Journal of Public Health Sciences (JPHS)
Vol. 3. No. 01, pp. 26-38
journal.iistr.org/index.php/JPHS
DOI: 10.56741/jphs.v3i01.466

Burnout and Fear of COVID-19 among Medical Students in Japan

Impact of infection history, gender, and social support

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ARTICLE INFO

Article history
Received 5 December 2023
Revised 9 January 2024
Accepted 26 January 2024

ABSTRACT

The COVID-19 pandemic caused significant changes in medical students' lives and study methods, with online learning replacing in-person classes and limited opportunities for clinical practice. However, there are few studies about burnout and fear of COVID-19 among medical students, especially in East Asia, and a need for research investigating the impact of gender, a history of COVID-19 infection, and social support. In March 2022, we conducted a cross-sectional web-based survey of 4th/5th year medical students who completed a clinical clerkship in Japan. Our survey included the Japan Burnout Scale (JBS, range 5-85, comprising of emotional exhaustion, depersonalization and reduced personal accomplishment), fear of COVID-19 scale (range, 1-4), gender, school year, COVID-19 history, household composition, online education use, and financial burden. There were 343 respondents and 42.4% were women. Multivariable adjusted linear regression analyses showed that students with a COVID-19 infection history had significantly higher overall burnout, depersonalization,

reduced personal accomplishment, and lower fear of COVID-19. Students with low social support (living alone and greater financial burden) had higher overall burnout, emotional exhaustion, and depersonalization. Gender had no significant effect on burnout (mean JBS among women was 38.6 versus 39.3 among men). Gender significantly predicted fear of COVID-19, with women scoring higher (1.60 versus 1.50). The findings of the present study have implications that medical schools should provide pastoral care for their students according to students' circumstances, especially those who live alone, have a high financial burden, and/or were infected with COVID-19.

Keywords
Burnout
Gender
Good health
Medical students
Social support
Well-being

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Introduction

A review of studies from different countries showed that 70-99% of medical students are exhausted [1], but there is little research about their levels of burnout during the COVID-19 pandemic. The pandemic forced medical schools to stop in-person classes and replace them with online learning, which radically changed medical students' lives and study methods. The cancellation of clinical practice forced students not to have sufficient opportunities to see peers in real settings. A study found that the prevalence of burnout among medical students was higher during the pandemic compared to before, and that half of the students scored high on loneliness and burnout [2]. The study Ref. [2] found that 30% of students had financial difficulties and they experienced more burnout than students without financial difficulties, suggesting that it is important to investigate whether students with less social support (e.g., living alone or managing a financial burden on their own) are more at risk of burnout. Moreover, the pandemic presented stressors for medical students relating to fears about COVID-19. Having been infected with COVID-19 might have increased these fears [2], students who had been infected with COVID-19 had more emotional exhaustion, which is a type of burnout. This suggests that it is important to investigate the levels of burnout and fears about COVID-19 among medical students during the pandemic, and to examine the effects of living alone and financial burden (as indicators of loneliness/low social support) as well as COVID-19 infection history on their levels of burnout and fears about COVID-19.

Gender is another factor which has been examined in literature about medical students' burnout, although its impact remains unclear. Several studies suggested that female students are more likely to suffer burnout compared to male students in Belgium, Romania, and the United States [3]-[6]. Also, one of those studies found that female students may experience higher emotional exhaustion [3], a type of burnout. However, other studies revealed that no differences by gender exist, regarding burnout among medical students in Spain, Brazil, and China [7]-[9]. Given that the proportion of female doctors has been continuously growing in the past decades in East Asian countries, including Japan [10],[11], and several countries such as the United States and the United Kingdom, female medical students outnumber their male counterparts [12],[13]. It is thus important to compare the experiences of male and female medical students, particularly during the COVID-19 pandemic. Previous evidence about gender and burnout during the pandemic is mixed, with one study finding that gender had no significant effect on levels of burnout during the pandemic, although female students were significantly more stressed and lonelier than male students [2]. Additionally, two studies found no significant differences in burnout by gender [14],[15].

In the current study, we examined the impact of infection history, gender and social support on burnout levels among medical students during the COVID-19 pandemic because this was a global medical emergency with a learning environment in which students might have been lonelier and more distressed. By examining the factors that are associated with burnout, this study will reveal whether (and to what extent) medical schools should consider providing social, financial and psychological support for future pandemics.

