

Educational Article

A comparative study on the psychological health status of pre-clinical medical students enrolled through different admission tests

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المخلص

أهداف البحث: أجريت هذه الدراسة في نهاية السنة الثانية لبرنامج كلية الطب لتقييم الاختلافات للحالة النفسية للطلاب المسجلين عن طريق المقابلات المتعددة الصغيرة والمقابلة الشخصية.

طرق البحث: اعتمدنا دراسة مقطعية مقارنة على مجموعتين لطلاب ما قبل المرحلة السريرية الذين تم اختيارهم في اختبارين مختلفين للقبول. تم قياس مستويات التوتر، والقلق، والاكتئاب للطلبة عن طريق مقياس الاكتئاب، والقلق والتوتر. كما تم قياس مستوى إرهابهم باستخدام مخزون كوبنهاجن للإرهاق.

النتائج: لم تكن درجات التوتر، والقلق، والاكتئاب بين المقابلات المتعددة الصغيرة والمقابلة الشخصية مختلفة بشكل كبير. ولم تكن درجات العمل الشخصي وإرهاق الطالب بين المقابلات المتعددة الصغيرة والمقابلة الشخصية مختلفة بشكل كبير. لم يكن معدل انتشار التوتر (المقابلات المتعددة الصغيرة=39٪، والمقابلة الشخصية=36.9٪)، والقلق (المقابلات المتعددة الصغيرة=78٪، والمقابلة الشخصية=67.4٪)، والاكتئاب (المقابلات المتعددة الصغيرة=41٪، والمقابلة الشخصية=36.2٪)، والإرهاق (المقابلات المتعددة الصغيرة=29٪، والمقابلة الشخصية=31.9٪) بين مجموعات المقابلات المتعددة الصغيرة والمقابلة الشخصية مختلفة بشكل كبير. أظهرت هذه النتائج مستويات متشابهة من التوتر، والقلق، والاكتئاب، والإرهاق للطلبة في نهاية المرحلة ما قبل السريرية.

الاستنتاجات: أظهرت هذه الدراسة الحالة الصحية النفسية المتشابهة لطلاب ما قبل المرحلة السريرية الذين تم تسجيلهم من خلال اختبارين مختلفين للقبول. وكان معدل انتشار التوتر، والقلق، والإرهاق، والاكتئاب بين طلاب الطب للمرحلة ما قبل السريرية مشابهًا للمعدل العالمي. وتشير هذه النتائج إلى أن كليات الطب يمكن أن تنظر في تنفيذ أيًا من المقابلات المتعددة الصغيرة أو المقابلة الشخصية لتعيين المرشحين المناسبين للتدريب الطبي.

الكلمات المفتاحية: المقابلة المتعددة الصغيرة؛ المقابلة الشخصية؛ التوتر؛ القلق؛ الاكتئاب؛ الإرهاق

Abstract

Objective: This study was conducted at the end of the second year of the pre-clinical program to assess differences in psychological status of students enrolled by multiple mini interview (MMI) and personal interview (PI).

Methods: We adopted a comparative cross-sectional study on pre-clinical medical students who appeared in two different admission tests. The stress, anxiety, and depression levels of students were measured by the depression, anxiety, stress scale (DASS-21), and their burnout level was measured by the Copenhagen Burnout Inventory.

Results: The stress, anxiety, and depression scores between MMI and PI were not significantly different (p -value > 0.05). The personal, work and client burnout scores between MMI and PI were not significantly different (p -value > 0.05). The prevalence of stress (MMI = 39%, PI = 36.9%), anxiety (MMI = 78%, PI = 67.4%), depression (MMI = 41%, PI = 36.2%) and burnout (MMI = 29%, PI = 31.9%) between MMI and PI cohorts was not significantly different (p -value > 0.05). These results showed similar levels of stress, anxiety, depression, and burnout in students at the end of the pre-clinical phase.

