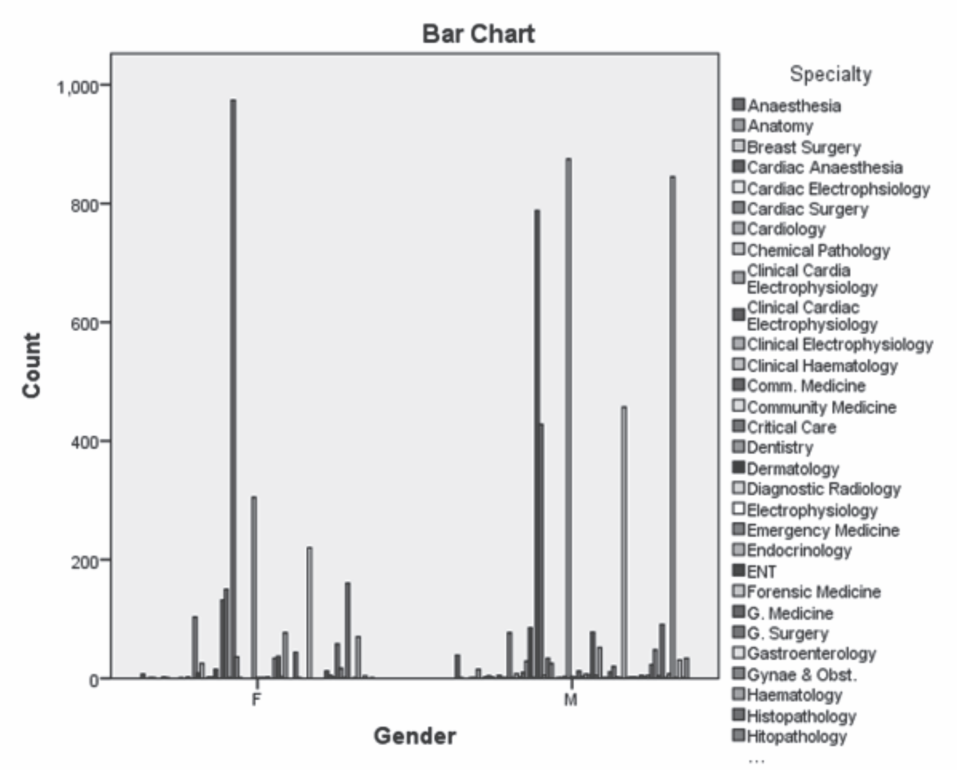

Figure 5: Bar Chart of Gender to Department Division

4.3. Trends in speciality choice of doctors

Accounting for the misdistribution of gender in different specialties, the specialities were divided into different categories. This categorization is based on the suggestion of a medical expert who suggested that different specialists have to deal with different types of patients, working hours, and environment. Based on these differences, seven categories are drawn up to club the findings and strengthen the claim that some specialities are more lucrative than others for medical students. These categories are divided as presented in Table 6.

Table 6: Categorized Departments

Category	Departments
Elderly Specific (Including Cardiac and renal specialities)	Cardiac Anaesthesia; Cardiac Electrophysiology; Cardiac Surgery; Cardiology; Clinical Cardiac Electrophysiology; Clinical Cardiac Electrophysiology; Clinical Electrophysiology; Electrophysiology; Intervention Cardiology; Interventional Cardiology; Paediatrics Cardiology; Paediatric Cardiology; Thoracic Surgery, Urology; Nephrology

Feminine issue specialities	Breast Surgery; Gynaecology & Obstetrics
Operative Specialities	Anaesthesia; Dentistry; Oral & Maxillofacial Surgery; Oral & Maxillofacial Surgery; Operative Dentistry; Orthodontics; Periodontology; Prosthodontics; Surg. & Allied; Plastic Surgery; Renal Transplant; Vascular Surgery; Orthopaedics; Neurosurgery, General Surgery
Medicine and Allied	Dermatology; ENT; Gastroenterology; Endocrinology; Med. & Allied; Medical Oncology; Orbit & Ocuplasty; Ophthalmology; Ophthalmology; Vitreoretina; Paeds Ophthalmology; Paeds Ophthalmology; Neurology; Pulmonology; Paediatric Neonatology; Paediatrics; Rheumatology; Psychiatry
General Medicine	General Medicine; Community Medicine; G. Medicine
Diagnostic Specialities	Chemical Pathology; Clinical Haematology; Diagnostic Radiology; Forensic Medicine; Haematology; Histopathology; Histopathology; Radiology; Microbiology; Pathology
Emergency Medicine	Emergency Medicine; Critical Care

With these categories, the Chi-Square test of Analysis was repeated to confirm the association between the gender of the doctor and their choice of speciality. The results of the analysis are presented in the following tables. Table 7 shows the cross-tabulation between the speciality categories and the gender of the doctors. The distribution is now more apparent in different specialities. Some categories have had more than a thousand trainees through the study period, whereas the others have less than 50 doctors.

