



Original paper

Medical physicists in Malaysia: A national workforce survey 2019

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A B S T R A C T

Objective: Medical physics in Malaysia is still considered a young profession.

This workforce survey aims to understand the status, aspirations, motivation and experiences of medical physicists (MPs) in the country. A subsection of this survey also aims to understand the role of women.

Method: A survey was carried out between April 20 and May 30, 2018 by a working group under the Medical Physics Division of the Malaysian Institute of Physics (IFM). The survey form was designed using Google Form and sent to various public and private institutions nationwide that employed MPs registered with IFM.**Results:** A total of 106 responses (28% men and 72% women) were analysed. This represented 30% of the medical physics workforce. Majority of them had postgraduate degrees, but their clinical training is mostly obtained on the job with no certification. The number of low-ranking female MPs was disproportionately high. MPs worked long hours and achieving work-life balance (WLB) was a challenge. Factors that improved their WLB included working close to home, having a supportive manager and flexible working hours. Most MPs aspired to become professional and mentor younger compatriots, besides contributing to patient care and research. Gender discrimination was reportedly low.**Conclusion:** Medical physics in Malaysia is growing and has a strong representation of women. In future, they would probably take over the top management from their male counterparts, whose number had stagnated. A united effort was essential to set up a proper clinical training system to train clinically qualified MPs.

1. Introduction

Malaysia has a population of more than 32.7 million, with a total area of 329,847 km². Average life expectancy is 77.3 years while infant mortality rate is 6.9 deaths/1000 births [1]. As of 2015, the physician density is 1.53 doctors per 1000 population [2]. In the case of medical physicists, there are about 349 medical physicists in the whole country, making the density at 0.01 physicist per 1000 population.

The history of medical physics in Malaysia can be traced back to 1955, when the Department of Radiotherapy, Oncology and Nuclear Medicine of Hospital Kuala Lumpur (HKL) installed the first superficial X-ray machine (50 kV). The first medical physicist (MP) completed his training and began working in HKL in 1960. Since then, the profession has expanded, with more graduates playing prominent roles in the public and private sectors. There are currently 35 centres offering radiological diagnosis and radiotherapy services nationwide, where seven are in public hospitals, 24 in private medical centres and four in university hospitals. Seventy-seven per cent of MPs in Malaysia are working in public hospitals, while the rest are in private medical centres and industrial companies.

Compared to developed countries, medical physics is a relatively young profession in Malaysia. It is a unique profession in the healthcare

industry encompassing scientific, technical and clinical professions. The awareness on this profession is, however, fairly poor. It is not well represented in the healthcare industry, with neither a professional pathway to a degree nor is there a local professional institution to monitor graduate quality and provide accreditation.

The need for proper training programmes to develop the clinical and technical skills of MPs has been lacking. There is also a general neglect of the special group of MP in the country as they are generally categorised as “science or physics officer” in the civil service.

A national survey on the medical physics workforce was launched by the Medical Physics Division of the Malaysian Institute of Physics to find out about the current status, aspirations, motivations and experiences of MPs in the country. The survey was carried out from April 20 to May 30, 2018. Part of the survey focused on women medical physicists, asking how they felt about their work-life balance (WLB), career development and role models.

2. Material & methods

The survey questionnaires were largely based on a similar survey by Bezak et al. (2019), modified to suit the local scene [3]. There were eight sections and 59 questions. The sections included (i) qualifications

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and employment, (ii) professional memberships, certification & enrolment, (iii) awareness of the Malaysian Allied Health Profession Act 2016 (Act 774), (iv) work-life balance, (v) career pathway, (vi) respondent details (vii) role models and (viii) summary. Question format consisted of multiple choice, multiple selection, ranking, short answer and long answer questions.

The survey form was designed using Google form and sent to all types of institutions in the country where MPs were employed, such as hospitals, research centres and universities. It was carried out in part to preserve anonymity, where participants' names and emails were not linked to their responses.

Quantitative statistical analysis was performed using IBM SPSS Version 22 (IBM Corporation, Armonk, New York, USA). All numerical data were tested for normality of distribution using the Shapiro-Wilk test. Non-parametric statistical tests were used because the data were not normally distributed (Shapiro-Wilk test, $p < 0.001$).

Descriptive statistics were reported using median and inter-quartile range (IQR). The Wilcoxon Signed Rank test, Mann-Whitney *U* test and Kruskal-Wallis test with post-hoc correction were used to compare the parameters. Association between factors were determined using the Spearman correlation test. Statistical significance was declared at $p \leq 0.05$. All data were tested for gender differences, but only those that reported significant statistical differences would be reported here.

Under the WLB and role model sections, open-ended questions were asked and participants were allowed to provide free text answers. The free text answers were used as part of the interpretation of the results and discussion.

3. Results

3.1. Respondents demographics

A total of 111 medical physicists responded to the survey. However, five were not working in Malaysia and had to be excluded. Table 1 shows the demographic details of respondents, who comprised 30% of the total medical physics workforce in the country.

Twenty-eight per cent of the respondents were men and 72% were women, among which 75% were Malays, 22% were Chinese and the rest being Indians and indigenous groups from the East Malaysia (Sabah

Table 1
Demographics of the respondents (n = 106).

| Demography | Groups | Count | N % |
|------------------------------------|---|--------|--------|
| Gender | Male | 30 | 28.30% |
| | Female | 76 | 71.70% |
| Ethnicity | Malay | 79 | 74.53% |
| | Chinese | 23 | 21.70% |
| | Indian | 1 | 0.94% |
| | Indigenous | 3 | 2.83% |
| Age Group | 21–30 | 33 | 31.13% |
| | 31–40 | 60 | 56.60% |
| | 41–50 | 10 | 9.43% |
| | 51–60 | 2 | 1.89% |
| | 60+ | 1 | 0.94% |
| | Household | Single | 20 |
| Single with dependants | | 19 | 17.92% |
| Married | | 26 | 24.53% |
| Married with dependants | | 41 | 38.68% |
| Breadwinner for the married couple | Respondent plays the primary career role in the household | 17 | 25.37% |
| | Respondent's partner has the primary career role in the household | 9 | 13.43% |
| | The roles are roughly equal between the partners | 39 | 58.21% |
| | No response | 2 | 2.99% |

and Sarawak). Eighty-eight per cent of the MPs surveyed were aged between 21 and 40, while only 12% were above 40.