Material and Methods

A. Participants

We conducted a web-based survey of medical students in the 4th and 5th-year out of the 6-year curriculum in Japan. We distributed an anonymous survey to medical schools nationwide using Google Forms and the social media platform Line from 23 February 2022 to 9 March 2022 when the sixth COVID-19 wave devastated Japan. Students gave informed consent before receiving the survey. The survey was approved by the Muribushi Okinawa Ethics Committee (No.2022-2).

B. Survey

We used burnout and fear as outcomes in the current study. We adopted the Japan Burnout Scale (JBS) to assess students' levels of burnout. JBS has three subscales, including emotional exhaustion (EE), depersonalization (DP), and reduced personal accomplishment (PA). Since there is no JBS version specifically for medical students, we adjusted it by replacing the words "work" and "company" with "clinical training" and the word "boss" with "attending doctor",

respectively. The original version of JBS has five-choice responses (Anytime, Often, Sometimes, Rarely, None), we revised it to four-choice responses (Anytime, Sometimes, Rarely, None) based on a previous study showing that the 4-responses burnout scale can provide similar levels of information in comparison to the original based on Item Response Theory 16. We also assessed students' feelings of fear about COVID-19 using a scale with four-choice responses (Anytime, Sometimes, Rarely, None). In all these scales, the higher the score, the greater magnitude the burnout or fear.

C. Potential predictors of burnout and fear of COVID-19

We explored the impact of factors which could predict medical students' burnout and fear of COVID-19. We measured these using demographic items which asked students about their gender, school year (4th-year or 5th-year), history of COVID-19 infection (presence or absence), household composition (single-person or multi-person household), use of online education (presence or absence), and financial burden during COVID-19 pandemic (presence or absence). Presence of COVID-19 infection was defined as a laboratory-confirmed infection including both symptomatic and asymptomatic infection. Financial burden was defined as the presence of a decline in income along with the occurrence of the COVID-19 pandemic.

D. Sample size estimation

Prior to the survey, we calculated the minimum sample size. One previous study used JBS and showed that mean scores for PA were 19 among the exposure group at a stress and 17 among the comparison group, and SD was 3.93. Based on alpha error of 0.05 and statistical power of 0.80 17-19, and, on the condition that the enrollment ratio was 1, the minimum sample size was estimated to be 124 samples (62, each gender).

E. Statistical analyses

We excluded those who gave incomplete responses to the items of JBS and those who selected the option of "do not want to respond" in the demographic questions. Continuous variables were expressed as mean ± standard deviation (SD) or median. We performed multivariable regression analyses for burnout composite scale, three burnout subscales, and fear against COVID-19 by adjusting for potential explanatory variables. Beta coefficient (beta) was estimated with its 95% confidence interval (95% CI). A P-value <0.05 was considered statistically significant. All analyses were conducted using Python version 3.8.

Results

We distributed the survey and 370 students responded. After excluding 27 non-eligible entries, 343 participants were eligible for this study. Table 1 shows the characteristics of participants. Of 343 respondents, 145 respondents (42.4%) were women. Mean age was 23.9

years old and 54.5% of the participants were in 4th-year grade. Mean scores (SD) of composite burnout, EE, DP, and PA were 39.0 (8.8), 12.8 (3.5), 13.2 (3.9) and 13.0 (3.2), respectively. The fear of COVID-19 was significantly higher in women than men (p = 0.04). Only seven responders had a history of COVID-19 infection. There were 35.6% of participants who reported a financial burden under the COVID-19 pandemic.