Conclusions: This study showed similar psychological health status of the pre-clinical students who were enrolled by two different admission tests. The prevalence of stress, anxiety, burnout, and depression among the pre-clinical medical students was comparable to the global prevalence. The results indicate that medical schools can consider implementing either MMI or PI to recruit suitable candidates for medical training.

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Introduction

In this technology-driven era, future medical graduates are facing a changing and challenging world that demands a different set of skills, which need to be considered in the medical admission process. Unlike in other fields, the attainment of a medical degree is just the beginning of a career, and medical graduates are expected to be life-long learners, in order to provide the best patient care.¹ Hence, medical schools must have an admission process to fit the purpose and be fair to the applicants, regardless of their background such as social-economic status and ethnic group. Recruiting the right talent is essential, as the kind of candidates initially recruited will determine the kind of medical graduates produced at the end.² Ensuring a valid, reliable, feasible, and evidence-based admission process is therefore important to recruit the best candidates; anything else will cause problems and defeat the end goal.¹⁻³

The rigour of medical training makes the medical education environment mentally challenging and demanding.⁴ This causes an unfavourable impact on the mental, physical, emotional, and social wellbeing of medical students.⁵⁻¹⁰ Ironically, mental illness among medical students doubles toward the end of their medical training,^{25,26} particularly close to a period of high-stake examinations.¹¹ Before starting medical training, the prevalence of stress and depression among medical students was less than 5%.^{10,12-14} However, during their medical training, the prevalence of depression ranged from 24.2% to 32.1%,¹⁵ the prevalence of stress ranged from 21.9% to 36.5%,⁸ the prevalence of anxiety ranged from 41.4% to 66.7%,¹⁰ and the prevalence of burnout among medical students was 43.3%.⁴ The main sources of stress were academic pressure, low personal accomplishment, and emotional exhaustion.^{4-6,8,11} Hence, the admission process could play a critical role in recruiting candidates who can handle the rigorous demands of medical training. Research into the psychological health status of students enrolled through different admission methods is thus important.

The medical admission process can be categorized into cognitive and non-cognitive aspects. The cognitive-based aspect looks at previous academic performance such as the cumulative grade point average (CGPA), while the non-cognitive-based looks at attributes such as communication skills, ethics, teamwork, and ethical reasoning skills.³ The most common non-cognitive method is the interview, either personal interview (PI) or multiple mini interviews (MMIs).³ According to earlier findings, an interview-based admission process had superior outcomes compared to the CGPA-based admission process in relation to clinical performance, emotional intelligence, and personality traits.¹ This was not

the case, however, for stress, depression, and anxiety.^{1,16,17} MMI has been widely implemented in many medical schools in various countries, and is increasingly gaining credibility.^{3,18} MMI has demonstrated its superiority concerning acceptability, reliability, content validity, and as a bias-free admission process.³ However, MMI has not demonstrated its superiority on non-cognitive outcomes such as mental health.^{3,18} Although several systemic review papers on the utility of MMI have been published,^{3,18,19} no study has directly compared medical students' psychological health status between MMI and PI. Therefore, this study was conducted at the end of the second year of medical training to assess the difference in the psychological status of students enrolled by MMI and PI. Hence, this study compared the level of stress, anxiety, depression, and burnout in medical students enrolled by different admission methods. The study hypothesises that there are significant associations between admission methods and psychological health.

Materials and Methods

Study design

A comparative cross-sectional study was conducted on medical students enrolled by MMI and PI at the end of pre-clinical medical training, due to the most psychological disorders being reported at this time.

Educational setting

The medical students (N = 157) selected by PI were in the second year of the 2016 academic session, and the medical students (N = 150) selected by MMI were in the second year of the 2017 academic session. Both groups of students were from the same school, and went through the same medical curriculum during their pre-clinical medical training. The medical students underwent a five-year medical course based on the SPICES (i.e. student-oriented, problem-based, integrated, community-oriented, electives, self-learning & systematic) curriculum model, and were organized into the pre-clinical phase (i.e. year 1 and 2) and the clinical phase (i.e. year 3, 4 and 5). The pre-clinical phase provides the foundation and applied knowledge related to the normal human being, and the normal responses to injuries. The clinical phase emphasises the acquisition of clinical skills in the workplace setting.