Sixty-three per cent of the respondents were married and 58% had dependants. There was a significant difference in the household types between genders. Sixty per cent of male MPs were married with dependants compared to 30% of female MPs. However, there was significantly higher number of single female MPs (22%) with dependants compared to only seven per cent for male MPs. There was a significant correlation between household types with the number of dependants. The median number of dependants per MP was two for singles and three for married ones. The number of dependants could rise to as high as seven in a family. They usually comprised extended family members like parents, children, siblings and relatives.

More than half of the respondents (59%) claimed equal partnership in the household. While 40% of the male MPs said that they were the primary breadwinner, a smaller portion of the female MPs (18%) also said their husbands were the breadwinners of the household.

3.2. Education

A majority of the respondents had a postgraduate degree (75%), with 10% holding a PhD. In Malaysia, there were only two postgraduate medical physics programmes by coursework. They are the Master of Medical Physics conducted at the Medical Faculty of the Universiti Malaya (UM) and M.Sc. (Medical Physics) at the School of Physics in the Universiti Sains Malaysia (USM) [4,5]. Between these programmes, they provided for 76% of the country's medical physics workforce. Twenty per cent of the respondents graduated with a Masters in engineering or Masters in science through research mode from local or foreign universities.

For PhD graduates, three obtained their PhD degrees from Australian universities, four obtained theirs from the United Kingdom and another four were home-grown PhDs.

Fig. 1 shows the distribution of male and female MPs with respect to the highest education obtained. Due to the huge difference in the number of male and female respondents, data in the bar chart would be presented as the percentage of each gender unless stated otherwise. For example, 81% of female MPs (62 out of 76) had a postgraduate degree (masters and PhD) compared to only 56% of male MPs (17 out of 30).

Fig. 2 shows the basic degrees of the current MP workforce. Over half (53%) of the respondents obtained a physics (including applied

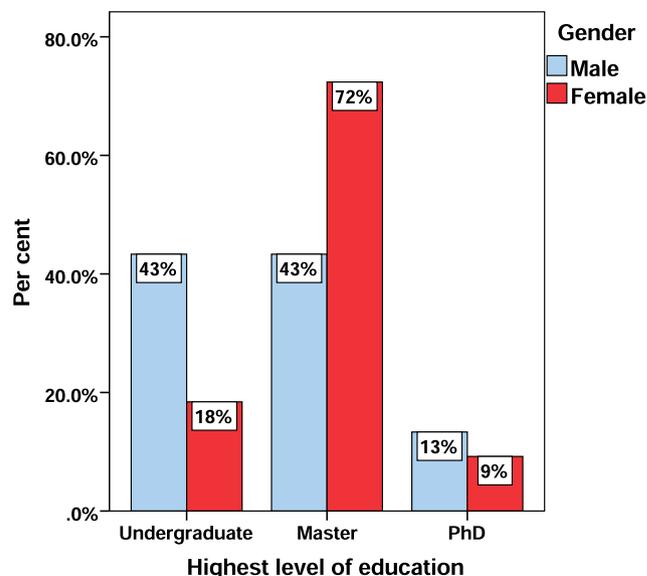


Fig. 1. Level of education among medical physicists in Malaysia according to gender.

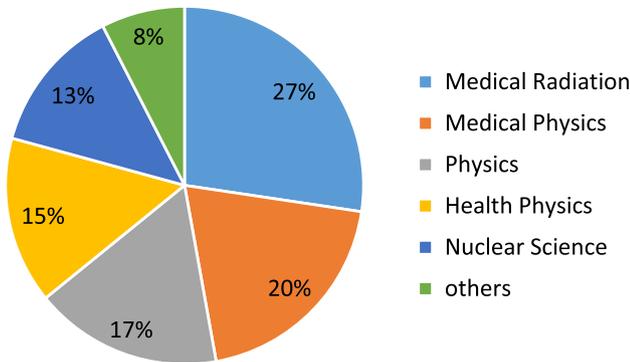


Fig. 2. Basic degrees of medical physicists in Malaysia.

physics) degree, whilst the rest graduated from specialised courses designed to produce medical and nuclear radiation experts (43%). Only four per cent had an engineering degree.

The top three basic degrees comprised of the B. Health Sc. in Medical Radiation (27%), B. Sc. in Medical Physics (20%) and B. Sc. Physics (15%). Almost half (47%) of the respondents graduated with the first two degrees offered by the School of Physics and School of Health Sciences at Universiti Sains Malaysia. The popularity of specialised radiation technology and applied physics courses at the undergraduate level was a common trend in some Asia-Pacific countries, with unestablished framework of qualification required to become an MP.

3.3. Employment

Fig. 3 shows the distribution of MPs in different states. Selangor (including the Putrajaya Federal Territory) (24%) had the highest number of working MPs (24%), followed by Kuala Lumpur (22%) and Penang (13%).

Majority (53%) of the respondents worked in the public sector (public hospitals, medical device authorities, and the Atomic Energy Licencing Board (AELB)). Twenty-nine per cent were working in the private sector (private hospitals/medical centres/consulting firms providing medical physics services etc.) while 18% worked in universities and research institutes.