Table 1. Characteristics of participants

Variable	Overall N=343	Men n=198	Women N=145	P-Value
Burnout composite score, mean (SD *)	39.0 (8.8)	39.3 (9.2)	38.6 (8.1)	0.471
Emotional exhaustion	12.8 (3.5)	12.6 (3.8)	13.2 (3.1)	0.098
Depersonalization	13.2 (3.9)	13.4 (3.9)	12.8 (3.8)	0.126
Reduced personal Accomplishment	13.0 (3.2)	13.3 (3.4)	12.7 (3.0)	0.063
Fear against COVID-19, mean (SD)	1.5 (0.8)	1.5 (0.8)	1.60 (0.7)	0.040
Age, mean (SD)	23.9 (2.9)	24.3 (3.4)	23.3 (1.9)	0.001
School year, n (%)				
4th Year	187 (54.5)	111 (56.1)	76 (52.4)	0.575
5th Year	156 (45.5)	87 (43.9)	69 (47.6)	
Medical history of COVID-19 infection, n (%)				
Absence	336 (98.0)	194 (98.0)	142 (97.9)	1.000
Presence	7 (2.0)	4 (2.0)	3 (2.1)	
Household composition, n (%)				
multi-person household	163 (47.5)	85 (42.9)	78 (53.8)	0.060
single-person household	180 (52.5)	113 (57.1)	67 (46.2)	
Use of online Education, n (%)				
Absence	173 (50.4)	106 (53.5)	67 (46.2)	0.218
Presence	170 (49.6)	92 (46.5)	78 (53.8)	
Financial burden during COVID-19 pandemic, n (%)				
Absence	221 (64.4)	131 (66.2)	90 (62.1)	0.504
Presence	122 (35.6)	67 (33.8)	55 (37.9)	

* SD: Standard deviation.

Table 2 shows distribution of scales and subscales of burnout and fear scale by individual characteristics [Table 2 near here]. Fear scale among female participants were higher than that among male participants. However, JBS composite scores and subscale scores were similar between women and men. The household composition was associated with burnout composite scale, EE, and PA. Fifth-year students showed higher DP scores than 4th-year grade students.

Table 2. Distribution of burnout composite scale and subscales as well as fear scale against COVID-19 by individual characteristics

	Mean	**Range**	**Median**
Burnout composite			
Gender			
Men	39.406	16 - 62	39
Women	38.624	23 - 64	38
School year			
4th Grade	38.217	16 - 64	37
5th Grade	40.140	22 - 62	39

	Mean	Range	Median
Medical history of COVID-19 infection			
Absence	12.777	5 - 20	13
Presence	15.625	7 - 20	16.5
Household composition			
Multi-person household	40.111	23 - 64	39
Single-person household	37.941	16 - 62	37
Use of online education			
Absence	39.038	20 - 64	38
Presence	39.173	16 - 61	39
Financial burden during COVID-19 pandemic			
Absence	38.875	23 - 52	38.5
Presence	39.115	16 - 64	38
Emotional exhaustion			
Gender			
Men	12.651	5 - 20	13
Women	13.141	6 - 20	13
School year			
4th Grade	12.556	5 - 20	13
5th Grade	13.213	5 - 20	13
Medical history of COVID-19 infection			
Absence	13.093	6 - 24	13
Presence	17.375	11 - 24	16.5
Household composition			
Multi-person household	13.200	5 - 20	13
Single-person household	12.465	5 - 20	12
Use of online education			
Absence	13.033	5 - 20	13
Presence	12.682	5 - 20	13
Financial burden during COVID-19 pandemic			
Absence	13.188	6 - 20	13
Presence	12.844	5 - 20	13
Depersonalization			
Gender			
Men	13.491	6 - 24	13
Women	12.785	6 - 24	12
School year			
4th Grade	12.768	6 - 24	13
5th Grade	13.750	6 - 24	13
Medical history of COVID-19 infection			
Absence	12.986	5 - 20	13
Presence	14.375	5 - 20	15
Household composition			
Multi-person household	13.484	6 - 24	13
Single-person household	12.894	6 - 24	12.5
Use of online education			
Absence	13.185	6 - 24	13
Presence	13.246	6 - 24	13
Financial burden during COVID-19 pandemic			
Absence	13.250	7 - 24	13
Presence	13.213	6 - 24	13
Reduced personal Accomplishment			
Gender			
Men	13.264	5 - 20	13
Women	12.698	7 - 20	12
School year			
4th Grade	12.894	5 - 20	12
5th Grade	13.177	7 - 20	13
Medical history of COVID-19 infection			
Absence	38.856	16 - 62	38
Presence	47.375	32 - 64	46

