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# Psychological health of graduating medical students in a time of COVID-19: a nationwide survey

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## INTRODUCTION

The coronavirus disease 2019 (COVID-19), first reported in Wuhan, China in December 2019, has taken a significant toll on the world. At the time of this manuscript, there have been more than 6.6 million confirmed cases globally, affecting almost every country in the world.[1] COVID-19's high reproduction number (R0) coupled with an apparent lack of effective treatment and vaccines have caused an exponential increase in the number of cases.[2]

Despite global efforts to 'flatten the curve', the disease has caused significant depletion of healthcare resources, from medical resources such as Personal Protective Equipment (PPE) and ventilators, to manpower resources. With increasing strain on healthcare manpower, coupled with increasing workload, there have been increasing concerns about the negative psychological impact on healthcare workers.[3] Many countries have taken pre-emptive steps to initiate needs assessments, preventive measures and set up support systems in order to minimize the psychological impact on healthcare workers.[4] To alleviate manpower shortages, countries like the United States of America and the United Kingdom have allowed medical schools to graduate their students early to join the workforce.[5,6] Meanwhile, in the United States of America, healthcare systems have employed medical students in other roles in this monumental fight against the pandemic.[7]

In Singapore, the country has experienced a growing number of infections ever since our first case on 23 January 2020.[8] Manpower remains a precious resource in ensuring quality healthcare delivery for both COVID-19 and non-COVID 19 related conditions. Final year medical students in Singapore sat for their final examinations in March and entered Postgraduate Year 1 (PGY1)/Housemanship by late April. The peak of the pandemic in Singapore coincided with the period after their examinations and prior to commencing work. There was inadequate time to include COVID-19 pandemic preparedness topics within their medical school undergraduate curriculum. During this pandemic, a study in China reported

anxiety levels of college students,[9] and a study from Singapore examined the psychological impact on current healthcare workers.[10] However, there have not been any studies, to our knowledge, studying the psyche of new doctors joining the workforce during these uncertain and complex times.

In this study, we aimed to examine the psychological health and preparedness of these graduating medical students entering the workforce during this COVID-19 pandemic using a nationwide survey.

## METHODS

We conducted a nationwide, cross-sectional, web-based survey to study the psychological impact of COVID-19 on graduating medical students, and their mental preparedness to enter the workforce during this pandemic. Convenience sampling was used to invite graduating medical students from all 3 medical schools in Singapore to participate by filling out a self-administered online questionnaire using the Google Forms platform. There were no specific exclusion criteria. The study was conducted from 13 Apr 2020 to 19 Apr 2020 after obtaining institutional ethical approval.

We designed a 22-item questionnaire. Utilising the well-validated Depression, Anxiety, and Stress Scale (DASS-21) inventory to screen for psychological conditions.[11] The questionnaire contained questions on demographics (6 items), personal interaction with COVID-19 positive patients (2 items), and 5-point Likert scale questions regarding psychological preparedness to start work in the climate of COVID-19 (8 items). Prior to the start of the study, the questionnaire was pilot tested on 10 graduating medical students to ensure comprehensibility. Minor modifications to phrasing of certain questions were made following feedback. The full version of the questionnaire can be found in the Appendix.

The survey was distributed through various online broadcast mediums including mailing list of the various undergraduate medical societies and medical students' social media platforms on 13 Apr 2020. A brief summary of the study including its objectives was distributed in the pre-survey portion. To prevent multiple entries, the survey required the participant to sign-in using their official University email address and email address was limited to 1 response. However, no identifiers were recorded, in order to preserve anonymity of respondents. Implicit consent was given when the respondent filled and submitted the online survey. The survey allowed responses for 1 week until 19 Apr 2020. This specific time frame was chosen to capture an accurate representation of psychological health prior to commencing work, since PGY1/Housemanship started in late-April 2020.