Fig. 4 shows the gender distribution of MPs working in various institutions. Besides the public sector, a large number of female MPs were found working in the private sector (36%), while only 10.4% were

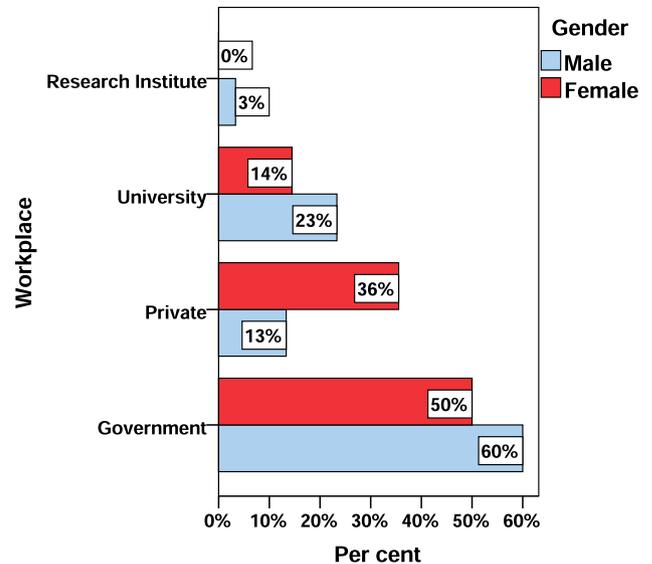


Fig. 4. Distribution of male and female medical physicists in different institutions.

academics at universities.

The job designations were based on the institution where they worked. They could be called medical physicists in private hospitals, but it becomes broader in the public sector, like “Physics Officer” or “Pegawai Fizik” for those employed under the Health Ministry, and “Science Officer” or “Pegawai Sains” in universities under the Education Ministry. Civil servants comprised the largest percentage (65%) of the workforce.

About 4.7% of them held top managerial positions, such as chief medical physicist, manager or head of department. All of them were also saddled with multiple responsibilities, including the role of radiation protection officers (RPO) in their respective institutions. Only 11.3% of MPs are academics working in universities and research centres.

Fig. 5 shows the gender division across different job designations. Only 26% of the female MPs held senior positions, such as radiation protection officers, lecturers/professors and chief/manager/head of department compared to 43% of male MPs.

Fig. 6 shows the year when the respondents started working and their cumulative numbers from 1988 to 2018. In the early years, most



Fig. 3. Distribution of MPs across the different states in Malaysia.

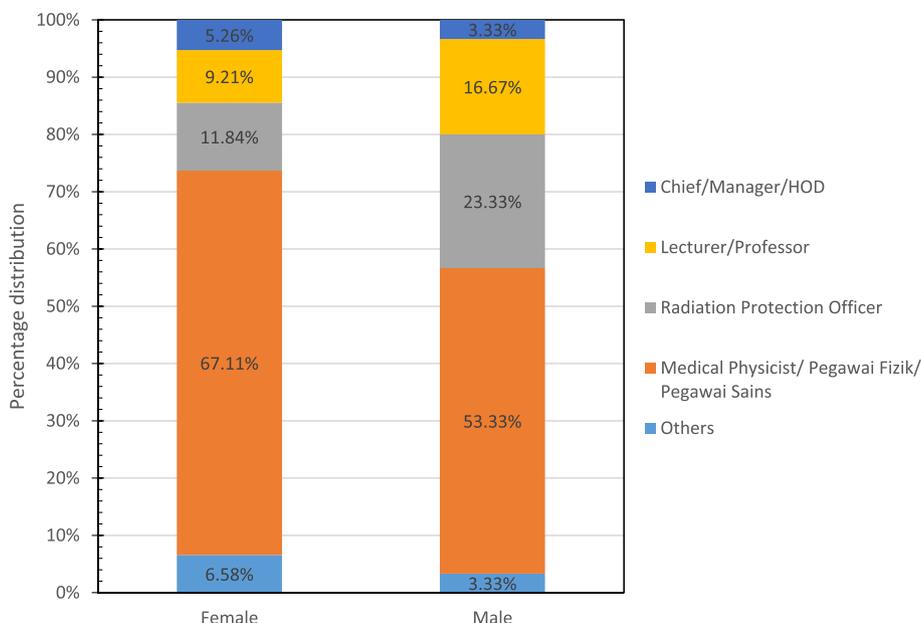


Fig. 5. Job hierarchy composition among medical physicists in Malaysia according to gender.

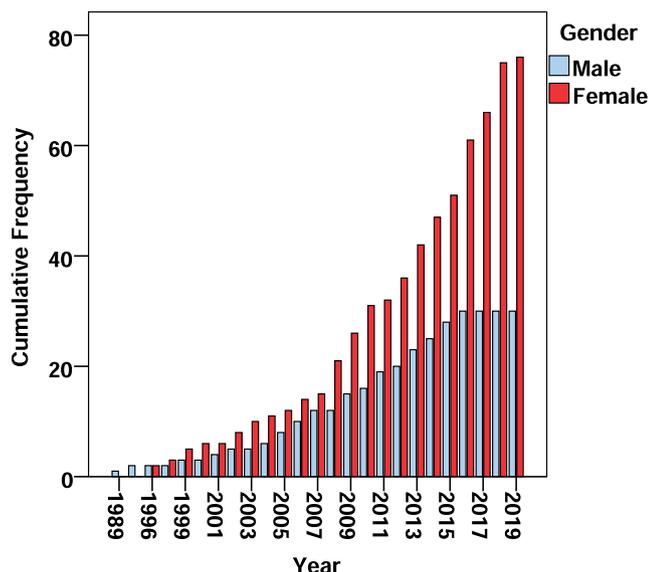


Fig. 6. The cumulative number of MPs with respect to the year they started working.

MPs were male. The first female respondent started working in 1995 and by 1998, their number had overtaken their male counterparts. They received an exponential boost from 2008 onwards and had continued to grow tremendously to this date. Meanwhile, the number of male MPs appeared to stagnate from 2015 onwards. However, the median working years for male MPs was still longer at 9.5 compared to six for female MPs. The longest serving respondent was obviously a male, who reported having 31 years of service. The trend of higher percentage of female MPs is also found in several countries in the South East Asia region such as Brunei, Myanmar, Philippines and Thailand [6].

The respondents were also enquired about their annual salary as presented in Fig. 7. One-third of them earned between Malaysian Ringgit (RM) 25,000 to RM 50,000 a year, while another one-third earned between RM 50,000 and RM 75,000.