Personal interview

The institution received applications from applicants through an online system. Based on the applicants' previous academic performance in high schools or equivalent, approximately 600 medical applicants were called for personal interviews. Each candidate was invited to attend a 30-minute personal interview session with a pair of interviewers. A battery of questions were asked, which assessed specific attributes including: 1) interest, general knowledge and expectations of applicants about medical career; 2) applicants' personal attributes and their suitability in studying medicine at USM; 3) communication ability of the applicants in the

Malay and English languages; and any traits that might hinder the applicants from completing their medical studies or performing clinical functions.¹ Based on their interview scores, the top 200 candidates were recommended for the medical program.

Multiple mini interview

The institution received applications from applicants through an online system provided by the admission unit. Based on the applicants' previous academic performance in high schools or equivalent, approximately 500 medical programme candidates were called for the MMIs. The applicants are interviewed for a shorter time compared to the traditional personal interview (hence the name "mini-interview"), but at multiple stations (hence "multiple"). Each candidate went through five active stations and four rest stations, each lasting for seven minutes (two minutes for preparation, and five minutes for performing the assigned task), and each station was assigned to an assessor. The candidates were assessed on language proficiency, general conduct, critical thinking, ethical awareness, communication skills, knowledge of the healthcare system, and standard interview questions.²⁰ Ranked on their scores, the top 150 candidates were recommended for the medical program.

Study subjects and sampling method

The study used census sampling, whereby all medical students of the two cohorts were invited to take part in this study. Medical students who refused to take part, failed to return the consent form, or failed to return the questionnaires, were considered as non-respondent. Participation in this study was voluntary, and had no effect on their medical training progress.

Research tools

The 21-item Depression Anxiety Stress Scale (DASS-21) and the Copenhagen Burnout Inventory (CBI) were administered by a research assistant through a guided self-administration immediately after the pre-clinical phase examination.

Depression, anxiety, and stress levels were measured by DASS-21, with a high score indicating poor psychological health.^{10,21–24} Its validity and reliability among student samples were well established.^{23–26} The subscales showed discriminative ability to distinguish between psychiatric and non-psychiatric patients.²⁴ Each statement was rated using a 4-point Likert scale ranging from 0 (did not apply to me at all) to 3 (applied to me very much). Based on the DASS manual for student samples^{22–24}, 1) stress level is categorized as normal (0–14), mild,^{15–18} moderate,^{19–25} severe,^{16,26–32} and extremely severe (34 and above); 2) Anxiety level is categorized as normal (0–7), mild,^{8,9} moderate,^{10–14} severe^{15–19} and extremely severe (20 and above); and 3) Depression level is categorized as normal (0–9), mild,^{10–13} moderate,^{14–20} severe^{21–27} and extremely severe (28 and above). Any scores of moderate to extremely severe levels were considered as unfavourable stress, anxiety, and depression.

For CBI, there are primarily three domains, which include personal burnout, work-related burnout, and client-related burnout. Two types of Likert scale are used. The questions on personal burnout were formulated in a way so that anyone can answer them (a truly generic scale). The work-related burnout questions assume that the respondent has paid work of some kind. Finally, the client-related burnout questions include the term "client" (or a similar term when appropriate such as patient, students, inmate, etc.).^{27,28} There are 12 questions that were rated by the Likert's scale ranging from "Always [0]", "Often [1]", "Sometimes [2]", "Seldom [3]", "Never/Almost never [4]"; while seven were rated ranging from "To a very high degree [0]", "To a high degree [1]", "Somewhat [2]", "To a low degree [3]", "To a very low degree [4]". Reversed scoring was applied in positively worded items, and high scores indicated a high level of burnout. Cronbach's alpha values of the three factors ranged from 0.83 to 0.87.²⁸ The total score of more than 50% (more than 38) is considered as burnout.