Table 7: Specialities*Gender Crosstabulation to Confirm Association between Gender and Speciality Selection

Count		Gender		Total
		Female	**Male**	
Specialties	Elderly Specific	8	77	85
	Feminine issue specialities	975	34	1009
	Operative Specialities	399	1084	1483
	Med and Allied	618	1653	2271
	Diagnostic Specialities	237	133	370
	General Medicine	283	1220	1503
	Emergency Medicine	2	11	13
Total		2522	4212	6734

After the categorization of specialities, the Chi-Square analysis for the association between gender and speciality selection by doctors for postgraduate medical training is presented in Table 8. The results are still highly significant. P-value is still less than 0.01, which indicates a highly significant association between the two variables under study, i.e. gender of the doctor and their choice of speciality.

Table 8: Chi-Square Tests to Confirm Association Between Gender and Speciality Selection

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2046.738a	9	.000
Likelihood Ratio	2222.962	9	.000
N of Valid Cases	6734		

a. 3 cells (15.0%) have expected count less than 5. The minimum expected count is .37.

Descriptive statistics hinted that the gender of a doctor would play a role in their selection of speciality. This was tested with the help of Chi-Square analysis to realize if there is an association between the variables. The association was proven significant in the first phase of analysis, but the results were not statistically reliable as the number of empty cells was too many for different specialities. Such a large number of empty cells may have led us to believe in an association to exist, which may not be there in the first place. Therefore, the specialities were divided into different categories and based on the categorization, Chi-Square analysis was repeated for the data. The second test confirmed the findings of the first phase of the test, and the variables were confirmed to have a highly significant association with each other.

The cross-tabulation between gender and speciality categorization confirmed the findings of the previous tests and descriptive statistics. Female doctors tend to choose Gynaecology and Obstetrics more frequently, whereas male doctors avoid going into these specialities. Similarly, males are more prone to evenly divide among other specialities of their choice, i.e. Medicine and Allied specialities, Operative specialities and even General medicine. The trend is such that males usually outnumber females and tend to choose specialities that are not gender-specific like Gynaecology. In contrast, females would mostly choose those specialities where there are many other females already.

The distribution of doctors based on this categorization is also presented in the form of a Stacked Column chart in Figure 6. It shows the distribution of doctors in each category of specialization based on the inductions in the study period. There are twelve inductions in six years (2014-19), with each round in January and July. The pattern of doctors selecting different specialities remain the same, five categories remain popular among students, and the other four remain unpopular throughout

the six years. Medicine and allied, operative specialities, General Medicine, Feminine issue specialities (Gynaecology and Obstetrics), and Diagnostic specialities remain the most favoured specialities in this order.

It is also notable that doctors qualifying for training remain within eight hundred, but there are two abnormally high inductions in July 2016 and July 2019. The concerned authority for inductions was contacted to determine the reason for these unusually high inductions compared to other periods. It was revealed that the Chief Minister office issued a directive in these periods to induct doctors in the entire country from the payroll of Postgraduate Medicine Institute, Peshawar. The institute is mainly responsible for the provincial allocation of trainees and other hospitals with agreements. Still, under this directive, the number of inductions increased, and the data showed abnormally high numbers compared to different periods. It was a politically motivated decision, so it was not probed further.

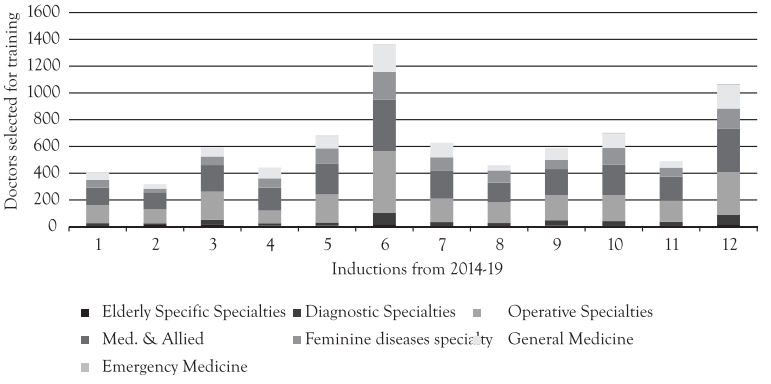

Figure 6: Stacked Column Chart: Inductions in Specialties

This trend is further explored with the help of the Line Chart in Figure 7. Every specialization category is drawn against the number of doctors selecting the speciality in each induction. It further clarifies the trend of selection of favourable specialities. Medicine and Allied Specialties and operative specialities are the two most popular categories among students. Mostly the students selecting medicine outnumber the students choosing surgical specialities.

