


BMJ Open Factors associated with the mental health status of medical students during the COVID-19 pandemic: a cross-sectional study in Japan

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ABSTRACT

Objective The COVID-19 pandemic had a substantial impact on university students, including those in medical schools, with disruption in routine education causing significant psychological distress. The objective of this study was to evaluate the factors associated with psychological distress among medical students during the period of enforced home quarantine from March through May 2020.

Design A cross-sectional study.

Setting One Japanese medical school.

Participants 571 medical students.

Primary and secondary outcome measures Self-administered electronic questionnaires including the K-6 scale for psychological distress, the Rosenberg Self-Esteem Scale (RSES) for self-esteem and the General Self-Efficacy Scale (GSES) for self-efficacy were distributed. To assess the determinant factor for psychological distress, variables such as sex, grade in school, living conditions, and RSES and GSES scores were evaluated in regression analysis.

Results 163 respondents (28.5%) scored ≥ 5 on the K-6 scale, indicating a significant degree of psychological distress. Logistic regression revealed that a higher score on RSES ($p < 0.001$) and GSES ($p < 0.01$) was an independent factor associated with lower levels of psychological distress. Multiple regression analysis focusing on students with a K-6 score ≥ 5 revealed that higher scores on RSES correlated with lower levels of psychological distress. By contrast, those with higher GSES scores also scored higher for indicators of psychological distress.

Conclusions This study identified that self-efficacy and self-esteem were both influential factors for predicting psychological distress during the current COVID-19 pandemic. Medical schools should provide support for mental health and educational initiatives directed at enhancing self-esteem and self-efficacy, with a focus on improving personal resilience. In emergency situations, such as that faced in response to the COVID-19 pandemic, initial programmes might target students with higher levels of self-efficacy. By contrast, under routine situations, these efforts should be directed towards students with lower self-esteem as primary means to prevent depression.

Strengths and limitations of this study

- We promptly conducted a cross-sectional study in Japan on the impact of the ongoing COVID-19 pandemic on depression, focusing on the roles of self-efficacy and self-esteem, in medical students, in whom no study to address these issues has been conducted.
- This study was based on a relatively large sample of medical students considering the social situation of the ongoing COVID-19 pandemic.
- Data from only one private medical school were included and this may be a somewhat unbalanced sample that does not fully represent the diversity of medical students in Japan.
- This study used self-reported questionnaires; therefore, data obtained were participants' subjective perceptions.

INTRODUCTION

COVID-19 was first identified in December 2019 in Wuhan, China.¹ According to the WHO, by 7 August 2020, there have been 19 936 210 cases and 732 499 deaths reported worldwide.² The highly contagious nature of this infection required immediate quarantines and lockdowns, and these actions had a substantial and worldwide impact on students of all ages.³ As part of the ongoing efforts to further limit the person-to-person spread of SARS-CoV-2, educational institutions were required to transfer on-site learning programmes to ones that were primarily online. As might be anticipated, not all educators and students were prepared for this rapid shift, and many lacked adequate access to appropriate infrastructure and resources. This resulted in new and unexpected challenges for many students,⁴ and some cases resulted in a dramatic disruption of the educational process.⁵ Most students were forced to stay at home and to learn the



required material by themselves; many had limited access to study resources, and little to no opportunity for interpersonal interactions with teachers or classmates. This unusual situation gave rise to profound isolation, anxiety, depression and uncertainty for the future. One recent study reported that this entire situation led to substantial stress among university students.⁴ Other recent studies revealed increased reports of loneliness, anxiety and depression resulting from stay-at-home orders required to combat the COVID-19 pandemic.⁶ These types of stress have an unfavourable impact on learning and can also lead to mental health problems.⁷