Data collection

The questionnaires were administered to participants by an independent research assistant immediately after the end of the pre-clinical phase examination. The participants were requested to submit the questionnaire as soon as they finished responding to all items.

Data analysis

Data were entered using the Statistical Package of Social Sciences (SPSS) version 24. An independent-t test was performed to test the significant difference of stress, anxiety, depression, and burnout scores between MMI and PI. Assumptions were checked before analysis, and the results were tabulated accordingly. Any p-values less than 0.05 were considered as a significant level.

Results

Demographic data

The demographic profiles are summarized in [Table 1](#), which shows the respondents were predominantly from the matriculation stream, and the mean age between the two cohorts was similar.

[Figure 1](#) shows a comparison of the stress, anxiety, and depression scores in PI and MMI. On further analysis, the stress score between MMI [mean (SD) = 16.82 (8.67)] and PI [mean (SD) = 15.65 (10.50)] was not significantly different [t-stat (df) = -0.918 (239), p-value = 0.359]. The anxiety score between MMI [mean (SD) = 16.33 (8.99)] and PI [mean (SD) = 15.27 (9.64)] was not significantly different [t-stat (df) = -0.865 (239), p-value = 0.388]. The depression score between MMI [mean (SD) = 11.42 (9.54)] and PI [mean (SD) = 10.57 (9.84)] was not significantly different [t-stat (df) = -0.666 (239), p-value = 0.506].

[Figure 2](#) shows that the personal, work, and client burnout scores are lower in PI than MMI. On further analysis, the personal burnout score between MMI [mean (SD) = 12.29 (4.82)] and PI [mean (SD) = 12.07 (5.07)]

Table 1: Demographic profiles of respondents.

Variable	n (%)
Selection method	
Personal interview	141 (58.5)
MMI	100 (41.5)
Sex	
Male	88 (36.5)
Female	153 (63.5)
Race	
Malay	119 (49.4)
Chinese	61 (25.3)
Indian	54 (22.4)
Other	7 (2.9)
Qualification	
Matriculation	188 (78)
HSC	8 (3.3)
A-Level	6 (15.8)
Other	39 (16.2)
Age, mean (SD)	
Personal Interview	21.11 (0.49)
MMI	21.27 (0.78)

*MMI: multiple mini interview.
 Matriculation - The pre-university course; HSC - High School Certificate.
 A-Level - General Certificate of Education Advanced Level.
 Other qualification such as diploma and bachelor.

was not significantly different [t-stat (df) = -0.324 (239), p-value = 0.746]. The work burnout score between MMI [mean (SD) = 12.77 (4.62)] and PI [mean (SD) = 12.45 (5.23)] was not significantly different [t-stat (df) = -0.488(239), p-value = 0.626]. The client burnout score between MMI [mean (SD) = 9.10 (4.84)] and PI [mean (SD) = 8.48 (4.95)] was not significantly different [t-stat (df) = -0.966 (239), p-value = 0.335]. These results suggested the MMI and PI cohorts demonstrated similar levels of personal, work, and client burnout at the end of the pre-clinical medical training.

Figure 3 shows the percentages of respondents with unfavourable stress, anxiety, depression, and burnout among medical students enrolled by PI compared to MMI. The highest prevalence was anxiety, followed by depression, stress, and burnout. The percentage of respondents with burnout in the MMI cohort was not significantly different [$\chi^2 = 0.234$, p-value = 0.629]. Although the percentage of respondents with unfavourable stress, anxiety, and depression in the MMI cohort was higher than the PI cohort (Figure 3), statistically there was no significant difference ($\chi^2_{\text{stress}} = 4.741$, p-value = 0.315; $\chi^2_{\text{anxiety}} = 4.413$, p-value = 0.353; $\chi^2_{\text{depression}} = 5.151$, p-value = 0.272). These results suggested the MMI and PI cohorts demonstrated a similar level of stress, anxiety, and depression at the end of the pre-clinical medical training. The interview-based admission methods were not associated

