ORIGINAL ARTICLE

Gender representation across surgical specialties in Malaysia

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ABSTRACT

Introduction: Although female enrolment exceeds 50% in many undergraduate medical programmes worldwide, surgeons remain overwhelmingly male despite studies reporting better outcomes by female surgeons. We aimed to characterise gender representation across surgical specialties in Malaysia.

Materials and Methods: We performed a cross-sectional study, extracting data of all surgical specialties from the Malaysian Specialist Register up to 30th September 2023. Gender proportions were assessed using the UNESCO Gender Parity Index (GPI), GPI<1 indicating fewer females. Gender parity was considered present at GPI 0.97-1.03. Disparities were categorised as extreme (<0.5,>1.5), intermediate (0.5-0.89, 1.11-1.5), and close to parity (0.9-0.96,1.04-1.1). Number of years post-specialisation for each surgeon were calculated.

Results: 5236 surgeons were included. Only one specialty (Obstetrics & Gynaecology, GPI=1.03) showed parity and two specialties (Breast & Endocrine, GPI 2.67 and Ophthalmology, GPI 1.27) had more female surgeons. The other thirteen specialties showed various degrees of male predominance. Most GPI values trended higher when younger surgeons were included in the calculation, indicating greater female representation in recent years.

Conclusion: Most surgical specialties in Malaysia show extreme gender inequity. Further work is needed to identify root causes and improve trends. Future efforts should further examine gender disparities and strengthen measures such as mentorship, supportive policies, transparent processes, and inclusive cultures, to advance equity in surgery.

KEYWORDS:
Female Surgeons, Gender Parity, Inequity, Surgical Training, Women in Surgery

INTRODUCTION

The persistent underrepresentation of women in global surgical specialties has become an issue of concern in the healthcare sector, despite the near-parity in female enrolment in undergraduate medical programmes[1-3] and evidence supporting the positive impact of female surgeons on outcomes.[4-6] Although trends worldwide show an increasing number of women pursuing medical education, significant gender disparities persist within surgical specialties due to systemic and cultural barriers.[7]

Studies from the United States and the United Kingdom have shown gradual increases in female surgical representation, though progress varies across specialties and parity remains distant in several fields.[8-9] Worldwide, fewer than one-third of surgeons are women.[10] Across Asia, similar trends have been observed, with countries such as China[11] and Japan[12] also reporting lower female participation in surgical specialties.

Within Malaysia, surgical training follows a pathway of medical school, housemanship and postgraduate specialty training through local or international programmes. Despite an increasingly gender-balanced medical workforce, women remain underrepresented in most surgical fields. For subspecialties requiring longer training, greater on-call demands or historically strong male dominance, more gender gap is present.

Despite the aforementioned studies, there remains a notable gap in research examining gender disparities across surgical specialties in Asia.[13-14] Our study seeks to fill this gap with the objective to characterise gender representation across surgical specialties in Malaysia. Results of our study can be used to inform targeted interventions aimed at achieving greater gender equity in these crucial medical fields.

MATERIALS AND METHODS

A cross-sectional study examined all surgical specialties documented in the Malaysian Specialist Register (SR) from 1st July 2017 until 30th of September 2023. The SR is a publicly available database established by the Malaysian Medical Council pursuant to the enactment of the Medical (Amendment 2012) Act 1971. It serves as a repository of information pertaining to specialists since its inception on 1st July 2017. This database contains information on various disciplines, qualifications, and geographic distribution of medical and surgical specialists practising within Malaysia.15 As the data used in this study were limited to non-identifiable variables such as gender and specialty, and no individual could be identified from the dataset, ethical approval was not required.

Gender-related information for registered surgeons across all surgical specialties listed on the SR website were extracted. This encompassed the following specialties: Breast and Endocrine Surgery, Cardiothoracic Surgery, Colorectal

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Table I: Gender Parity Index (GPI) of all surgical specialties in Malaysia on 30th September 2023