In this study, we focused specifically on medical students. These students routinely encounter substantial emotional stress,⁸ including anxieties associated with overloaded study programmes and the need to maintain superior academic performance.⁹ At the time that the COVID-19 quarantine was initiated, many medical students were preparing for the national examination for medical practitioners, an activity associated with high parental expectations.⁹ A previous cross-sectional study assessed 326 Japanese female medical students in 2018 and showed 15% of them experienced psychological distress.¹⁰ A systematic review of 195 studies from 47 countries around the world revealed a prevalence of depressive symptoms of 27.2% among medical students¹¹; this is much higher than that reported for this age cohort among those in the general population in the USA, where the 12-month prevalence of depressive episodes has been reported at 9.3% among those in a cohort of individuals aged 18–25 years old.¹² Psychological distress was identified at the early stages of medical education,¹³ as students encounter both personal and societal pressure as well as competitiveness, which is typically associated with perfectionism.¹⁴ These stresses continue and increase throughout training and into medical practice.^{15–16} Other studies revealed that student depression was a problem at all levels of medical training.^{17–18} Results from several studies revealed that depressive symptoms among medical trainees may harm the long-term health of physicians as well as the quality of care delivered by academic medical centres.^{19–21}

Among the factors associated with psychological distress, including anxiety and depression, previous studies suggested a relationship between these factors and motivational beliefs, such as self-efficacy^{22–23} and self-esteem.⁸ Self-efficacy is an important concept that reflects the personal belief that one can perform novel or difficult tasks and attain desired outcomes.²⁴ According to Bandura's social cognitive theory, self-efficacy also plays an important role in influencing achievement via its dynamic interplay with environmental and behavioural determinants.²⁵ According to this theory, the factors that influence behaviour are embedded in the belief that one is capable of accomplishing a specific behaviour or goal.²⁶ This may be particularly important in competitive learning environments such as in medical schools, where students encounter challenging coursework and a substantial risk of failure. According to this concept,

these beliefs facilitate learning and development among medical students.²⁶ A strong sense of self-efficacy also supports personal accomplishments, reduces stress and limits vulnerability to depression.²⁷ Previous studies revealed a significant negative relationship between self-efficacy and other domains associated with efficacy and depression.²²

Previous research has also indicated that self-esteem and depression correlate with one another and contribute to negative psychological attributes.²⁸ Self-esteem is essentially the evaluation of one's worth; this attribute encompasses beliefs about oneself and is directly associated with emotional status, including responses associated with triumph, despair, pride and shame.²⁹ Self-esteem can also be defined as positive or negative evaluations of the self.³⁰ Self-esteem is an attractive psychological construct because it predicts critical outcomes, including academic achievement.³¹ Previous research has shown that low self-esteem is a strong predictor of depression.³² Indeed, earlier work suggested that treatments aimed at reducing depression as a means to improve self-esteem could provide short-term gains for clients as well as long-term protection from depression among those most at risk.³³

Self-esteem itself is also strongly correlated with personality traits, including self-efficacy,³⁴ and can serve to promote resilience.³⁵ Resilience is defined as the ability to maintain a state of equilibrium in the face of extremely unfavourable circumstances.³⁶ Another definition of this term includes the capacity to respond to stress in a healthy way such that goals are achieved at minimal psychological and physical cost; resilient individuals typically rebound after challenges while learning and gaining strength from the experience.³⁷ Programmes that explore and encourage resiliency have been proposed as a means to modulate the impact of stresses encountered by medical professionals who are experiencing a high rate of psychological morbidity and emotional exhaustion; this approach may ultimately have long-term positive effects.³⁸

Medical students with high self-esteem and self-efficacy may be capable of handling the stresses associated with the heavy workload, time pressure, emotional exhaustion and vulnerability to depression, and may ultimately develop better communication skills and interpersonal relationships.³⁹ In addition to personal benefits, these skills may promote improved future physician–patient relationships.

While self-esteem and self-efficacy are both positive motivational and psychological factors associated with academic performance, there are very few studies that have explored these traits and their relationship with depression with a specific focus on medical students. Furthermore, to the best of our knowledge, there are few to no studies that focus on the role(s) of self-efficacy and self-esteem and their relationship with depression during the current COVID-19 pandemic.