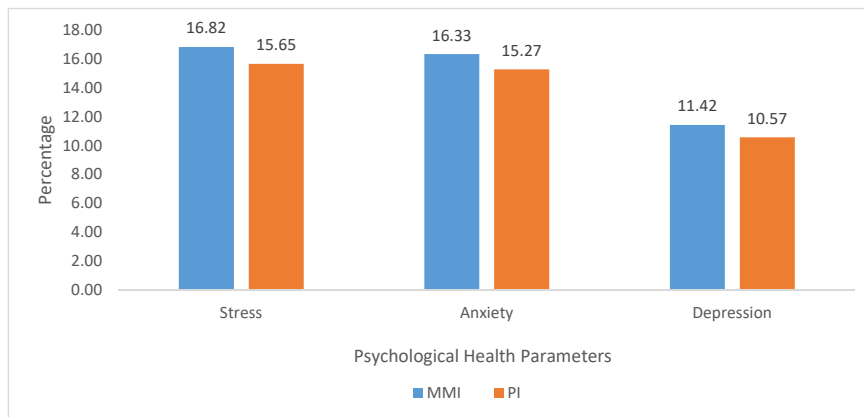


Figure 1: Comparison of stress, anxiety, and depression scores between MMI and PI. *MMI: multiple mini interview; PI: personal interview.

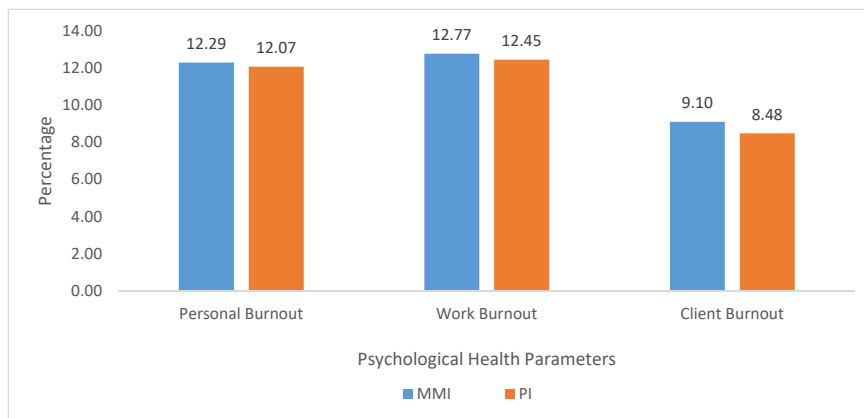


Figure 2: Comparison of personal, work, and client burnout scores between MMI and PI. *MMI: multiple mini interview; PI: personal interview.

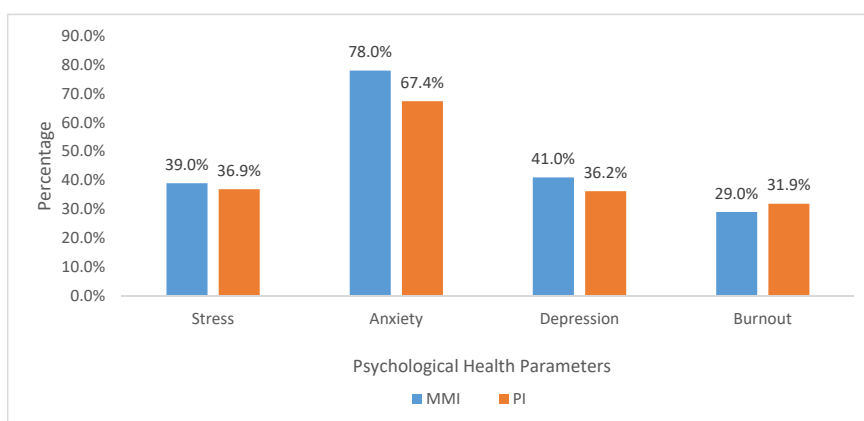


Figure 3: Percentages of respondents with unfavourable stress, anxiety, depression, and burnout in MMI and PI. *MMI: multiple mini interview; PI: personal interview.

with stress, anxiety, and depression. In other words, they were not associated with psychological health parameters.