Seventy-one per cent felt that there were no salary gaps among the same level in their organization and 41% said that they have not been unfairly denied a salary increase. Only 11% are satisfied with their

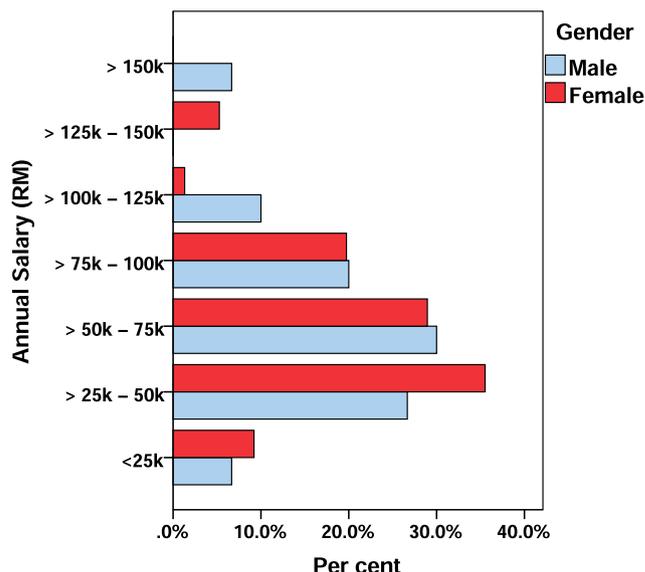


Fig. 7. Annual salary of male and female MPs.

current salary and 9.4% of the respondent felt that they were unfairly denied a salary increase.

Most younger MPs (with annual salaries < RM 100,000), regardless of their gender, do not have much opinion on the salary gap in their institutions, disagreeing to the notion that there were salary gaps among the same level in their organisation and being neutral in this question.

There were significant differences between the number of working years between male and female MPs (Kruskal-Wallis, $\chi^2 = 5.78$, $p = 0.016$), with female MPs being generally younger. There were significant correlations between age and number of years they had been working (Spearman correlation, $\rho = 0.788$, $p < 0.001$) and annual salary ($\rho = 0.634$, $p < 0.001$) as shown in Fig. 8.

The daily work of MPs, other than clinical medical physics related work, also includes management, clinical training, research, academic education, customer/patient support, and sales and marketing.

Eighty-four per cent of the MPs' daily work involved some kind of administration task. This was particularly so for those working in the

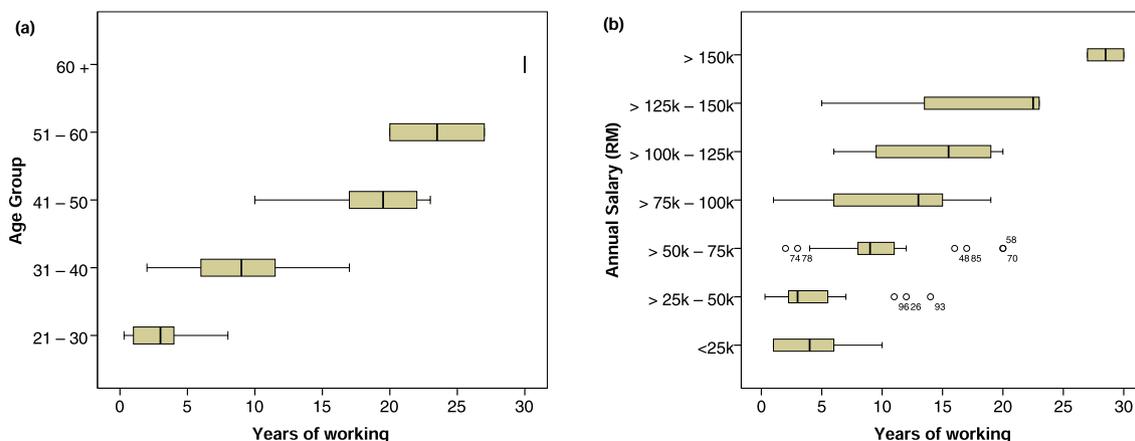


Fig. 8. MPs years of working experience with respect to (a) age groups and (b) annual salary.

non-academic public sector and in regulatory departments. In the private sector, most of the time was focused on clinical work, while in the university setting, research was predominant.

In Malaysia, MPs worked in four subfields, namely radiotherapy (RT), diagnostic imaging (DX), nuclear medicine (NM) and regulatory. The highest percentage (34%) currently worked in radiotherapy departments, followed by 22% in diagnostic imaging, 17% in education (universities), 13% in regulatory agencies and five per cent in nuclear medicine. About four per cent of the participants worked in more than one specialisation. MPs in private sector were often required to cover multiple subfields as a cost-saving measure by their employers. Fig. 9 shows the subfield preferences according to gender. The radiotherapy and diagnostic imaging departments were dominated by female MPs whereas male MPs tended to be in regulatory and education subfields.

A separate follow up survey was carried out to determine the number of medical physicists working as academics in the country. The survey identified 52 active academics and four retirees working on contract. More than half of the academics were employed by USM as they had four faculties that were involved in medical physics education, training and research. The USM master and undergraduate degree programmes were supported by medical physics lecturers and clinical facilities at its Advanced Medical & Dental Institute and the School of Medical Sciences. Universiti Kebangsaan Malaysia (UKM) and UM currently have eight and seven medical physicists in their respective

academias.

Ninety-three per cent of the academic MPs were PhD holders. Although the number of female MPs tripled their male counterparts in the whole country, the gender divide was not so distinct in the academic arena, where female academic MPs comprised a smaller portion of 41%. Most of the academics (71%) were fairly junior, holding the position of lecturer/senior lecturer. The gender distribution was quite equal at this level.

At higher academic positions, the gender gap was wider. There were only two female MPs compared to seven males serving as associate professors, while all six professors were male.

3.4. Clinical training

Malaysia did not have a formal clinical training programme for MPs. From the survey, we found that 12% of the MPs reported that they did not undergo any form of clinical training before they began their career. However, 88% of the respondents reported receiving some form of clinical training, half of them during or shortly after their formal education, while another half received clinical training during their job. Most MPs acquired on-the-job training provided by senior colleagues (32%). As much as 22.6% of the MPs obtained some form of clinical training/experience through industry training/internship at hospitals during their formal education, or short-term clinical attachments during the early days of their career.