The significant difference occurs again in July 2016, where the numbers of students selecting surgical specialities surpass those who choose Medicine. It may indicate that surgical specialities may be more popular throughout the country than in the province of our interest, i.e. Khyber Pakhtunkhwa. Similarly, Gynaecology and General Medicine are also almost equally popular among students, surpassing the others at different inductions. The other three categories remain lower than these four major categories.

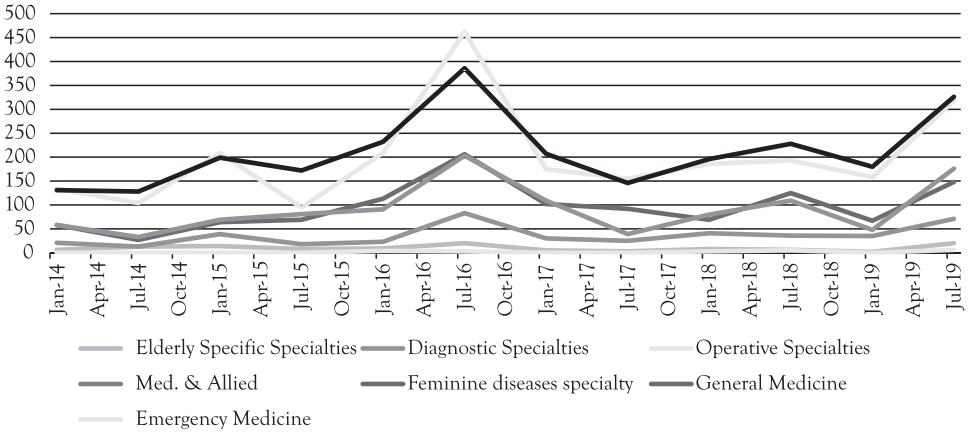

Figure 7: Line Chart: Trend of Speciality Selection

To control for the differences observed in the trends due to the anomaly of July 2016, the observations of this period are removed. A Line Chart is presented again for the remaining data in Figure 8. The popularity of Operative Specialties seems to be overemphasized in the previous chart because of the anomalous observations of July 2016. As the data is removed and the Line chart is redrawn, Medicine and Allied specialities are the most favoured specialities among the graduates. The surgical specialities are getting near them in popularity in only some periods. Similarly, Gynaecological specialities and General Medicine also seemed to be over projected in terms of their popularity. They seem to be chosen more frequently, and the choice of Diagnostic specialities is also increasing.

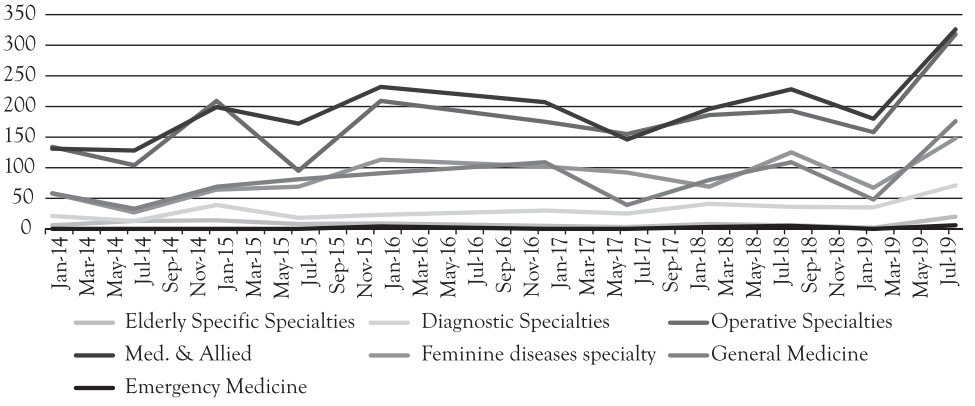

Figure 8: Line Chart: Trend of Speciality Selection

Medicine and Allied specialities are the most selected speciality category among doctors opting for postgraduate medical training. It was observed that the specialities were divided into two subgroups, group A and group B, by PGMI. The division of these subgroups is presented in Table 9.