For ease of analysis, responses from the 5-point Likert scale was further categorized into 3 distinct categorical data, namely: 'agree' (score 4 and 5), 'neutral' (score 3) and 'disagree' (score 1 and 2). DASS-21 scores are reported categorically, namely: normal, mild, moderate, severe and extremely severe according to Table I. However, subsequent cross analyses of the scores were done as continuous variables. The Pearson chi-square test was used to compare categorical variables. Student T-test and one-way ANOVA were used to compare continuous variables. Multivariate analysis was also performed to adjust for potential confounders. A p-value of $<0.05$ was deemed statistically significant. All analyses were performed using IBM SPSS Statistics, Version 25.

## RESULTS

We received a total of 127 responses from 13 Apr 2020 to 19 Apr 2020, with all of the respondents completing the entire survey. The overall response rate was 29.0%, ranging from 27.1% to 35.8% among the 3 medical schools. Responder demographics can be found in Table I.

The DASS-21 inventory scores 3 separate scales namely, Depression, Anxiety and Stress with the score subsequently categorised into normal, mild, moderate, severe and extremely severe depending on the score for the various psychological distresses. Of the 3 psychological conditions, anxiety was the most prevalent with 34 (27%) respondents screening positive for anxiety. 32 (25%) respondents screened positive for depression, and 30 (24%) screened positive for stress (Table II). Our respondents scored a median of 4 (IQR 8), 3 (IQR 7) and 7 (IQR 11) for depression, anxiety and stress respectively.

On univariate analysis, female respondents had higher anxiety scores (p=0.04; 95% CI 0.81-3.67) and higher stress scores (p=0.007; 95% CI 1.10-6.79) as compared to male respondents. However, on multivariate analysis, these were no longer statistically significant. Other demographics studied including medical school, first PGY1/Housemanship posting, race, and knowing someone with COVID-19 did not have statistically significant association (all p>0.05) with DASS-21 scores.

A majority of graduating medical students reported feeling inadequately trained to manage patients with COVID-19 (n=81, 63.8%). Regarding infectious control measures, 75 (59%) believed they would require more formal infection control training. A large majority 90 (71%) were confident in the PPE supplied by the hospital in preventing transmission of COVID-19. Interestingly, a far larger proportion of respondents were concerned of the possibility of passing the infection to their family members (n=110, 87%) than they were of contracting the virus themselves (n=86, 68%). 53 (42%) respondents agreed that they would potentially benefit from availability of counselling services during the pandemic. Despite all these concerns, only 13 (10%) respondents indicated that they would prefer to delay their entry into the workforce in this current pandemic. A summary of the responses can be found in Table III.

We compared respondents' DASS-21 scores with their preparedness to start work. Graduates with higher depression (p=0.009), anxiety (p<0.001) and stress (p=0.005) scores were more likely to prefer to delay their entry into the workforce. Graduates with higher anxiety (p=0.009) and stress (p=0.009) scores were more likely to think that they would benefit from the availability of counselling services during the pandemic. On the contrary, graduates with higher depression scores were less likely to think that they will benefit from such services (p=0.19).

## DISCUSSION

This is the first nationwide study examining the psychological health and preparedness of a cohort of graduating medical students entering the workforce during the time this COVID-19 pandemic.

The uncertainty and fear surrounding this COVID-19 pandemic have been shown to have some psychological effects on medical students.

The DASS-21 has been used to assess the psychological health of medical students under periods of societal stress and unrest. In Syria, where the ongoing Syrian conflict has been a significant source of psychological distress, 350 students at a single centre were assessed psychologically using the DASS-21.[12] The prevalence of depression, anxiety and stress were 61%, 35% and 53% respectively. With a protracted conflict and its devastating socioeconomic ramifications, these rates were understandably higher compared to the 25%, 27%, 24% rate of depression, anxiety and stress respectively in our study. Female students were also more likely to be depressed and anxious, similar to our study.

In Singapore, the true prevalence of baseline depression, anxiety and stress among medical students prior to COVID-19 pandemic is not known. Availability of this data is further hampered by the preference for non-disclosure of personal mental health conditions for fear of

stigmatization.[13] Our study represents the first estimate of prevalence of depressive, anxiety and stress symptoms among medical students in Singapore. Globally, a meta-analysis by Quek et al. had shown that the global prevalence of anxiety among medical students was 34% (95% CI: 29.2-38.7%). There were no statistically significant differences in anxiety symptom prevalence between gender and year of medical study on subgroup analysis.[14] Another meta-analysis by Puthran et al demonstrated a global prevalence of depression among medical students of 28% (95% CI: 24.2-32.1%).[15] They found that females were more likely to be depressed, similar to our findings.