Universities should find ways to address mental health problems associated with the COVID-19 pandemic among students.⁴⁰ Unfortunately, most universities were

not equipped with the infrastructure that facilitated effective action concerning mental health support for students in this situation; many employed no professional mental health counsellors.⁴ Ideally, universities might perceive and respond appropriately to the current status of mental health problems among the students, especially those undergoing psychological distress resulting from the stay-at-home measures imposed by the COVID-19 pandemic. These actions would support student well-being, increase motivation towards study and help to promote effective learning both during and after the pandemic.

As such, the purpose of this study was to evaluate the factors associated with psychological distress during the recent stay-at-home quarantine among students at one private medical school in Japan. We assessed the factors known to promote psychological distress, including self-management variables as well as perceived self-efficacy and self-esteem. We hypothesised that self-esteem and/or self-efficacy would be influential factors for predicting depression among Japanese medical students during the current COVID-19 pandemic. The results of this study would suggest specific educational interventions that might provide substantial support for mental health, to enhance resilience among medical students.

METHODS

Design and setting

A cross-sectional study was conducted at the Showa University School of Medicine, Tokyo, Japan. Sampling was done by sending an electronic survey to all medical school students registered at the Showa University School of Medicine in May 2020. The electronic survey was sent on the internet through the 'Showa University student portal' platform website. All students received the announcement of the survey from this website and answered the questionnaire; 576 students returned the questionnaire. Respondents who did not provide informed consent were excluded from further consideration, resulting in a total of 571 valid responses.

Participants

All 715 students (both male and female) in years 1 through 6 at the Showa University School of Medicine were provided with an electronic survey via Google Forms between 29 May 2020 and 6 June 2020, during the stay-at-home quarantine imposed during the COVID-19 pandemic. To avoid participant selection bias, all medical students from Showa University were included in the study. The Showa University School of Medicine is a private medical university in Japan (established in 1928) with schools of dentistry, pharmacy and health sciences at four campuses and with eight affiliated hospitals. Each participant was asked to review the purpose of the study and to indicate informed consent within a checkbox, which was provided before participating in the survey.

Instrumentation

Demographic characteristics such as sex, grade in school and living conditions were included. The three

instruments used in this study were the K-6, the General Self-Efficacy Scale (GSES) and the Rosenberg Self-Esteem Scale (RSES). The K-6 is a self-reported six-question screening scale that uses a 5-point Likert-type scale to evaluate psychological distress. Scores on the K-6 range from 0 to 24, with scores ≥ 5 indicating significant psychological distress.⁴¹ The K-6 is a shortened version of the K-10; the latter instrument includes 10 questions. Validity and reliability concerning measures of distress were assessed over 4 weeks before administration of the survey, with a Cronbach's alpha value of 0.89.⁴¹

The GSES was created as a means to assess perceived self-efficacy concerning coping and adaptation and focuses both on general activities and isolated stressful events. The GSES assesses the general situation and is not confined to domains associated with self-efficacy. This instrument has been used internationally, with reliability and validity that have been confirmed in 25 countries, with Cronbach's alpha value ranging from 0.76 to 0.90.⁴² The GSES is a self-reported measure that includes 10 questions scored on a 4-point Likert scale; the total score is the sum of all items evaluated. Scores on this scale range between 10 and 40, with a higher score indicating greater self-efficacy.⁴³ According to Schwarzer and Jerusalem⁴⁴, responses obtained from the short form of the scale are highly consistent ($r=0.899$) with those obtained from the original long-form of this scale.

The self-esteem scale developed by Rosenberg⁴⁵ in 1965 is based on responses to a 10-item survey that measures global self-worth based on self-reported positive and negative feelings about oneself. All items were scored using a 4-point Likert scale format with responses that ranged from 'strongly agree' to 'strongly disagree'.⁴⁵ This study used an approved Japanese version of RSES that has been validated and shown to be reliable, with a Cronbach's alpha value of 0.81.⁴⁶

Statistical analysis

Data were entered into a Google Form database spreadsheet. The SPSS V.26.0 statistical package was used for statistical analysis. To assess the determinant factor for psychological distress, logistic regression was performed, coding '1' for a K-6 score of ≥ 5 and '0' for a K-6 score ≤ 4 as the objective variable. Sex, grade in school, living conditions, and RSES and GSES scores were evaluated as variables in the regression analysis using a forward selection method. Results are presented as OR with 95% CI, with statistical significance set at $p < 0.05$.