A total of 13.2% of participants acquired clinical exposure via postings/observation/practical sessions during their formal education. Only 4.7% of Malaysian MPs said they had received training from International Atomic Energy Agency (IAEA) training courses. We also noticed that for the last five years, new science officers at public hospitals had been required to keep a competency logbook to keep record of their on-the-job clinical training. In terms of clinical training length, 18% of the MPs claimed to receive less than one month training, 42% received two to six months training, while 18% received up to 12 months training.

Fig. 10 shows the training period experienced by respondents across different subfields. MPs working in regulatory and education reported the longest training period of at least six months, and 75% reporting training up to 12 months. In the three clinical subfields, the median training period was longest for radiotherapy, with the MPs quoting three months compared to only two months for diagnostic imaging and nuclear medicine.

Participants were also asked when they were deemed able to work independently as medical physicists by their senior colleague. We found no correlation between this expected training periods with their own experience. Seventy-five per cent of the MPs acquired their training within 12 months of less, but they were deemed able to work

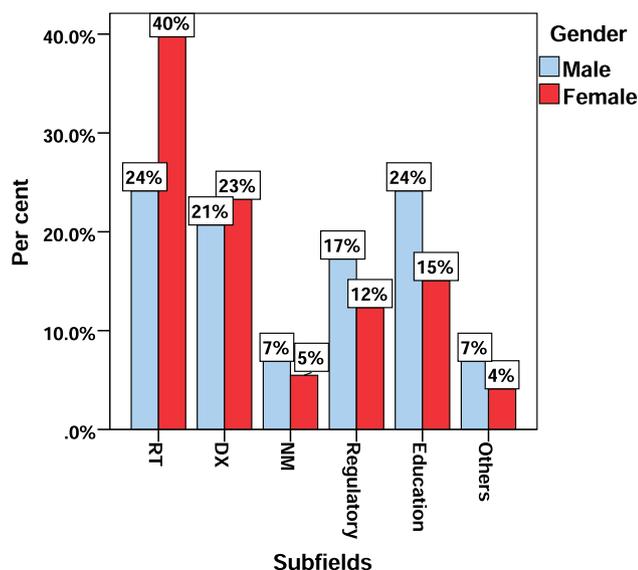


Fig. 9. Medical physics subfield preferences between genders.

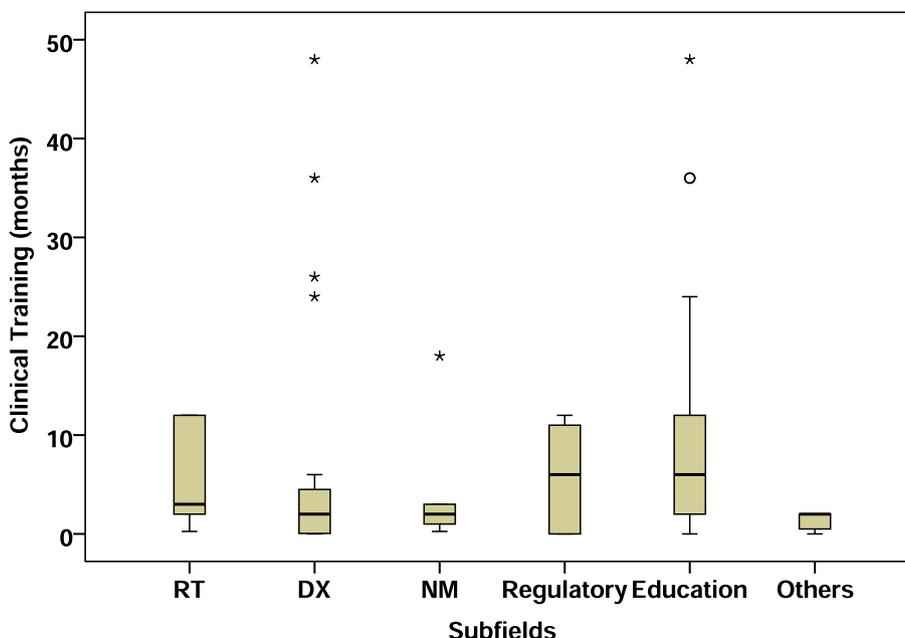


Fig. 10. Training period (months) reported by medical physicists in different subfields.

independently by their senior colleagues after six months of training. The median training period was the same, which was three months for both experiential wise and expected time frames.

Part of their continuous professional development involved attending medical physics seminars and courses to improve their knowledge and skills. MPs attended an average of two seminars per year. A number of Malaysian medical physicists had been very active in initiating and supporting activities by the South East Asian Federation of Organizations for Medical Physics (SEAFOMP) and ASEAN College of Medical Physics (ACOMP) [7,8].

Despite the lack of a systematic clinical training scheme, 61% of the MPs agreed that their clinical training had equipped them with necessary skills to perform their job.

3.5. Professional memberships, certification and enrolment

Professional medical physics institutions are important to champion the field and the cause of its members that is to ensure quality education and skills so that the profession could be formally recognised. Some examples include the American Association of Physicists in Medicine (AAPM) based in the United States, the Australasian College of Physical Scientists and Engineers in Medicine (ACPSEM) in Australia and the Institute of Physics and Engineering in Medicine (IPEM) in the United Kingdom.

In Malaysia, such institution has yet to be established, but there were three associations where MPs could further their cause, namely the Malaysian Institute of Physics (IFM), Malaysian Association of Medical Physics (MAMP) and Society for Physics Officers under the Health Ministry's Physics Officers' Association (PERFEKS). Some MPs also join AAPM and IPEM as affiliated members. Many MPs were members in more than one medical physics association. This study found that a large number of them were members of the Malaysian Association of Medical Physics (MAMP). Besides, all MPs working in the Health Ministry were encouraged to enroll as PERFEKS members.