In this study, we focused specifically on graduating final year medical students entering the workforce during the pandemic. In the meta-analysis by Puthran et al, the rate of depression reduces with progression in medical school. Year 1 students had higher depression rates of 34% (95% CI: 25.2-43.1%), than the rate of 21% (95% CI: 13.2-30.5%) for final year students.[15] Various studies have postulated increased resilience in their latter years in medical school as a reason for low rate of mental conditions.[16-18] The global rate for final year students is lower compared to the 25% rate in our study, possibly due to the effect of this COVID-19 pandemic. However, the lack of baseline local data precludes a definite conclusion.

In our study, graduating medical students with higher anxiety and stress scores were more likely to agree that they would benefit from counselling services but a similar trend is not seen in respondents with higher depression scores. This finding is consistent with Purthran et al's meta-analysis, where only 13% of depressed medical students sought medical treatment.[15] This is a worrying trend as help-seeking behaviour might be unhealthy among students with depressive symptoms, contributed by preference for non-disclosure of their mental health conditions.[13] A group in the United Kingdom created a digital psychological support learning package for healthcare workers during this COVID-19 pandemic.[19] Such interventions would

improve access to psychological support, normalize and encourage help-seeking behaviour with the assurance of anonymity and confidentiality.

This study revealed psychological preparedness of graduating medical students in entering the workforce during this pandemic, with 64% of respondents feeling inadequately prepared. Singapore, being porous to foreign travellers, and its relative proximity to China, had the COVID-19 pandemic hit our shores fast. Our high-density population allowed for rapid second wave community spread. Medical schools managed to take students through a modified, high quality final year examination just before the peak of the pandemic, with little time for pandemic preparedness in the undergraduate curriculum.[20]

This lack of preparedness was represented in our findings where 59% reporting they would require more formal infection control training. Upon completion of the final year examination, intensive pandemic training and preparation have been implemented. Interestingly, a far larger proportion of respondents were concerned of the possibility of passing the infection to their family members (86%) than they were of contracting the virus themselves (67%). Furthermore, graduates with higher depression ($p=0.009$), anxiety ($p<0.001$) and stress ($p=0.005$) scores were more likely to prefer to delay their entry into the workforce.

When employed, various evidence-based interventions improve the psychological preparedness of graduating medical students. Education and improved knowledge of PPE use have been shown to significantly correlate with healthcare workers' confidence in PPE during a pandemic, reduce absenteeism, and reduce anxiety of being infected.[21] Resilience training prior and during a pandemic has also been shown to allow healthcare workers to feel more prepared and confident to deal with crises.[22] Moving forward, medical schools could consider incorporating pandemic preparedness-related training for medical students, as countries are bracing for a new normal with COVID-19. Equally importantly, such training would better equip our future doctors in the event of another pandemic of unpredictable impact.

The world we live in is volatile, uncertain, complex and ambiguous (VUCA), exemplified by the virulence and magnitude of this pandemic. Anxiety is related to an individual's ability to navigate through the uncertainty, medical education via formal or informal curriculum would certain encourage graduating medical students to step into their new identity and become healthcare providers. This transition from medical student to doctor is one of the largest steps in one's medical career, the stress and anxiety of this change in role is amplified by this pandemic. The medical community would do well to provide intentional support and care to their healthcare workers, with special attention to this group of doctors who transited during this COVID-19 pandemic.

We acknowledge certain study limitations due to restrictions imposed by this COVID-19 pandemic. In our study, due to the short timeframe available to collect responses before the graduating medical students started work, we used convenience sampling, which could introduce a degree of sampling bias. Due to social distancing during this COVID-19 pandemic, many surveys including ours, had to rely primarily on electronic dissemination, which is known to have lower overall response rates. Future research could also include focus group studies for qualitative assessment of these complex psychological health issues.