Discussion

This study provided important evidence on the medical students' psychological status (stress, anxiety, depression, and burnout) enrolled by two different interview-based selection methods. The results demonstrated that there was no significant association between the admission methods and psychological health status, indicating medical students enrolled by MMI and PI had a similar level of psychological health. As there have so far been limited studies conducted to compare the psychological status of medical students enrolled through MMI and PI,^{3,18,19} these findings provide valuable data to add to the current body of knowledge related to the interview-based admission process. The insights gained from these findings are discussed below.

Both the MMI and PI enrolled medical students demonstrated an equal level of stress, indicating they were having similar stressful experiences at the end of their pre-clinical medical training, especially toward the end of the phase examination period. While there were no similar studies to compare findings with, an earlier study had found that final year medical students of both interview-based and CGPA-based admission cohorts experienced a similar level of stress (measured by DASS-21) at the end of clinical medical training.¹ However, two previous studies conducted during first-year medical training found that the interview-based cohort demonstrated a lower prevalence of psychological distress (measured by GHQ-12) compared to the CGPA-based cohort.^{16,17} These findings indicate that the interview-based admission has an important role in stress levels at the beginning, but not at the end of medical training. One possible explanation for this could be that the process of medical training strengthens students' ability to deal with psychological pressure, ensuring that by the end of their medical training no difference is observed between the two groups. Another reason could be that, at the end of the pre-clinical phase, they have developed skills to handle their academic loads, and are therefore better able to cope with various stressors. It is worth noting that both medical

students of MMI (mean stress = 16.82) and PI (mean stress = 15.65) cohorts showed a higher level of stress compared to the mean stress scores of medical students at the end of the first year (mean stress = 11.38),²⁵ indicating that medical students at the end of the pre-clinical phase (second year) experienced more stress due to their upcoming pre-clinical examination.⁸ This data suggests that regardless of medical school admission processes, the psychological wellbeing of medical students is gradually affected by the rigour of medical training.²⁹ Perhaps psychological wellbeing assessments such as a resilience test³⁰ should be incorporated into the existing medical school admission process, ensuring that those with high resilience levels are recruited for medical training.

Both MMI and PI medical students demonstrated equal anxiety levels, signifying they were all equally anxious at the end of pre-clinical medical training, as it was near their final pre-clinical phase examination. Despite the lack of similar research, one study found similar results, with final year medical students of interview-based and CGPA-based admission cohorts showing comparable levels of anxiety (measured by DASS-21) at the end of clinical medical training.¹ Based on three recent systematic review reports, none of the studies reported the advantage of MMI over PI on the anxiety level.^{3,18,19} This reveals that neither interview-based nor CGPA-based admission plays an active role in the anxiety level of prospective medical students at the beginning or end of medical training. One possible explanation of this could be the difficulty in recognising anxiety, which is a combination of biological, psychological and social factors^{31,32}; since the MMI, PI, and CGPA did not assess these factors, the lack of difference in the result is expected. These facts suggest that present medical school admission processes do not assess the anxiety level of prospective medical students, and hence an alternative assessment is required. Otherwise, medical schools should introduce a special program^{33–35} to increase students' ability to manage stressors that induce anxiety.

A longitudinal study reported that up to 30% of medical students experienced depression after one-year medical training,^{10,13} and a recent meta-analysis revealed the