Surgical Specialty	Female (F)	Male (M)	Total (N)	Gender Parity Index (GPI)	GPI Classification
Breast and Endocrine Surgery	48	18	66	2.67	Extreme disparity (>1.5)
Ophthalmology	460	362	822	1.27	Intermediate disparity (1.11-1.5)
Obstetrics and Gynaecology	650	632	1282	1.03	Parity (0.97-1.03)
Paediatric Surgery	27	45	72	0.60	Intermediate disparity (0.5-0.89)
Otorhinolaryngology	192	352	544	0.55	Intermediate disparity (0.5-0.89)
Plastic Surgery	32	77	109	0.42	Extreme disparity (<0.5)
General Surgery	131	602	733	0.22	Extreme disparity (<0.5)
Upper Gastrointestinal Surgery	4	23	27	0.17	Extreme disparity (<0.5)
Neurosurgery	21	144	165	0.15	Extreme disparity (<0.5)
Colorectal Surgery	10	71	81	0.14	Extreme disparity (<0.5)
Thoracic Surgery	1	9	10	0.11	Extreme disparity (<0.5)
Orthopaedic Surgery	101	913	1014	0.11	Extreme disparity (<0.5)
Hepatobiliary Surgery	3	46	49	0.07	Extreme disparity (<0.5)
Urology	5	134	139	0.04	Extreme disparity (<0.5)
Cardiothoracic Surgery	3	85	88	0.04	Extreme disparity (<0.5)
Vascular Surgery	1	34	35	0.03	Extreme disparity (<0.5)

Table II: Pearson Correlation between Years-Post Specialisation and Gender Parity Index (GPI) of all surgical specialties in Malaysia

Surgical Specialty	Pearson correlation coefficient	p-value
Breast and Endocrine Surgery	-0.72	0.01 *
Ophthalmology	-0.94	0.01 *
Obstetrics and Gynaecology	-0.94	0.01 *
Paediatric Surgery	-0.88	0.01 *
Otorhinolaryngology	-0.94	0.01 *
Plastic Surgery	-0.96	0.01 *
General Surgery	-0.88	0.01 *
Upper Gastrointestinal Surgery	-0.77	0.01 *
Neurosurgery	-0.76	0.01 *
Colorectal Surgery	-0.81	0.01 *
Thoracic Surgery	-0.673	0.05
Orthopaedic Surgery	-0.919	0.01 *
Hepatobiliary Surgery	-0.71	0.01 *
Urology	-0.86	0.01 *
Cardiothoracic Surgery	-0.87	0.01 *
Vascular Surgery	-0.66	0.01 *

Surgery, General Surgery, Hepatobiliary Surgery, Neurosurgery, Obstetrics and Gynaecology, Ophthalmology, Orthopaedic Surgery, Otorhinolaryngology, Paediatric Surgery, Plastic Surgery, Thoracic Surgery, Upper Gastrointestinal Surgery, Urology, and Vascular Surgery. Only surgeons registered on or before 30th September 2023 were included, thereby providing a snapshot of gender proportions within Malaysia up to that date. No data cleaning, recoding, or duplicate exclusion was required, as all analyses were conducted using the dataset as provided.

The number of female and male surgeons in each specialty was obtained. The Gender Parity Index (GPI) was calculated for each specialty to assess gender disparities by dividing the number of females by the number of males, rounded up to two decimal places. This methodology was uniformly applied across all surgical specialties listed on the SR. A GPI value below 1 indicates a predominance of male surgeons while GPI value above 1 suggests a preponderance of female surgeons. We then categorised the severity of disparities as follows: GPI values below 0.5 or above 1.5 were classified as

extreme disparities, while intermediate disparities were those that fell between 0.5 to 0.89 or 1.11 to 1.5. GPI ranges 0.9 - 0.96 and 1.04 - 1.1 were considered close to parity. Gender parity was considered present at GPI range 0.97-1.03.[16]

The surgical specialties were then ranked based on their GPI values and summarised in a table, with statistical measures such as mean, median, interquartile range, and standard deviation derived. In addition to gender-related data, the number of years post-specialisation for each surgeon were calculated by subtracting their year of first specialist qualification from 2023. Figures illustrating the relationship between GPI and number of years post-specialisation for each surgical specialty were generated based on this data. Descriptive analysis was used to characterise our results. Data was described as median, interquartile range and range. The average GPI by years post-specialisation across decades for surgical specialties was calculated and plotted to illustrate temporal trends. Pearson's Correlation Coefficient was used to assess the relationship between years-post specialisation and GPI across all surgical specialties in Malaysia.