	Mean	Range	Median
Household composition			
Multi-person household	13.426	5 - 20	13
Single-person household	12.582	5 - 20	12
Use of online education			
Absence	12.821	5 - 20	12.5
Presence	13.246	5 - 20	13
Financial burden during COVID-19 pandemic			
Absence	12.438	5 - 18	13
Presence	13.058	5 - 20	13
Fear against COVID-19			
Gender			
Men	1.458	0 - 3	2
Women	1.658	0 - 3	2
School year			
4th Grade	1.515	0 - 3	2
5th Grade	1.573	0 - 3	2
Medical history of COVID-19 infection			
Absence	1.565	0 - 3	2
Presence	0.625	0 - 2	0.5
Household composition			
Multi-person household	1.505	0 - 3	2
Single-person household	1.582	0 - 3	2
Use of online education			
Absence	1.543	0 - 3	2
Presence	1.542	0 - 3	2
Financial burden during COVID-19 pandemic			
Absence	1.375	0 - 2	2
Presence	1.550	0 - 3	2

Table 3 reveals the results of the multivariable adjusted linear regression analysis [Table 3 near here]. Women were more likely to feel fear against COVID-19 (beta= 0.171, 95% CI, [0.001, 0.341]) in comparison to men, independently of other variables. However, no burnout composite scale and subscales had a statistically significant difference by gender. DP score was significantly higher in 5th-year students than in 4th-year students (beta= 0.97, 95% CI, [0.159, 1.781]). Those who had a history of COVID-19 infection had significantly lower scores in fear (beta= -0.845, 95% CI, [-1.436, -0.255]), while they had higher scores in several burnout scales, including burnout composite scale (beta= 8.751, 95% CI, [2.335, 15.167]), DP (beta= 3.529, 95% CI, [0.689, 6.37]), and PA (beta= 2.866, 95% CI, [0.474, 5.258]). All burnout scores were significantly higher among people in a single-household (beta= 2.71, 95% CI, [0.883, 4.537]) than among people in a multi-household, although there was no significant difference in fear against COVID-19 based on the type of household. Students with greater financial burden had higher burnout composite scale (beta= 2.238, 95% CI, [0.337, 4.139]), EE (beta= 0.91, 95% CI, [0.148, 1.672]), and DP (beta= 0.895, 95% CI, [0.054, 1.737]). No significant difference of burnout scores was observed regarding the use of online education.

Table 3. Multivariable adjusted linear regression analyses

	Coefficient	SE †	t value	P value	95% CI ‡
Burnout composite score					
Gender					
Men	(ref§)	(ref)	(ref)	(ref)	(ref)
Women	-0.585	0.94	-0.622	0.5341	(-2.435,1.265)
School year					
4th Grade	(ref)	(ref)	(ref)	(ref)	(ref)
5th Grade	1.788	0.932	1.918	0.0559	(-0.046, 3.621)
Medical history of COVID-19 infection					
Absence	(ref)	(ref)	(ref)	(ref)	(ref)
Presence	8.751	3.262	2.683	0.0077	(2.335, 15.167)
Household composition					
Multi-person household	(ref)	(ref)	(ref)	(ref)	(ref)
Single-person household	2.71	0.929	2.918	0.0038	(0.883, 4.537)
Use of online education					
Absence	(ref)	(ref)	(ref)	(ref)	(ref)
Presence	0.565	0.928	0.609	0.5432	(-1.260, 2.390)
Financial burden during COVID-19 pandemic					
Absence	(ref)	(ref)	(ref)	(ref)	(ref)
Presence	2.238	0.966	2.316	0.0211	(0.337, 4.139)
Emotional exhaustion score					
Gender					
Men	(ref)	(ref)	(ref)	(ref)	(ref)
Women	0.685	0.377	1.817	0.0701	(-0.057, 1.427)
School year					
4th Grade	(ref)	(ref)	(ref)	(ref)	(ref)
5th Grade	0.662	0.374	1.772	0.0774	(-0.073, 1.397)
Medical history of COVID-19 infection					
Absence	(ref)	(ref)	(ref)	(ref)	(ref)
Presence	2.356	1.308	1.801	0.0726	(-0.217, 4.929)
Household composition					
Multi-person household	(ref)	(ref)	(ref)	(ref)	(ref)
Single-person household	1.012	0.372	2.717	0.0069	(0.279, 1.745)
Use of online education					
Absence	(ref)	(ref)	(ref)	(ref)	(ref)
Presence	-0.312	0.372	-0.84	0.4016	(-1.044, 0.419)
Financial burden during COVID-19 pandemic					
Absence	(ref)	(ref)	(ref)	(ref)	(ref)
Presence	0.91	0.387	2.348	0.0195	(0.148, 1.672)
Depersonalization score					
Gender					
Men	(ref)	(ref)	(ref)	(ref)	(ref)
Women	-0.647	0.416	-1.555	0.1208	(-1.466, 0.171)
School year					
4th Grade	(ref)	(ref)	(ref)	(ref)	(ref)
5th Grade	0.97	0.412	2.351	0.0193	(0.159, 1.781)
Medical history of COVID-19 infection					
Absence	(ref)	(ref)	(ref)	(ref)	(ref)
Presence	3.529	1.444	2.445	0.015	(0.689, 6.37)
Household composition					
Multi-person household	(ref)	(ref)	(ref)	(ref)	(ref)
Single-person household	0.813	0.411	1.977	0.0489	(0.004, 1.622)
Use of online education					
Absence	(ref)	(ref)	(ref)	(ref)	(ref)
Presence	0.214	0.411	0.521	0.6028	(-0.594, 1.022)
Financial burden during COVID-19 pandemic					
Absence	(ref)	(ref)	(ref)	(ref)	(ref)
Presence	0.895	0.428	2.093	0.0371	(0.054, 1.737)
Reduced personal accomplishment score					
Gender					
Men	(ref)	(ref)	(ref)	(ref)	(ref)
Women	-0.623	0.351	-1.777	0.0764	(-1.313, 0.067)