Patient and public involvement

No patients were involved.

RESULTS

Of 715 students, a total of 571 valid responses were used for data analysis, representing a response rate of 79.9%. We received 222 responses from female students (38.9%) and 349 responses from male students (61.1%; [table 1](#)).

Table 1 Demographic characteristics of participants (N=571) and those with K-6 scores ≥ 5 (n=163)

Characteristics		N=571	% (N=571)	n=163	% (n=163)
Sex	Female	222	38.9	65	39.9
	Male	349	61.1	98	60.1
Grade	First year	101	17.7	21	12.9
	Second year	112	19.6	39	23.9
	Third year	97	17.0	34	20.9
	Fourth year	91	15.9	25	15.3
	Fifth year	81	14.2	23	14.1
	Sixth year	89	15.6	21	12.9
Living status	Living with other people	487	85.3	133	81.6
	Living alone	84	14.7	30	18.4

When stratified by educational year, we found that 17.7% of the responses were from first-year students, 19.6% were from second-year students, 17.0% were from third-year students, 15.9% were from fourth-year students, 14.2% were from fifth-year students, and 15.6% were from sixth-year students. Moreover, 85.3% of the respondents reported that they were currently living with family or others and 14.7% reported that they were living alone. No statistically significant differences were found for sex, grade in medical school or current living status. Among the students who responded, we calculated an average K-6 score of 3.35, with an SD of 3.907 (figure 1). Cronbach's alpha was determined at 0.816.

Of 571 respondents evaluated in this study, 163 (28.5%) reported K-6 scores of ≥ 5 , a value indicative of psychological distress. This percentage was higher than that identified in a previous study which revealed that 15% of Japanese female medical students had experienced psychological distress under routine conditions,¹⁰ and another study which revealed 27% of the students had experienced depression under routine conditions.¹¹

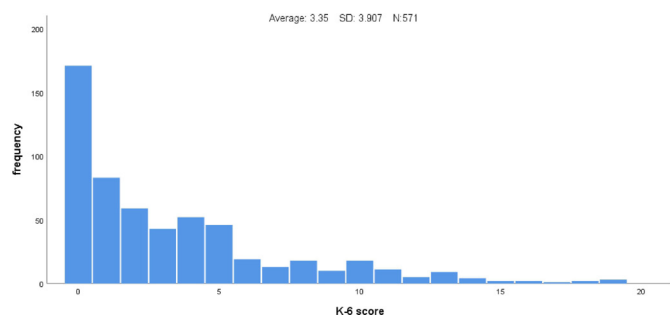


Figure 1 Histogram of the K-6 score distribution. The average K-6 score of the 571 respondents evaluated in this study was 3.35 and the SD was 3.907. K-6 scores of ≥ 5 are indicative of psychological distress.

The average GSES score was 29.11, with an SD of 5.36 and a Cronbach's alpha at 0.924. Similar to the K-6 score, this value was much higher than the average GSES score of 20.22 identified in a study of Japanese university students.⁴² The average score on the RSES was 17.43, with an SD of 5.83 and a Cronbach's alpha at 0.886.

To explore the possibility of associations of critical variables with the degree of psychological distress, logistic regression analysis was performed using the K-6 score as the objective variable. This score was divided into two values, with scores ≥ 5 categorised as positive and those ≤ 4 categorised as negative. Relationships with sex, grade in school, living status, GSES scores and RSES scores were determined (table 2). For this analysis, variables such as sex, grade and living status were standardised to include female versus male, first-year versus another grade, and living alone versus living with others. The variables that revealed a statistically significant association were GSES ($\beta = -0.065$; $p < 0.01$; 95% CI 0.892 to 0.984) and RSES ($\beta = -0.148$; $p < 0.001$; 95% CI 0.822 to 0.905). No statistically significant associations were observed for sex, grade in school or living status. A comparison of the ORs between RSES (0.863) and GSES (0.938) showed increasing RSES values were more clearly correlated with reduced psychological distress than GSES values. Our findings based on the OR suggest that a student who scored 1 point higher on the GSES was 0.938 times less likely to succumb to depression; 2 points on the GSES corresponded to a 0.880-fold reduction in the likelihood of depression (ie, 0.938×0.938).