RESULTS

Gender Parity Index (GPI) of all surgical specialties in Malaysia on 30th September 2023 (Table I)

In examining gender distribution across Malaysian surgical specialties, a total of 5236 registered surgeons were analysed based on gender. Two surgical specialties, namely Breast and Endocrine Surgery, and Ophthalmology, showed female preponderance. Conversely, Obstetrics and Gynaecology was the sole specialty achieving gender parity, while the remaining surgical specialties demonstrated a dominance of male surgeons. The overrepresentation of female surgeons in Breast and Endocrine Surgery and Ophthalmology varied in intensity. Breast and Endocrine Surgery showed extreme gender disparity (>1.5), with 48 female surgeons compared to 18 male surgeons. Ophthalmology exhibited intermediate disparity with a GPI of 1.27, indicating a more moderate imbalance. In contrast, Obstetrics and Gynaecology achieved gender parity, with a GPI of 1.03, reflecting an almost equal distribution of male and female surgeons.

The thirteen remaining specialties (Cardiothoracic Surgery, Colorectal Surgery, General Surgery, Hepatobiliary Surgery, Neurosurgery, Orthopaedic Surgery, Otorhinolaryngology, Paediatric Surgery, Plastic Surgery, Thoracic Surgery, Upper Gastrointestinal Surgery, Urology, and Vascular Surgery) also recorded gender imbalance, albeit in the opposite direction, with more male surgeons identified. Among these specialties, only Paediatric Surgery and Otorhinolaryngology were in the intermediate category of disparity favouring males.

Vascular Surgery showed the most extreme gender disparity, with just 1 female surgeon compared to 34 male counterparts, resulting in the lowest GPI value (0.03). Cardiothoracic Surgery and Urology shared identical GPIs of 0.04, while Orthopaedic Surgery and Thoracic Surgery both had a GPI of 0.11. The median GPI of all surgical specialties in Malaysia on 30th September 2023 was 0.16 (range 0.03 – 2.64). The mean GPI was 0.48 with standard deviation of 0.17. The estimated GPI had a 98% confidence interval of 0.03 to 0.93.

Gender Parity Index (GPI) according to Number of Years Post-Specialisation for all Surgical Specialties in Malaysia up to September 2023

The number of years post-specialisation for a total of 5217 surgeons was calculated. Excluded from the calculations were 19 surgeons due to missing information on the SR website. These 19 surgeons comprised of 2 general surgeons (GPI: 0.22), 1 neurosurgeon (GPI: 0.15), 3 obstetrics and gynaecology specialists (GPI: 1.03), 3 ophthalmologists (GPI: 1.27), 1 otolaryngologist (GPI: 0.55), 8 orthopaedic surgeons (GPI: 0.11), and 1 urologist (GPI: 0.04). As the years post-specialisation increased, reflecting greater surgeon experience, the GPI values generally declined. GPI values were typically higher when younger surgeons were included in the GPI calculation. There was a very strong and statistically significant negative linear association between years post-specialisation and GPI of all surgical specialties, excluding Thoracic Surgery (Table II).

All graphs do not have data plotted in the first few years after the date of specialist qualification as additional time is required to process each applicant's entry into the National Specialist Registry post exit qualification. This period varies between specialties (Supplementary Figures 1a-1d). Average GPI across decades for each surgical specialty had been calculated (Supplementary Table I) to facilitate the understanding of GPI trend (Figure 1a). Also, each specialty varies in the temporal data available, as some specialties (such as obstetrics & gynaecology and general surgery) have a long history of existence in Malaysia, while other newer specialties (e.g. vascular surgery, thoracic surgery, colorectal surgery) were available only more recently.

DISCUSSION

Our study examining gender representation across Malaysian surgical specialties reveals a complex landscape. The field of Obstetrics and Gynaecology shows gender parity, while other specialties exhibit varying degrees of gender imbalance, with most favouring males. Breast and Endocrine Surgery, and Ophthalmology stand out with more female surgeons, while thirteen out of sixteen surgical specialties have more male surgeons. These disparities underscore the urgent need for addressing gender imbalances effectively. To our knowledge, this study is the only comprehensive analysis of gender proportions in Asia, utilising a national publicly available governmental registry for up-to-date information on all registered surgeons. This approach ensures inclusivity and provides a precise depiction of GPIs across surgical specialties, enabling informed policy discussions aligned with the World Health Organization (WHO) gender equity principles.[17]