Unfortunately, in terms of certification and accreditation, 86.8% of the MPs did not have any registration, certification from a professional institution. Seven per cent hold a radiation protection officer (RPO) certificate issued by AELB and only one MP was certified by the American Board of Medical Physics (ABMP). Another MP was certified by the International Medical Physics Certification Board (IMPCB).

On 4th February 2016, the Malaysian Allied Health Profession Act (Act 774) was gazetted to regulate the practice of allied health professions in the country. The Act encompassed 23 categories in the Health Ministry, covering three major thrusts of clinical, health and general laboratory services.

Medical physics was one of the allied health professions covered by the Act and MPs were required to register with the government. The survey found that as many as 88% of the respondents were aware of this, but only 43% had registered while 49% expressed their intention to register. Just over half of the respondents (59%) understood the specifications and requirements of the code of conduct of a medical physicist under this Act. Only 56% of the MPs believed that Act 774 would bring positive impact to their profession.

The respondents were asked how they felt about their contributions towards the healthcare industry. Seventy-four per cent gave an encouraging response by saying they had a major contribution to provide. This was balanced by almost the same number of MPs (70%) who felt that their efforts had been acknowledged by their colleagues.

3.6. Work-life balance (WLB)

Eighty-one per cent of MPs worked between 40 and 50 h a week. There was no correlation between working hours and subfields. However, there was a weak correlation between working hours with number of seminars attended.

More than 80% of MPs agreed that the best measure of WLB would be (i) achieving satisfaction at work and at home; (ii) being able to meet personal and work obligations; and, (iii) maintaining clear boundaries between roles at home and at work. A slightly lesser percentage (69%) thought that having control over when, where and how they worked helped in achieving WLB.

Only 55% of the MPs said their current job allowed them to achieve optimum WLB as defined above. We explored the type of work arrangements that would help MPs improve their WLB. The results are tabulated in Table 2. It was worth noting that there were no significant differences between the male and female MPs in all of these aspects.

The resounding factors ($\geq 80\%$) were working close to home and having a supportive manager. Seventy-six per cent of the MPs also vouched for a supportive spouse in sharing home duties and child-rearing responsibilities. Malaysians liked to travel, at least in the case of

Table 2
Work arrangement that may help to improve WLB of MPs and their correlation with achieving satisfaction at work and at home.

| To what extend do you agree that the following have helped or would have helped you improve your WLB? | Agree/strongly agree (%) |
|---|--------------------------|
| 1. Working close to home | 80 |
| 2. Having a supportive manager | 80 |
| 3. Flexible working hours | 77 |
| 4. Supportive spouse in sharing home duties and child-rearing responsibilities | 76 |
| 5. Working within office hours | 64 |
| 6. Opportunity to take annual leave during school holidays | 67 |
| 7. Wide choice of child care options | 62 |
| 8. Availability to work part-time | 52 |
| 9. Working out of clinical hours | 36 |
| 10. Not having to travel (e.g. outstation or overseas) | 26 |

MPs. Only 26% of the MPs felt that travelling would disrupt their WLB. While 77% of MPs would like to have flexible working hours, most preferred not to work beyond office hours (64%).

3.7. Professional aspiration

Seventy-three per cent of the MPs envisaged working in this profession for the next 10 years. Three quarters of the respondents aspired to achieve senior status (24%), Chief/Manager/Director/head of department (HOD) status (28%) and senior academic/professor (23%).

Table 3 shows the professional aspiration of respondents. More than 90% aspired to be recognised as an expert in their jobs and mentor the younger members of the profession.

The MPs were asked to rank “the person” who had the main responsibility in supporting their wellbeing. Fifty-nine per cent of respondents ranked themselves as the main person responsible for their wellbeing. This was followed by their family, colleagues, leadership team, their manager and, lastly, the professional associations which they joined.

Similarly, they also ranked measures that would be most helpful in supporting their wellbeing. The number one factor was mentoring and skills training, followed by return to work provisions, remuneration equity, parental and carers leave, and more childcare options.

3.8. Gender equity

The ratio of male to female MPs was 1:2. While at the top

Table 3
Professional aspirations of Malaysian medical physicists.

| Thinking of your professional aspirations, to what extend do you agree with the following? | Agrees/strongly agrees (%) |
|---|----------------------------|
| 1. I aspire to provide expert training and education for younger members of the profession | 92 |
| 2. I aspire to become a recognised expert in my field | 90 |
| 3. I aspire to mentor other members of the profession | 87 |
| 4. I aspire to improve diagnostic and treatment options for patients | 82 |
| 5. I aspire to contribute knowledge through research | 82 |
| 6. In time, I believe I will reach my career goals | 81 |
| 7. I aspire to contribute to policy-making within the profession | 78 |
| 8. I aspire to contribute to policy-making within my institution | 76 |
| 9. I aspire to contribute to policy-making outside my institution (e.g. at national level). | 73 |
| 10. I aspire to serve in the profession on an international level (e.g. in developing countries) | 73 |
| 11. Financial returns is a big motivator | 64 |
| 12. At the moment, I am lacking experience to achieve my aspirations | 63 |
| 13. I have defined my personal (family, community, social) commitments and goals, and have tailored my professional aspirations so they will not interfere in achieving my personal aspirations | 56 |
| 14. There are few opportunities for promotion (both in my organisation and other organisations) | 54 |
| 15. I am actively seeking a promotion | 41 |
| 16. My personal commitments (e.g. family, interest groups) are preventing me from pursuing my professional aspirations | 32 |
| 17. I cannot find the motivation to pursue my career aspirations | 30 |

management, this ratio was 2:3. There was a significant difference between the number of male and female MPs, where the females outnumbered males in most organisations (Wilcoxon signed ranks test, $Z = -6.004$, $p < 0.001$). In the top management, female top managers also significantly outnumbered their male counterparts (Wilcoxon signed ranks test, $Z = -2.250$, $p < 0.024$).

No significant difference was found between the male and female MPs on the perception of gender discrimination in the profession. More than half of the MPs (57%) said they did not experience gender discrimination in their workplace and they were not treated differently by their peers because of their gender (53%).