Additionally, in a substudy that focused on the 163 respondents with K-6 scores ≥ 5 (figure 2), multiple regression analysis was performed to identify specific factors associated with psychological distress (table 3). A total of 408 respondents with K-6 scores ≤ 4 were not included (figure 2). Our results revealed that a higher score on RSES ($\beta = -0.334$, $p < 0.001$) were associated with lower scores associated with psychological distress; those with higher scores on GSES had higher scores ($\beta = 0.128$, $p < 0.05$) for psychological distress. As such, our results implied that high scores on GSES were negatively correlated with psychological distress.

DISCUSSION

This study identified self-efficacy and self-esteem as influential factors for predicting psychological distress among Japanese medical students during the COVID-19 pandemic. Other studies investigated influencing factors of depression such as female gender and suburban place of residence⁴⁷; however, the studies were limited to demographic factors and did not include motivational factors, such as GSES and RSES. In this study, both GSES and RSES provided statistically significant information and helped us to evaluate psychological distress among medical students. Further analysis revealed that a one-point increase on RSES correlated with a significant reduction in vulnerability to psychological distress; the RSES was

Table 2 Logistic regression analysis

Characteristics		β	P value	OR	95% CI
Sex	Female (to male)	-0.097	0.655	0.907	0.591 to 1.391
Grade	Second (to first year)	0.659	0.058	1.934	0.977 to 3.827
	Third year (to first year)	0.684	0.057	1.982	0.980 to 4.005
	Fourth year (to first year)	0.216	0.563	1.242	0.597 to 2.584
	Fifth year (to first year)	0.226	0.566	1.253	0.580 to 2.708
	Sixth year (to first year)	0.113	0.778	1.120	0.510 to 2.461
Living status	Alone (to living with somebody)	0.425	0.150	1.530	0.858 to 2.729
RSES		-0.148	0.001*	0.863	0.822 to 0.905
GSES		-0.065	0.009*	0.938	0.892 to 0.984

**P<0.01.

GSES, General Self-Efficacy Scale; RSES, Rosenberg Self-Esteem Scale.

a better predictor of this outcome than was the GSES. This finding suggested a specific and feasible approach for primary prevention of depression; these approaches might be discussed and deployed at the organisational level. For example, one might consider introducing organised lectures and curricula focused on enhancing both RSES and GSES scores. To maximise the effectiveness of this approach, one might identify students with lower scores as targets for primary intervention. Educational resources that include professionals with skills associated with enhancing self-esteem and self-efficacy should be included in all organisations and integrated into the medical curriculum.

Our subanalysis that targeted participants with K-6 scores ≥ 5 revealed that students with higher GSES scores were more likely to experience psychological distress in response to emergency situations. By contrast, students with higher RSES scores were more likely to show diminished levels of psychological distress. The causal relationship between GSES and depression could not be

investigated in our study; however, this result implied that the target population for the intervention might vary depending on the specific nature of the situation at hand. Under ordinary circumstances, educational interventions targeting students with lower RSES scores might be deemed as necessary. By contrast, under emergency circumstances, such as the current quarantine associated with COVID-19, primary interventions might target students with higher levels of self-efficacy. Another previous study that investigated the relationship between motivational factors and COVID-19-related psychological distress was a cross-sectional research among nurses and showed a negative correlation with self-efficacy and anxiety during the COVID-19 outbreak, suggesting measures to improve self-efficacy as well as cognitive-behavioural therapy and mindfulness-based interventions,⁴⁸ which was compatible with our study. Cognitive-behavioural techniques that can help students to change their thought process to more adaptive patterns should also be taught. Another study among Chinese students showed that COVID-19-related stressful experiences and acute stress disorders could be mediated by resilience and adaptive coping strategies.⁴⁹