Table 9: Subgroups of Medical and Surgical Specialties

	Group A	Group A
Medicine and Allied	Cardiology	Cardiology
	Pulmonology	Pulmonology
	Nephrology	Nephrology
	Neurology	Neurology
Surgery and Allied	Neurosurgery	Neurosurgery
	Orthopaedics/Trauma	Orthopaedics/Trauma
	Plastic Surgery	Plastic Surgery
	Urology	Urology

As presented the division of subgroups in each speciality, their frequency of selection is shown in Table 9. It is clear that in Medicine, group B is more popular with people leaning towards Cardiology, Dermatology, Gastroenterology, and Medical Oncology. On the other hand, in surgical specialities, group A is more prevalent among doctors, which include Neurosurgery, Orthopaedics, Plastic Surgery and Urology.

Table 10: Frequency of Selection of Subgroups in Medical and Surgical Specialties

	Group A	Group B	Unassigned	Total
Medicine and Allied	309	570	301	1180
Surgery and Allied	567	128	220	915

The results of Table 10 presenting the frequency of selection of subgroups in medical and surgical specialities is also shown visually in the form of Clustered Column Chart in Figure 9. There are three subgroups, Group A, B, and unassigned. In the data retrieved before 2015, the allocation of the subgroup was not done at the time of speciality selection. It was not available for this research, which is also presented here as "unassigned." Those students would also have selected any of the subspeciality shown in Table 9 in the latter part of their training.

This data points again towards misdistribution of Human Resource in different departments. Even within the medical and surgical specialities, students are leaning more towards one subgroup, while others may face shortages.

5. Discussion

Throughout the literature, the popular fields attract a more significant number of doctors compared to other areas. The attractive fields may differ from country to country. In Pakistan, Surgery and Medicine were among the most popular speciali-

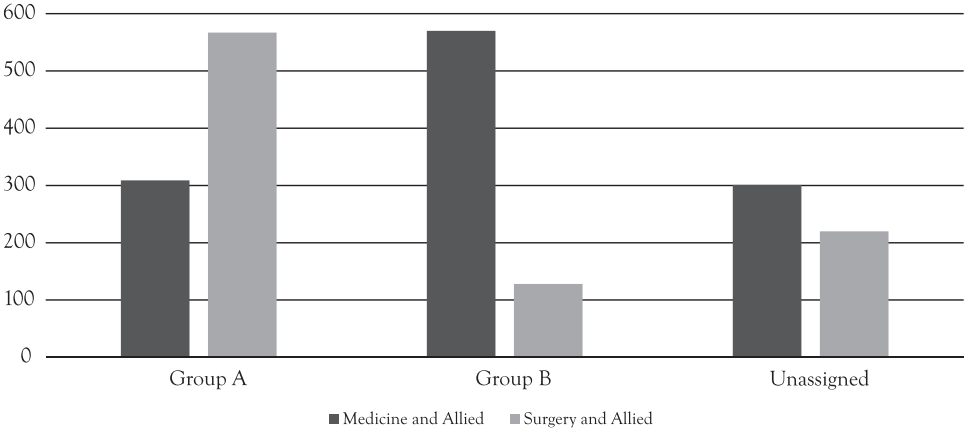

Figure 9: Clustered Column Chart: Selection of Subgroups in Speciality

ties. Gynaecology and Obstetrics followed these two in popularity. However, when checked in detail, Gynaecology and Obstetrics attracted female doctors more than male doctors. There are hundreds of inductions in these fields every year.

On the other hand, there has been only one inductee in the fields like Forensic Medicine, Critical care, Breast Surgery etc., from 2014-19. That confirms the findings of Ossai et al. other studies reported in the literature review. Around the world, the trend is such that men favour Surgery and Medicine over different fields and women choose Gynaecology (Jabeen et al., 2018).

The division of gender-based speciality selection is studied in detail. The number of males surpasses females throughout the induction tenures except in June 2017 and January 2019. Among twelve induction periods, men have always exceeded women in the field of medicine. Chi-Square analysis is conducted to test the hypothesis that there is no relationship between gender and speciality selection to confirm the association of gender with the choice of speciality. The hypothesis is rejected with highly significant results, showing a statistically significant relationship between the gender of the doctor and their choice of selection of medical speciality. It points out that there would be uneven distribution in different fields of medicine. Some areas may be male dominant, and females may saturate others. It could also be interpreted as hindering for the opposite gender to enter the specific field. Reasons behind such a divide need to be explored, and interventions should be designed to manage the division of genders across different specialization.