In conclusion, during this COVID-19 pandemic, approximately a quarter of our graduating medical students entering the workforce screened positive for depression, anxiety and stress. This represents the first study worldwide, to our knowledge, estimating the psychological health of graduating doctors during this COVID-19 pandemic. With a likely protracted COVID-19 pandemic and recovery phase, the reported low rate of psychological preparedness among our new doctors entering the workforce is of grave concern. This needs to be urgently addressed through a combination of deliberate pandemic preparedness training and psychological resilience training.

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**Table I: Demographics of Respondents**

| **Variable** | | **No.(%)** |
|---|---|---|
| **Age(mean, SD)** | | 24.5, 2.16 |
| **Sex** | M | 56(44) |
| | F | 71(56) |
| **Race** | Chinese | 116(91) |
| | Malay | 0(0) |
| | Indian | 8(6) |
| | Others | 3(2) |
| **Marital status** | Single | 123(97) |
| | Married | 4(3) |
| | Others (divorced, separated, widowed) | 0(0) |
| **Medical School** | Yong Loo Lin School of Medicine | 80(63) |
| | Lee Kong Chian School of Medicine | 28(22) |
| | Duke-NUS School of Medicine | 19(15) |
| **First Housemanship Posting** | Internal Medicine | 72(57) |
| | General Surgery | 24(19) |
| | Orthopedic Surgery | 13(10) |
| | Pediatric Medicine | 10(8) |
| | Obstetrics & Gynecology | 8(6) |
| **Family members with COVID-19** | Yes | 0(0) |
| | No | 127(100) |
| **Friends/acquaintances with COVID-19** | Yes | 41(32) |
| | No | 86(68) |

**Table II: DASS-21 Scales of Respondents**

| Severity of Distress | Depression(%) | Anxiety(%) | Stress(%) |
|---|---|---|---|
| Normal | 95(75) | 93(73) | 97(76) |
| Mild | 15(12) | 9(7) | 7(6) |
| Moderate | 12(9) | 17(13) | 15(12) |
| Severe | 4(3) | 7(6) | 8(6) |
| Extremely Severe | 1(1) | 1(1) | 0(0) |

**Table III: Respondents' Preparedness to Start Work**

| Question | Disagree(%) | Neutral(%) | Agree(%) |
|---|---|---|---|
| I am well-trained to manage patients with COVID-19 | 81(64) | 39(31) | 7(6) |
| I am aware of the hospital's infection control measures for COVID-19 | 56(44) | 40(32) | 31(24) |
| I am confident in the PPE supplied in preventing transmission of COVID-19 | 16(13) | 21(17) | 90(71) |
| I am concerned that I may contract the virus from patient encounters | 13(10) | 28(22) | 86(68) |
| I am concerned that I may infect my family members in my line of work | 5(4) | 12(9) | 110(87) |
| I would prefer to delay my entry into the workforce | 95(75) | 19(15) | 13(10) |
| I need more formal infection control training | 22(17) | 30(24) | 75(59) |
| I would benefit from the availability of counselling services | 27(21) | 47(37) | 53(42) |

## APPENDIX

### Questionnaire

1. What is your age? _____

2. Which medical school did you graduate from?
   a. Yong Loo Lin School of Medicine
   b. Duke-NUS Graduate Medical School
   c. Lee Kong Chian School of Medicine

3. Which is your first HO Posting?
   a. Internal Medicine
   b. Surgery
   c. Orthopaedics
   d. Paediatrics
   e. Obstetrics & Gynaecology

4. What is your gender?
   a. Male
   b. Female

5. What is your race?
   a. Chinese
   b. Malay
   c. Indian
   d. Other

6. What is your marital status?
   a. Single
   b. Married
   c. Divorced
   d. Separated
   e. Widowed

# DASS21

Name: Date:

Please read each statement and circle a number 0, 1, 2 or 3 which indicates how much the statement applied to you **over the past week**. There are no right or wrong answers. Do not spend too much time on any statement.