However, 44% of the respondents said their supervisors took their gender into account when delegating assignments. In view of the positive feedback on the two previous statements, this action was understood to be carried out in good faith. An almost equal number of respondents said that their gender did (35%)/did not (34%) influence their profession. There was a fairly big portion of the respondents, comprising around one-third, who chose to remain neutral in gender discrimination issues.

3.9. Role models

There was a significant difference between the number of female and male mentors (Wilcoxon signed ranks test, $Z = -2.785$, $p = 0.005$). MPs tended to have more male mentors than females. The ratio of male to female mentors was 2:1. Close to 40% of the respondents listed their professional colleagues as their role model, followed by college/university lecturers (34%) and their supervisors (26%).

The survey asked about how the role models affected the respondents and their career choices (Fig. 11). Thirty-six per cent said their mentors helped them in their personal development while another 35% said their mentors inspired them in the development in their professional careers. Forty-one per cent did not provide any answers and eight per cent cited the influencing traits of their mentors as their source of inspiration. Their mentors were often those who introduced them to the medical physics career pathway, providing them with support, guidance, opportunities and leadership. Mentors also pushed them to work harder, cared about their professional development and inspired them to improve themselves. Personal traits of mentors that were inspiring were hardworking, humble and being skillful in their work. Mentors also believed in their mentees and showed empowerment, leading to increase in self-confidence in their mentees.

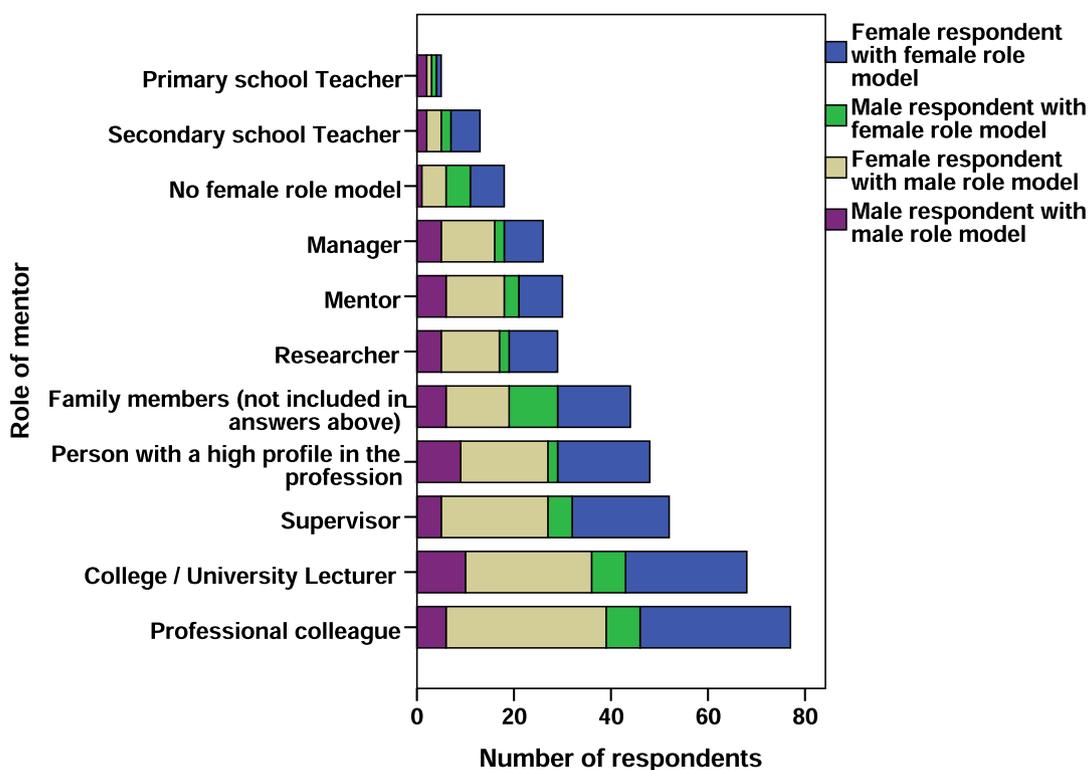


Fig. 11. Role models cited by Malaysian medical physicists.

4. Discussion

This workforce survey was the first of its undertaken to assess the field of medical physics in Malaysia. The ethnic distribution of the respondents reflected a multi-ethnic distribution of the Malaysian society. In general, most Malaysian MPs were young and had just started off in their careers, with the major part of the workforce comprising generation Y or the millennials, and only 12% from generation-X. Female MPs were also significantly younger than male MPs.

There was no significant difference in the education level of male and female MPs. However, more females MPs held postgraduate degrees. In Malaysia, the Health Ministry recruited most of the MPs with an undergraduate degree. This resulted in a large group of MPs with minimal specialised training. However, some of them would later further their studies and achieve a master degree. Sixty per cent of the MPs felt that their education had helped them in their work. Female MPs felt more empowered by their education compared to their male counterparts. Younger MPs reflected a stronger agreement to this question. This might be due to improvements in the MP education programmes in the past ten years.

Distribution of MPs across different states is not uniform. However, it did follow the state-wise distribution of radiotherapy facilities. This was not surprising as most of the clinical MPs were predominantly radiotherapy physicists, much the same situation with other developed countries.

MPs were generally not complaining about their pay and did not think that there was a gap in their salary scheme. This might be because most of them were working in the civil service, where the salaries of all employees had been standardised throughout the civil service. Most MPs with an annual salary of less than RM 100,000 reported that they were not unfairly denied a pay increase in the organisations where they worked. This reflected a good and probably content working

environment for MPs in Malaysia. However, the caveat to this interpretation was the huge number of respondents (50%) who chose to remain neutral in this question.

There was no standard module by the government to train MPs at public hospitals and research institutes. Most of their training was acquired on-the-job, which was not structured. This resulted in a wide variation of so-called “clinical training” received by the MPs. MPs working in regulatory and mixed fields also generally trained for a longer period, usually more than a year. In the Health Ministry, MPs who wanted to transfer from a regulatory role to (any) clinical subfields would require training all over again for a new set of skills.