In order to account for the uneven division between the specialities, they are divided into different categories after consulting with specialists in the medical field. It helped to increase the power of statistical analysis and remove the doubts that the

specialities with zero female doctors, like Forensic Medicine and Critical Care, would affect the analysis. Again Chi-Square Analysis confirmed the findings from the previous analysis. The relationship between gender and speciality selection remained highly significant. Even though the working hours of both Surgery and Gynaecology are very demanding. Females seem to be struggling in surgery to manage the workload and balancing their personal life, while in gynaecology, they surf better (Gjerberg, 2002). The factors that affect a woman's career choice are interest, flexibility, job security, and women friendliness (Lawrence, Poole, & Diener, 2003). When gender segregation is studied for the difference between the choice of speciality, it is reported that females liked to combine care with work, whereas their male counterparts were more likely to opt for career-oriented opportunities (van Tongeren-Alers et al., 2011). The extra time spent on leave due to maternity and pregnancy leave gets females penalised in the medical profession (Ng-Sueng et al., 2016).

Clubbing together the specialities also helped confirm the trend of doctors opting for Surgical or Medical Specialities throughout the years. Even within these specialities, some areas are more popular than others. Group A (Neurosurgery, Orthopaedics, Plastic Surgery, Urology) in Surgery is more popular than Group B (Cardiovascular Surgery, Orthopaedics, Paediatric Surgery, Thoracic Surgery). In Medicine specialities, students prefer Group B (Cardiology, Dermatology, Gastroenterology, Medical Oncology) over Group A (Cardiology, Pulmonology, Nephrology, Neurology). It was confirmed upon further investigation that some specialities are facing a shortage of trainees. They have been officially declared as "unattractive specialities", and special incentives have been allocated. The incentives are both in the form of an extra stipend and allocated slots to these specialities. They are: Critical Care Medicine, Anaesthesia, ENT and its subspecialties, Subspecialties of Ophthalmology, Psychiatry, Sub-specialty of Paediatrics, Microbiology, Histopathology, Nephrology, Thoracic Surgery, Rheumatology, Radiotherapy, Rehabilitation Medicine, and Periodontology. Resultantly, these specialities, Anaesthesia (46), Psychiatry (65), Nephrology (13), and ENT (100), have attracted some additional trainees, when all the rest have not even attracted ten trainees in the previous six years. This may need to be looked into further by the policymakers.

Although many students choose surgery, few anaesthetics are available to assist the surgeons in the Operation Theatre. To handle the shortage, the authorities have allowed some technicians to perform the procedure of Anaesthesia during operations. This move was intended to cover up the lack of Anaesthetics. However, it negatively affected the area among students who did not want to be associated with technicians in the field. In the UK, this shortage is faced in General Practice (Svirko et al., 2013), and specialities are favoured over General Practice. The underlying reasons behind

this distribution need to be studied in the future to find out why doctors choose a particular speciality over others.

6. Conclusion

The results show that skewness in favour of some specialities is the trend throughout the years. Several doctors choose similar specialities again and again, and the underrepresented specialities suffer from shortages. It would hinder the process of providing healthcare services to the masses that would require the right number of people, for the right job, at the right time. Preemptive planning is necessary for the health sector, with interventions targeted at fixing the gap between the demand and supply of the health workforce.

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Practical implications of this study include highlighting the areas that need to be addressed by the policymakers, e.g. Anaesthesia is understaffed. Incentives can be introduced to attract the medical staff towards these specialities. These can be financial incentives, growth opportunities, flexible timings, mentoring etc. (Aslam & Mujtaba, 2015; Koussa, Atun, Bowser, & Kruk, 2016; Yang et al., 2019). Future research is necessary to identify the reasons behind this shortage and address the issues to help the future graduates choose the area. Similarly, the trend of women choosing Gynaecology over other specialities also needs investigation. The reasons behind their comfort in one department as compared to others should be studied in detail, and policies can be designed to have a well-rounded workforce in the future.