The rating scale is as follows:

0 Did not apply to me at all
1 Applied to me to some degree, or some of the time
2 Applied to me to a considerable degree or a good part of time
3 Applied to me very much or most of the time

| | | | | | |
|---|---|---|---|---|---|
| 1 (s) | I found it hard to wind down | 0 | 1 | 2 | 3 |
| 2 (a) | I was aware of dryness of my mouth | 0 | 1 | 2 | 3 |
| 3 (d) | I couldn't seem to experience any positive feeling at all | 0 | 1 | 2 | 3 |
| 4 (a) | I experienced breathing difficulty (e.g. excessively rapid breathing, breathlessness in the absence of physical exertion) | 0 | 1 | 2 | 3 |
| 5 (d) | I found it difficult to work up the initiative to do things | 0 | 1 | 2 | 3 |
| 6 (s) | I tended to over-react to situations | 0 | 1 | 2 | 3 |
| 7 (a) | I experienced trembling (e.g. in the hands) | 0 | 1 | 2 | 3 |
| 8 (s) | I felt that I was using a lot of nervous energy | 0 | 1 | 2 | 3 |
| 9 (a) | I was worried about situations in which I might panic and make a fool of myself | 0 | 1 | 2 | 3 |
| 10 (d) | I felt that I had nothing to look forward to | 0 | 1 | 2 | 3 |
| 11 (s) | I found myself getting agitated | 0 | 1 | 2 | 3 |
| 12 (s) | I found it difficult to relax | 0 | 1 | 2 | 3 |
| 13 (d) | I felt down-hearted and blue | 0 | 1 | 2 | 3 |
| 14 (s) | I was intolerant of anything that kept me from getting on with what I was doing | 0 | 1 | 2 | 3 |
| 15 (a) | I felt I was close to panic | 0 | 1 | 2 | 3 |
| 16 (d) | I was unable to become enthusiastic about anything | 0 | 1 | 2 | 3 |
| 17 (d) | I felt I wasn't worth much as a person | 0 | 1 | 2 | 3 |
| 18 (s) | I felt that I was rather touchy | 0 | 1 | 2 | 3 |
| 19 (a) | I was aware of the action of my heart in the absence of physical exertion (e.g. sense of heart rate increase, heart missing a beat) | 0 | 1 | 2 | 3 |
| 20 (a) | I felt scared without any good reason | 0 | 1 | 2 | 3 |
| 21 (d) | I felt that life was meaningless | 0 | 1 | 2 | 3 |

7. Based on the DASS-21 score above, what is your Depression scale/score? _____

8. Based on the DASS-21 score above, what is your Anxiety scale/score? _____

9. Based on the DASS-21 score above, what is your Stress scale/score? _____

10. Do you know of any family members diagnosed with COVID-19?
    a. Yes
    b. No

11. Do you know of any friends or acquaintances diagnosed with COVID-19?
    a. Yes
    b. No

**Please select the most appropriate for each statement.**

12. I am well trained to manage patients with COVID-19.
    a. Strongly disagree
    b. Disagree
    c. Neutral
    d. Agree
    e. Strongly Agree

13. I am aware of the hospitals' infection control measures for COVID-19.
    a. Strongly disagree
    b. Disagree
    c. Neutral
    d. Agree
    e. Strongly Agree

14. I am confident in the PPE supplied in preventing transmission of COVID-19.
    a. Strongly disagree
    b. Disagree
    c. Neutral
    d. Agree
    e. Strongly Agree

15. I am concerned that I may contract the virus from patient encounters.
    a. Strongly disagree
    b. Disagree
    c. Neutral
    d. Agree
    e. Strongly Agree

16. I am concerned that I may infect my family members in my line of work.
    a. Strongly disagree
    b. Disagree
    c. Neutral
    d. Agree
    e. Strongly Agree

17. I would prefer to delay my entry into the workforce in view of the COVID-19 situation.
    a. Strongly disagree
    b. Disagree
    c. Neutral
    d. Agree
    e. Strongly Agree

18. I need more formal infection control training.
    a. Strongly disagree
    b. Disagree
    c. Neutral
    d. Agree
    e. Strongly Agree

19. I would benefit from the availability of counselling services during this pandemic.
    a. Strongly disagree
    b. Disagree
    c. Neutral
    d. Agree
    e. Strongly Agree