	Coefficient	SE †	t value	P value	95% CI ‡
School year					
4th Grade	(ref)	(ref)	(ref)	(ref)	(ref)
5th Grade	0.156	0.347	0.448	0.6545	(-0.528, 0.839)
Medical history of COVID-19 infection					
Absence	(ref)	(ref)	(ref)	(ref)	(ref)
Presence	2.866	1.216	2.356	0.019	(0.474, 5.258)
Household composition					
Multi-person household	(ref)	(ref)	(ref)	(ref)	(ref)
Single-person household	0.885	0.346	2.556	0.011	(0.204, 1.566)
Use of online education					
Absence	(ref)	(ref)	(ref)	(ref)	(ref)
Presence	0.663	0.346	1.917	0.056	(-0.017, 1.344)
Financial burden during COVID-19 pandemic					
Absence	(ref)	(ref)	(ref)	(ref)	(ref)
Presence	0.433	0.36	1.202	0.2301	(-0.276, 1.142)
Fear against COVID-19 scale					
Gender					
Men	(ref)	(ref)	(ref)	(ref)	(ref)
Women	0.171	0.087	1.976	0.049	(0.001, 0.341)
School year					
4th Grade	(ref)	(ref)	(ref)	(ref)	(ref)
5th Grade	0.053	0.086	0.619	0.5365	(-0.116, 0.222)
Medical history of COVID-19 infection					
Absence	(ref)	(ref)	(ref)	(ref)	(ref)
Presence	-0.845	0.3	-2.817	0.0051	(-1.436, -0.255)
Household composition					
Multi-person household	(ref)	(ref)	(ref)	(ref)	(ref)
Single-person household	-0.055	0.085	-0.646	0.5184	(-0.223, 0.113)
Use of online education					
Absence	(ref)	(ref)	(ref)	(ref)	(ref)
Presence	-0.028	0.085	-0.333	0.7394	(-0.196, 0.140)
Financial burden during COVID-19 pandemic					
Absence	(ref)	(ref)	(ref)	(ref)	(ref)
Presence	-0.069	0.089	-0.779	0.4368	(-0.244, 0.106)

† SE: standard error
‡ CI: Confidence Interval
§ Ref: Reference group

Discussion

We examined factors associated with levels of burnout among medical students during the COVID-19 pandemic. There was no significant effect of gender on burnout, but a significant effect of financial burden, COVID-19 infection history and living alone on burnout. The implications are that medical schools should support students' mental health by providing extra pastoral care especially among those who live alone, have a financial burden, and had COVID-19.