References

Ahmed, S. M., Hossain, M. A., Chowdhury, A. M., & Bhuiya, A. U. (2011). The health workforce crisis in Bangladesh: shortage, inappropriate skill-mix and inequitable distribution. *Human Resources for Health*, *9*(1). https://doi.org/10.1186/1478-4491-9-3

Al-fouzan, R., Al-ajlan, S., Marwan, Y., & Al-saleh, M. (2012). Factors affecting future specialty choice among medical students in Kuwait Factors affecting future specialty choice among medical students in Kuwait. *Medical Education Online*, *17*(1). https://doi.org/10.3402/meo.v17i0.19587

Ali, A., Ahmed, M., Khan, W. S., Abdelrazig, Y. M., Elzain, Y. I., Bakri, O., ... Adam, I. (2015). Factors considered by undergraduate medical students when selecting specialty of their future careers. *Pan African Medical Journal*, *20*(102), 1–6. https://doi.org/10.11604/pamj.2015.20.102.4715

Aslam, F., & Mujtaba, M. (2015). Factors influencing specialty selection among doctors working in Punjab, Pakistan. *Rawal Medical Journal*, *40*(3), 315–318.

Attaur-Rasool, S., Hasan, S., Bhatti, A. (2015) Early career intentions of newly inducted medical students in a private medical college in pakistan. *Gomal Journal of Medical Scinces, 13*(4):211–6.

Baschera, D., Taylor, E. O., Masilonyane-Jones, T., Isenegger, P., & Zellweger, R. (2015). Are Medical Students Who Want to Become Surgeons Different? An International Cross-Sectional Study. *World Journal Of Surgery*, *39*(12), 2908–2918. https://doi.org/10.1007/s00268-015-3195-1

Birch, S., Kephart, G., Murphy, G. T., Brien-Pallas, L. O., ALder, R., & Mackenzie, A. (2009). Health Human Resources Planning and the Production of Health: Development of an Extended Analytical Framework for Needs-Based Health Human Resources Planning. *Journal of Public Health Management Practice, Suppl.*, *15*(November Suppl), 56–61. https://doi.org/10.1097/PHH.0b013e3181b1ec0e

Birch, Stephen, Kephart, G., Tomblin-Murphy, G., O'Brien-Pallas, L., Alder, R., & MacKenzie, A. (2007). Human resources planning and the production of health: A needs-based analytical framework. *Canadian Public Policy*, *33*(Supplement). https://doi.org/10.3138/9R62-Q0V1-L188-1406

Budhathoki, S. S., Zwanikken, P. A. C., Pokharel, P. K., Scherpbier, A. J. (2018) Factors influencing medical students ' motivation to practise in rural areas in low-income and middle-income countries : a systematic review. *BMJ Open, 7*(e013501):1–10.

Childs-Kean, L., Edwards, M., & Smith, M. D. (2020). Use of Personality Frameworks in Health Science Education. *American Journal of Pharmaceutical Education*, *84*(8), ajpe7231. https://doi.org/10.5688/ajpe7231

Devanand, C., Anuja, A. V., Sangeetha, A., Thanalakshmi, J., & Doss, S. S. (2021). Gendered Choice of Post Graduate Speciality among Undergraduate Indian Medical Students – A Cross Sectional Study. *Annals of Romanian Society for Cell Biology*, *25*(4), 13690–13698. Retrieved from https://www.annalsofrscb.ro/index.php/journal/article/view/4492

Diderichsen, S., Johansson, E. E., Verdonk, P., Lagro-Janssen, T., Hamberg, K. (2013) Few gender differences in specialty preferences and motivational factors: a cross-sectional Swedish study on last-year medical students. *BMC Medical Education, 13*(39). https://doi.org/10.1186/1472-6920-13-39

Domaga□a, A., & Klich, J. (2018). Planning of Polish physician workforce – Systemic inconsistencies, challenges and possible ways forward. *Health Policy*, *122*(2), 102–108. https://doi.org/10.1016/j.healthpol.2017.11.013

Elston, M. A. (2009) Women and medicine: the future. London: Royal College of Physicians. Available online at <www.rcplondon.ac.uk/pubs/brochure.aspx?e=277>

Farooq, K., Lydall, G. J., Malik, A., Ndetei, D. M., Bhugra, D., & Grp, I. (2014). Why medical students choose psychiatry - a 20 country cross-sectional survey. *BMC Medical Education*, *14*(12). https://doi.org/10.1186/1472-6920-14-12

Fazel, S., & Ebmeier, K. P. (2009). Specialty choice in UK junior doctors : Is psychiatry the least popular specialty for UK and international medical graduates? *BMC Medical Education*, *9*(7), 3–9. https://doi.org/10.1186/1472-6920-9-77

Gjerberg, E. (2002). Gender similarities in doctors' preferences - and gender differences in final specialisation. *Social Science & Medicine*, *54*(4), 591–605. https://doi.org/10.1016/S0277-9536(01)00054-5

Huda, N., & Yousuf, S. (2006). Career preference of final year medical students of Ziauddin Medical University. *Education for Health*, *19*(3), 345–353. https://doi.org/10.1080/13576280600984087

Jabeen, A., Ashraf, S., Mahmood, T., Shah, S. A., & Riaz, F. (2018). Specialty Preference and the Factors Affecting it among the Junior Doctors of Wah Medical College . *Isra Medical Journal*, *10*(6), 367–370.