When comparing the number of years post-specialisation of each surgeon with the GPIs of their respective surgical specialties over different time periods, an upward trend was observed as the number of years post-specialisation decreased, indicating the growing inclusion of younger surgeons in GPI calculations. This trend was particularly pronounced in Cardiothoracic Surgery, Colorectal Surgery, General Surgery, Neurosurgery, Orthopaedic Surgery, Otorhinolaryngology, Plastic Surgery, Thoracic Surgery, Upper Gastrointestinal Surgery, Urology and Vascular

Surgery. This finding reflects contextual factors that influence female participation in surgery, including cultural expectations, work–life balance challenges, maternity-related considerations, and perceptions of specialty difficulty. Across all these surgical specialties, GPIs were consistently below 1. Notable exceptions were Breast & Endocrine Surgery and Ophthalmology, in which Breast & Endocrine Surgery had a GPI above 1 for most years, while the Ophthalmology achieved a GPI above 1 when including surgeons with less than 10 years post-specialisation.

For Ophthalmology, Obstetrics and Gynaecology, as well as Paediatric Surgery, there was an early dip in GPI trends. This may be because entrance into the SR was not mandatory at its inception. As such, many senior surgeons, especially those near or post-retirement, did not submit applications for SR registration. We do recognise some limitations in our methodology. Potential omissions of specialists and variations in specialty training pathway structures in Malaysia[18] could impact GPI calculations. For instance, the number of surgeons categorized under General Surgery may have decreased over time, as certain surgical specialties in Malaysia have developed direct entry pathways for specialisation in recent years. Examples of such specialties include Cardiothoracic Surgery, Neurosurgery, Orthopaedic Surgery, Paediatric Surgery, and Plastic Surgery. Conversely, there is a possibility that surgeons initially specialising in General Surgery later pursue further specialisation in another surgical field, thereby contributing to the GPI value of the respective specialty they eventually choose.

Another limitation we detected was that some surgical specialities are more newly recognised, such as Upper Gastrointestinal Surgery, thus affecting the duration of data available when compared to long-established surgical specialities such as Obstetrics and Gynaecology. Moreover, SR registration may exclude older or non-practising surgeons, which could lead to the GPI appearing less male-predominant or even female-predominant. While this limitation introduces a risk of under-representing a small subset of practitioners, the available data still provides a reasonable approximation of parity on which further analysis can be based. Moreover, it is essential to consider the possibility of omissions resulting from specialists who have passed away but whose status may not have been promptly updated in the SR system in the GPI calculation for each surgical specialty. Despite these potential discrepancies, they are believed to have minimal impact on the overall findings, as GPI is calculated fractionally and is relatively stable despite minor changes in surgeon numbers. Nevertheless, it is evident that the number of female surgeons is rising, with evidence of GPI values trending upwards when number of years post-specialisation are lower.[19]

We are progressing; however, more solutions or policies need to be implemented to accelerate progress towards achieving gender parity across all surgical specialties.14,20 Future work should include research that clarifies the underlying drivers of gender disparity especially in Vascular Surgery and tracks the impact of evolving policies as well as workforce trends. Implementation efforts must accelerate, with targeted measures such as strengthened mentorship and sponsorship, improved work–life integration policies, transparent merit-based selection processes, and more inclusive departmental cultures. These strategies are essential to reducing structural barriers and advancing gender equity in the surgical workforce.

CONCLUSION

Surgical specialties in Malaysia, an upper-middle-income country in Southeast Asia, exhibit varying degrees of gender disparity, primarily characterised by the underrepresentation of females across most fields. It is essential to delve deeper into this phenomenon to discern the underlying causes of such gender imbalances within the surgical domain. By understanding these factors, efforts can be directed towards fostering an environment of equity. While progress is evident with more female surgeons joining the ranks, the pace of change remains slow. Future work should clarify the drivers of gender disparity and assess the impact of reforms, while accelerating measures such as stronger mentorship, supportive policies, transparent selection processes, and inclusive cultures to advance gender equity in surgery.

DECLARATIONS

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AUTHORS' CONTRIBUTIONS

Jing Xuan Teh and Shireen Anne Nah had full access to all of the data in the study and take responsibility for the integrity of the data and accuracy of the data analysis. Study concept and design [Jing Xuan Teh] and [Shireen Anne Nah]; Acquisition of the data [Jing Xuan Teh]; Analysis and interpretation of the data [Jing Xuan Teh] and [Shireen Anne Nah]; Drafting of the manuscript [Jing Xuan Teh] and [Shireen Anne Nah]; Critical revision of the manuscript for important intellectual content [Shireen Anne Nah]

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