depression prevalence among medical students across years of study ranged from 24.2% to 32.1%.¹⁵ The medical students from both MMI and PI had similar depression levels, indicating they experienced similar depressive moments at the end of pre-clinical medical training. Despite the scarcity of similar research, one study found similar results, whereby both interview-based and CGPA-based admission did not influence the depression level (measured by DASS-21) at the end of clinical medical training.¹ This observation could be due to both cohorts of medical students having peak psychological pressure⁸ from high academic demands during the data collection period, and thus a similar depressive experience was recorded. One study showed that the highest prevalence of psychological distress was noted during the summative assessment, especially during the final examination that determines their progression to the next level of training.³⁶ Another explanation is that MMI and PI did not directly screen characteristics of depression during the selection of candidates, and therefore it is logical if no significant difference was observed. Besides, these facts point out that while the selection process is well-intentioned, it is not able to assess students' depression levels. Perhaps, more direct wellbeing indicators should be integrated into the selection processes, to screen out candidates who are vulnerable to developing depression, considering the rigour of medical training. Based on the latest resilience model,³⁰ medical schools should create a selection mechanism to assess candidates who remain controlled under challenging tasks, who are actively engaged with problems, are resourceful in completing challenging tasks, and who show potential to bounce back stronger after bad experiences.

Finally, this study found the levels of burnout related to personal, work, and client between the MMI and PI medical students were no different, suggesting a similar burnout experience at the end of pre-clinical medical training. The prevalence of burnout among university students ranged from 38.6% to 48.1%, with some studies finding the prevalence of burnout doubled compared to the prevalence of depression, and the burnout mostly related to the experience of inefficacy and low-performance achievement.⁴ In this study, the highest level of burnout was related to work and personal, indicating that medical students of MMI and PI experienced personal inefficacy (i.e. personal burnout) and low-performance achievement (i.e. work burnout), which is most strongly associated with low academic performance.^{4,37} Interestingly, the prevalence of burnout among MMI (29.0%) and PI (31.9%) medical students was below the estimated prevalence of burnout worldwide (38.6%–48.1%); however, it is still considered as a high prevalence. It is worth highlighting that the highest burnout level was reported in the second, third, and fourth years, and the lowest burnout level was in the first and fifth years of medical training.⁴ Dyrbye et al. (2010) reported that at least 64% of medical students are vulnerable to burnout, 54% experienced burnout, 43% developed burnout, and only 20% recovered from burnout, while 37% never experienced burnout (resilience).³⁸ One important lesson to be learned from this data is that medical schools and

researchers should put more effort into finding the best mechanism to recognise and screen out candidates susceptible to developing burnout. Otherwise, medical schools should consider incorporating wellbeing strategies in their curriculums, to ensure the medical training environment is at an optimal level to nurture tomorrow's doctors. Based on the three recent systematic review reports,^{3,18,19} no study had reported the relationship of burnout with the interview-based admission process; this study therefore fills the gap.

Despite the interesting outcomes, this study has several limitations. First, the medical students were recruited from a single centre, and hence, any attempt to generalize the findings to other medical schools should be done with caution. Second, several potential confounding factors such as the history of psychiatric illness, previous scholastic performance, and personality were not controlled, which might influence the accuracy of the results. Third, the baseline measurement of stress, anxiety, depression, and burnout before the medical training was not measured to control the uniformity of its level between the two cohorts. This could lead to inaccuracy of the results, and subsequently lead to a different conclusion. Fourth, this study used solely quantitative measurements, and it is recommended that qualitative studies should also be conducted in the future, to explore the underlying reasons for the study findings. Finally, the data was a cross-sectional measurement at the end of the pre-clinical phase, and thus was not able to capture the outcome longitudinally. Future research should therefore address these limitations to confirm the present findings. Last but not least, this study showed that different admission strategies should be considered to select candidates who are mentally fit for the challenge of medical training.

Conclusion

This study provided evidence on the psychological health status of medical students enrolled by both MMI and PI at the end of their pre-clinical medical study. Both interview-based admission methods demonstrated a similar level of psychological health status. The prevalence of stress, anxiety, burnout, and depression among MMI and PI medical students was comparable to the global prevalence. The results indicate that medical schools can consider implementing either MMI or PI to recruit the best candidates to enrol in medical training, which is challenging and demanding.

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Conflict of interest

The author has no conflict of interest to declare.

Ethical approval

Ethical approval was sought from the Human Ethics Committee of Universiti Sains Malaysia before the study (USM/KK/PPP/JEPeM(212.4[2.5]) - 12-Sept-2014).

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