Kaur, B., Carberry, A., Hogan, N., Roberton, D., & Beilby, J. (2014). The medical schools outcomes database project: Australian medical student characteristics. *BMC Medical Education*, *14*. https://doi.org/10.1186/1472-6920-14-180

Kawamoto, R., Ninomiya, D., Kasai, Y., Kusunoki, T., Ohtsuka, N., Kumagi, T., & Abe, M. (2016). Gender difference in preference of specialty as a career choice among Japanese medical students. *BMC Medical Education*, *16*(288). https://doi.org/10.1186/s12909-016-0811-1

Koehler, N., & McMenamin, C. (2015). Who wants to be a GP? An examination of the Medical Schools Outcomes Database. *Focus On Health Professional Education-A Multidisciplinary Journal*, *16*(4), 38–49. https://doi.org/10.11157/fohpe.v16i4.97

Koussa, M. El, Atun, R., Bowser, D., & Kruk, M. E. (2016). Factors influencing physicians' choice of workplace : systematic review of drivers of attrition and policy interventions to address them. *Journal of Global Health*, *6*(2). https://doi.org/10.7189/jogh.06.020403

Kruger, A., & Bezuidenhout, C. (2015a). Factors influencing female doctors' career decisions at Tshwane District Hospital, Pretoria. *South African Family Practice*, *57*(1), 12–17. https://doi.org/10.1080/20786190.2014.976971

Kruger, A., & Bezuidenhout, C. (2015b). Factors influencing female doctors ' career decisions at Tshwane District Hospital , Pretoria Factors influencing female doctors ' career decisions at Tshwane District Hospital , Pretoria. *South African Family Practice*, *57*(1), 12–17. https://doi.org/10.1080/20786190.2014.976971

Lambert, T. W., Goldacre, M. J., & Turner, G. (2006). Career choices of United Kingdom medical graduates of 2002: questionnaire survey. *Medical Education*, *40*(6), 514–521. https://doi.org/10.1111/j.1365-2929.2006.02480.x

Lambert, T. W, Smith, F., & Goldacre, M. J. (2017). Trends in attractiveness of general practice as a ca-

reer: surveys of views of UK-trained doctors. *British Journal Of General Practice*, *67*(657), E238–E247. https://doi.org/10.3399/bjgp17X689893

Lambert, T. W. , Smith, F., & Goldacre, M. J. (2018). Career specialty choices of UK medical graduates of 2015 compared with earlier cohorts : questionnaire surveys. 1–7. *Postgraduate Medical Journal , 94 (1110), 191-7*https://doi.org/10.1136/postgradmedj-2017-135309

Lawrence, J., Poole, P., Diener, S. (2003) Critical factors in career decision making for women medical graduates. *Medical Education, 37*(4):319–27. https://doi.org/10.1046%2Fj.1365-2923.2003.01476.x

Levaillant, M., Levaillant, L., Lerolle, N., Vallet, B., & Hamel-Broza, J.-F. (2020). Factors influencing medical students' choice of specialization: A gender based systematic review. *EClinicalMedicine*, *28*, 100589. https://doi.org/https://doi.org/10.1016/j.eclinm.2020.100589

Liu, J. X., Goryakin, Y., Maeda, A., Bruckner, T., & Scheffler, R. (2017). Global Health Workforce Labor Market Projections for 2030. *Human Resources for Health*, *15*(1), 1–12. https://doi.org/10.1186/s12960-017-0187-2

Maisonneuve, J. J., Pulford, C., Lambert, T. W., & Goldacre, M. J. (2014). Career choices for geriatric medicine: national surveys of graduates of 1974-2009 from all UK medical schools. *Age And Ageing*, *43*(4), 535–541. https://doi.org/10.1093/ageing/aft211

Mehmood, S. I., Kumar, A., Al-Binali, A., & Borleffs, J. C. C. (2012). Specialty preferences: Trends and perceptions among Saudi undergraduate medical students. *Medical Teacher*, *34*(1), S51–S60. https://doi.org/10.3109/0142159X.2012.656753

Ng-Sueng, L. F., Vargas-Matos, I., Mayta-Tristán, P., Pereyra-Elías, R., Montenegro-Idrogo, J. J., Inga-Berrospi, F., … Da Silva-Abreu, A. (2016). Gender associated with the intention to choose a medical specialty in medical students: A cross-sectional study in 11 countries in Latin America. *PLoS ONE*, *11*(8). https://doi.org/10.1371/journal.pone.0161000

O'Brien-Pallas, L., Baumann, A., Donner, G., Murphy, G. T., Lochhaas-Gerlach, J., & Luba, M. (2001). Forecasting models for Human Resources in Health Care. *Journal of Advanced Nursing*, *33*(1), 120–129.