Our results showed that no significant gender difference was found in burnout including the subscales, although female students felt higher fear of COVID-19. This illustrates that gender has no significant association with EE, DP or reduced PA as types of burnout, although future researchers should conduct a meta-analysis of studies and consider outcomes in addition to burnout. Some studies suggest, during the COVID-19 pandemic, a higher number of female participants experienced EE, DP, or professional disengagement, and they also felt

that COVID-19 affected their energy levels, interest in education, and their career choice [15]. Another study, which was conducted before the pandemic, also suggested that women were associated with two of the components of burnout (EE and low PA) [4]. According to those studies, female participants have alexithymia or doubtfulness about their academic burden for their career choice, and those factors might be related to burnout states. However, our participants were in the 4th/5th school year (not in the final year), and thus the participants could diminish the perceived stressors such as doubtfulness about their future career or academic burdens.

Our study revealed that female participants were more likely to experience fear of COVID-19. This finding is in line with a previous study illustrating that female medical students reported a higher score of fear of COVID-19 [20]. Epidemiologically, more men were dying from COVID-19, and adverse outcomes of COVID-19 were also more likely to be seen among men [21]. However, women faced different types of burdens from COVID-19 that affect their mental-wellbeing, such as child or elderly care, housework, or domestic violence [21]. The high fear of COVID-19 among female participants could be explained by those women's specific burdens. Medical schools should pay attention to the gender-specific burden and implement a measure to protect their both physical and mental well-being including the fear of an ongoing pandemic disease.

In addition to gender differences, we also examined other risk factors for burnout and fear of COVID-19 and revealed that there were significant factors, including higher school year, absence of cohabitants, presence of financial burden, and history of COVID-19 infection. Several studies suggested that burnout risks among medical students increased with the higher school year [7],[22], and this trend was seen in our study as well, especially in depersonalization. The risk of absence of family support in an increase in burnout state was emphasized by several studies [22],[23] and our results also supported this point. Thus, to maintain mental wellness, it is important to consider school year, presence of family support, and the financial burden. Surprisingly, history of COVID-19 infection was related to burnout, including the subscales of depersonalization and personal accomplishments. This supports a previous study which suggested that there was increased burnout among healthcare workers with a history of COVID-19 [24]. However, from our findings, COVID-19 infection has rather diminished the fear among medical students. This might be because having been infected with COVID-19 increases immunity against the virus such as through neutralizing antibody and T-cell responses [25], and recognition of this medical knowledge might reduce students' fears of infection. Nonetheless, medical students might maintain fears about COVID-19 because of the

risk of long covid; this includes the possibility of developing myalgic encephalomyelitis or chronic fatigue syndrome that lasts many years [26].

We should report several limitations in this study. Firstly, as this study was based on a web-based survey using a convenient sample. Also, of 82 medical schools in Japan, we could get the responses from students in 42 schools. Thus, there would be selection bias on participants. Secondly, we targeted only 4th/5 th-year students with experience in clinical clerkship, so the different results might be identified if a similar study had been performed on medical students with other years. However, we argue that experiencing a clinical clerkship is an important background factor for the assessment of medical students' mental health during the pandemic. Thirdly, we adopted JBS known to have greater suitability for Japanese people than the Maslach Burnout Inventory (MBI) [27],[28] as a burnout scale, and conveyed it from five-choice to four-choice responses for convenience. This made it difficult to conduct comparisons our study results to those of previous studies. It does not also have a cutoff value, and the prevalence of burnout among our participants could not be measured. Finally, we conducted this study when the sixth wave of infection cases occurred, and the results might differ depending on the phase of the pandemic.

Conclusion

During the COVID-19 pandemic many lives were lost, and many healthcare workers sacrificed their lives and health for their patients. Much of the media discourse has shown appreciation for the contribution by healthcare workers but medical students are often forgotten in the news, and in much of the literature, yet students are the future frontliners in healthcare. This study found that financial burden, COVID-19 infection history and living alone predicted levels of burnout among medical students. Gender had no significant effect on levels of burnout but it predicted students' fears about COVID-19. This study has implications for teachers, administrators and students in medical schools because it improves their understanding of the social and mental health needs of students during the next pandemic, helping them determine how to tailor pastoral care according to students' circumstances.

Conflict of Interest

The authors have no declarations of interest to declare.

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