It is not precisely clear how one goes about promoting resilience; this personality trait may depend on various factors, not all of which can be addressed by an institutional intervention.³⁷ At the institutional level,

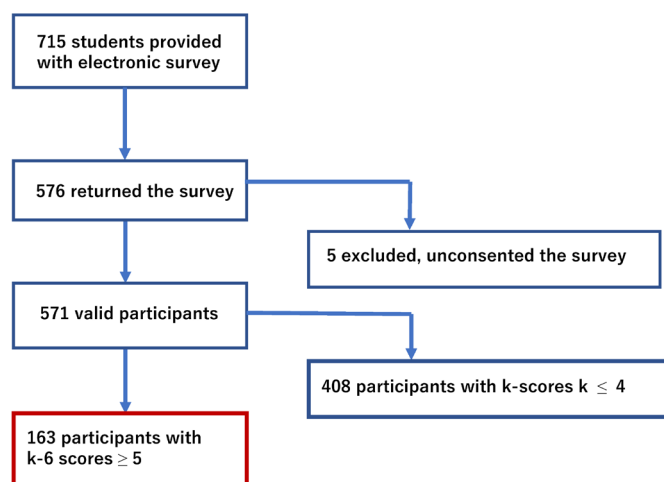


Figure 2 Flow diagram of participants. A total of 715 students were initially provided with an electronic survey, 576 returned the survey and 5 were excluded. 163 participants had a K-6 score of ≥ 5 .

Table 3 Multiple regression analysis for participants with K-6 scores ≥ 5 (n=163)

Characteristics	β	P value	95% CI
Sex	0.182	0.284	-0.152 to 0.516
Grade	0.153	0.774	-0.896 to 1.201
Living status	-0.303	0.595	-1.428 to 0.822
RSES	-0.334	0.001**	-0.441 to 0.227
GSES	0.128	0.024*	0.017 to 0.238

*P<0.05, **P<0.01.

GSES, General Self-Efficacy Scale; RSES, Rosenberg Self-Esteem Scale.

interventions might include perspectives from medical students who have insight into enhancing resiliency and may include support focused on spiritual, emotional and psychological needs as a fundamental prerequisite for medical professionals. In other words, medical students should be taught how to improve their sense of self-worth and to adapt to difficult situations to have a means for effective management of their depressive tendencies. Improvements in self-esteem and self-efficacy would not only strengthen resilience and motivation towards learning and career development, but interventions directed at this goal will also provide internal positive feedback and help students with their performance of difficult tasks while learning to cope in a meaningful and supportive climate. Psychological well-being among medical students should be among the highest priorities when developing programmes focused on educational interventions.

Limitations of the study

We collected data from one private medical school only; this may be a somewhat unbalanced sample that does not fully represent the diversity of medical students currently in training in Japan. However, participants were originally from different regions of Japan, consisting of each of the eight regions; hence, the results still had generalisability. A future study might target both private and public institutions with a focus on diversity among the respondents. Furthermore, this study used self-reported questionnaires and the data obtained were participants' perceptions, which are by definition highly subjective. A follow-up study might follow these same participants to determine the persistence (or transience) of the perceived psychological distress.

CONCLUSION

This study evaluated the psychological distress of medical students in Japan during the stay-at-home quarantine measures imposed to prevent the spread of COVID-19. We examined factors associated with vulnerability to depression, including self-efficacy and self-esteem. Further analysis revealed that participants with higher RSES scores typically scored lower on measures of psychological distress, whereas those with higher scores on GSES scored higher on these parameters.

To conclude, efforts might be made to improve self-efficacy and self-esteem; these educational interventions would have a substantial impact on mental health and may enhance resilience among medical students. Furthermore, in emergency situations such as lockdowns associated with the COVID-19 pandemic, initial interventions should be those targeting students with higher self-efficacy. Under normal circumstances, one might first target students with lower self-esteem as a primary means of preventing depression.

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