Ossai, E. N., Uwakwe, K. A., Anyanwagu, U. C., Ibiok, N. C., Azuogu, B. N., & Ekeke, N. (2016). Specialty preferences among final year medical students in medical schools of southeast Nigeria: need for career guidance. *BMC Medical Education*, *16*. https://doi.org/10.1186/s12909-016-0781-3

Reed, V., & Buddeberg-Fischer, B. (2001) Career obstacles for women in medicine: an overview. *Medical Education, 35*(2):139–47.

Rehman, A., Rehman, T., Shaikh, M. A., Yasmin, H., Asif, A., & Kafil, H. (2011). Pakistani medical students' specialty preference and the influencing factors. *Journal of Pakistan Medical Association*, *61*(7), 713.

Santana, I. R., & Chalkley, M. (2017). Getting the right balance? A mixed logit analysis of the relationship

between UK training doctors' characteristics and their specialties using the 2013 National Training Survey. *BMJ Open*, *7*(8). https://doi.org/10.1136/bmjopen-2016-015219

Shahab, F., Hussain, H., Inayat, A., & Shahab, A. (2013). Attitudes of medical students towards their career - perspective from Khyber-Pukhtunkhwa. *Journal Of The Pakistan Medical Association*, *63*(8), 1017–1020.

Stagg, P., Greenhill, J., Worley, P. (2009) A new model to understand the career choice and practice location decisions of medical graduates. *International Electronic Journal of Rural and Remote Health Research, Education, Practice and Policy, 9* (1245) https://doi.org/10.22605/RRH1245

Sturesson, L., Palmgren, P. J., Öhlander, M., Nilsson, G. H., & Stenfors, T. (2021). Migrant physicians' choice of employment and the medical specialty general practice: a mixed-methods study. *Human Resources for Health*, *19*(1), 63. https://doi.org/10.1186/s12960-021-00607-x

Svirko, E., Goldacre, M. J., & Lambert, T. (2013). Career choices of the United Kingdom medical graduates of 2005, 2008 and 2009: Questionnaire surveys. *Medical Teacher*, *35*(5), 365–375. https://doi.org/10.3109/0142159X.2012.746450

Teljeur, C., Thomas, S., Kelly, F. D. O., & Dowd, T. O. (2010). General practitioner workforce planning : assessment of four policy directions. *Health Services Research*, *10*, 148. https://doi.org/10.1186/1472-6963-10-148

Tjoa, A., Kapihya, M., Libetwa, M., Schroder, K., Scott, C., Lee, J., & Mccarthy, E. (2010). Meeting human resources for health staffing goals by 2018 : a quantitative analysis of policy options in Zambia. *Human Resources for Health*, *8*(15), 1–10.

Umoetok, F., Van Wyk, J. M., & Madiba, T. E. (2017). Does gender impact on female doctors' experiences in the training and practice of surgery? A single centre study. *South African Journal Of Surgery*, *55*(3), 8–12.

van Tongeren-Alers, M., van Esch, M., Verdonk, P., Johansson, E., Hamberg, K., & Lagro-Janssen, T. (2011). Are New Medical Students' Specialty Preferences Gendered? Related Motivational Factors at a Dutch Medical School. *Teaching And Learning In Medicine*, *23*(3), 263–268. https://doi.org/10.1080/10401334.2011.586928

Yang, Y., Li, J., Wu, X., Wang, J., Li, W., Zhu, Y., ... Lin, H. (2019). Factors influencing subspecialty choice among medical students: A systematic review and meta-analysis. *BMJ Open*, *9*(3), 1–12. https://doi.org/10.1136/bmjopen-2018-022097

Zia, S., Abbas, M., Sulaiman, M., & Sheikh, S. M. (2017). Career choices of medical doctors at graduate level - A multicenter study. *Pakistan Journal of Medical Sciences*, *33*(5), 1086–1090. https://doi.org/10.12669/pjms.335.12945