Malaysia had started a series of IAEA-based clinical training. The first batch started under the RAS6038 project themed “Strengthening Medical Physics through Education & Training in the Asia Region”. Six radiation oncology medical physicists (ROMP) were the first to graduate, followed by two diagnostic radiology medical physicists (DRMP). The second batch of MPs who enrolled in the IAEA-based training was launched under RAS 6087, themed “Enhancing Medical Physics Services in Developing Standards, Education and Training through Regional Cooperation (RCA)”. To date, a total of 15 MPs had been shortlisted under the programme, comprising of seven ROMPs, four DRMPs and four nuclear medicine medical physicists (NMMPs). This training programme required at least a Master degree in Medical Physics and two years full-time working experience in the relevant field (i.e. radiotherapy, nuclear medicine, diagnostic or interventional radiology).

Although there was a lack of systematic clinical training for MPs, their on-the-job training modes appeared to have equipped them with the necessary skills for their jobs. There was no apparent trend in the appreciation of clinical training across the different levels of working experience. This is not surprising since the clinical training of MPs in Malaysia had not changed much since its inception. Another

consequence of this was that Malaysian MPs often specialised in multi-disciplines and cross-discipline research, and collaborations were common. This trend was very much evident in many Asian countries.

Currently, there is no singular umbrella professional for MPs in Malaysia. Hence, it would be a challenge to unite all MPs to champion the cause of the profession. Professional certification for clinically competency were also non-existent in Malaysia.

The new Allied Health Professions Act was gazetted in 2016, but there was a lack of understanding among MPs on the content/implication of the Act. This indicated a need to have roadshows or engagements with MPs nationwide. Only half of the respondents thought that Act 774 will have a positive impact on their profession. The senior MPs tended to be sceptical compared to the younger generation.

MPs in Malaysia worked long hours, many clocking more than 40 h a week. This had caused disruption in their WLB. Two working arrangements that were found to be significantly correlated with achieving satisfaction at work and at home were working in office hours and closer to home. Working close to home was important to reduce commuting distance and hence, spending less time being stuck in traffic congestion. None of these measures were correlated to MPs being able to meet personal and work obligations. In maintaining clear boundaries between their roles at home and at work, significant correlations were found for both working in office hours or flexible hours, and close to home. This seemed contradictory because while Malaysians liked to work during office hours, they also liked to have the flexibility to work part-time. The underlying meaning was probably, MPs liked to work office hours (means no overtime), and when overtime was unavoidable, they would prefer to do it flexibly. Part-time working arrangements are uncommon in Malaysia.

Measures that were significantly correlated to having control over when, where and how MPs worked were flexible working hours, working close to home and having a supportive manager. Having a supportive partner sharing home duties and child-rearing responsibilities was important in ensuring WLB. These were family-centric considerations and hence, not surprisingly, they were also significantly correlated with several other family-centric factors, such as standard but flexible work hours, ability to take annual leave during school holidays, wide option of childcare and having a supportive manager.

Other aspects to achieve better WLB included being good at time management and having a harmonious working environment. Good and supportive working relationships with supervisors and colleagues, including respect and appreciation from clinicians, were also important. Work overload and lack of staff were factors that negatively impacted the work environment.

A huge 70% of Malaysian MPs are women. This was a stark contrast to the worldwide statistics of 28% [6]. While we might revel in these statistics, a closer look exposed a similar trend in developed countries. More male MPs could be observed in senior positions with higher pay compared to female MPs. Is this a leaky pipe syndrome? It may be worthwhile revisiting this topic again in another 10–20 years' time. On the other hand, the numbers of male MPs appears to stagnate since 2016. This may be due to two factors, the first, being the limited number of male MPs in the survey sample and the second being that currently female student is over represented in Malaysian universities [9]. However, if the situation does continue in this trend, we may need to address the gender imbalance problem reversely.

Since a majority of the MPs were women and of younger generation, family needs and child-rearing had to be juggled with the demands of career development. The long working hours and working on weekends negatively affected many MPs' WLB as people would rank family as the priority in life. The responsibility of child-rearing also influenced their decisions in changing career choices, sometimes giving up opportunities to stay home with their children. However, family and personal commitments were not considered a hindrance to career and some respondents said this even helped them to be more focused in their careers by motivating them to work harder to provide for their families.

Factors that would be helpful in supporting the wellbeing of female MPs included more childcare options, flexible working hours and co-operation from male counterparts. Measures to address heavy work load, especially during pregnancy, and lack of staff during maternity leave would improve the wellbeing of female MP workforce.

When asked about the positive aspect of being an MP, an overwhelming number of respondents said it was being able to contribute to patient care and acquiring a unique combination of technical and medical knowledge in the field made medical physics an interesting pursuit. The nurturing nature of the female gender may very well be the reason why more women gravitates to this profession. They aspired to become a professional so they could mentor their juniors. Although many felt they lacked the experience to achieve promotional aspiration, they were confident that with time, they would reach their career goals.

The primary challenges cited in career development were incompetent colleagues/seniors, bad managers, difficulties in acquiring proper training and supervision, difficulties in balancing family life, pregnancy, WLB and limited opportunities for advancement.

5. Conclusion

The medical physicist community is still a young community. The profession requires a united effort from all fronts — the public, private, industry, professional bodies and education sectors — to move towards setting up a proper clinical training system to ensure the quality of skills among MPs in Malaysia. There is a dire need for the local professional associations, namely MAMP, IFM and PERFEKS to come together as a team to develop a specific strategic plan based on a systematic strengths, weaknesses, opportunities and threats (SWOT) analysis to resolve issues highlighted in this study [10–12]. Although women made up the majority in the profession, more empowerment and support are needed for them to progress into leadership roles. Given their current composition, it is only a matter of time before they rise and helm the field. However, the stagnant number of males in the field has to be resolved so that a gender imbalance would not develop and give rise to complications in future. More efforts are also needed towards improving WLB of MPs. This may have to come in a paradigm shift in the Malaysian work culture, emulating systems that cater to flexible working hours.

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