ORIGINAL ARTICLE

Covid-19 One Year on: Exposure to Infection, Covid-related Functional Difficulties and Concerns Among Medical Students From a Malaysian Medical School

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ABSTRACT

Introduction: The COVID-19 pandemic has forced revolutionary changes in the delivery of medical education and imposed much stress on medical students and academicians. This study aimed at evaluating the level of exposure to COVID-19, COVID-related functional difficulties and concerns experienced by medical students, approximately one year after COVID-19 became significant health and socio-economic issues in Malaysia. **Methods:** A cross-sectional study using self-administered online questionnaire, was conducted among the undergraduate medical students of a private university in Malaysia. **Results:** A total of 243 medical students participated. They reported low level of exposure to COVID-19 infection. Majority of them demonstrate moderate level of difficulties in learning (median score of 3, highest score = 4) and high levels of COVID-related concerns (median scores of 4 to 5, highest score = 5). Lowest household income category was a significant predictor of high level of functional difficulties (OR = 3.878, 95%CI: 1.651, 9.110); whilst female gender was a significant predictor of high level of COVID-related concerns (OR = 7.400, 95%CI: 1.920, 28.514). **Conclusion:** One year following the onset of COVID-19 pandemic in Malaysia, medical students still reported significant functional difficulties in learning and demonstrated high levels of COVID-related concern. Collaborative efforts to mitigate the problems need to be intensified with emphasis on the delivery of online medical education and special attention to female and lower socio-economic group students to prevent detrimental consequences to medical students and medical education. Multi-center and longitudinal studies are recommended.

Keywords: Medical students, Exposure to COVID-19, COVID-related functional difficulties, COVID-related concerns, Medical education

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INTRODUCTION

The COVID-19 pandemic was declared by the World Health Organisation (WHO) on 11th March 2020 (1). Without an established effective treatment or a vaccine to fight this new virus, the authorities had been forced to implement drastic community mitigation strategies to control the transmission of the disease (2,3). Lockdowns and semi lockdowns have been enforced worldwide to ensure social distancing with measures like home-quarantine, travel restrictions, shutting down of non-essential services and educational institutions (2,3).

Malaysia reported the first case of COVID-19 on 25th Jan 2020 (2). That was followed by increase of cases in February and March 2020 leading to the lockdowns in

Malaysia [locally know as "Movement Control order" (MCO)] which started on 18th March 2020. Since then, Malaysians at different locations have undergone multiple levels of MCO with different level of restrictions based on the severity of disease occurrence (2).

Since the onset of the pandemic, numerous studies conducted during earlier phases of the pandemic, have highlighted the significant impact of COVID-19 and the lockdowns on the mental health of university students (both medical and non-medical) (3-5). The main stressors identified were online learning and financial constraints (3,4), with females noted to be more prone to adverse psychological effect of COVID-19 (3,4,6).

Medical education is inherently stressful (7). The training at medical schools are unique as clinical attachments and practical sessions are essential to prepare students to be competent doctors. Multiple institutional studies have shown that at least half of medical students may experience "burn-out" at some point of their education

(8).

The impact of COVID-19 has forced revolutionary changes in medical education which will eventually change the delivery mode of medical education (9). Closure of educational institutions had forced initial postponement of classes at medical schools and subsequently sudden conversion of regular face to face teaching to online lectures and assessments (3,9). Many traditional practical, clinical bedside teaching and assessments [e.g. Objective Structured Clinical Examinations (OSCE)] had to be cancelled or postponed. Clinical attachment and practical skills teaching sessions were cancelled or postponed to minimise human interaction and reduce the risk of exposure of medical students to the disease (10). However, it was most worrying to note that the lack of essential clinical training may lead to poor performance in the exams and most importantly inadequate competency as a doctor in the future (10). Therefore, during some of the less restrictive phases of MCO, students in the clinical years had been allowed to resume clinical bedside teachings and clinical attachments. However, these activities have made the medical students potential vectors for transmission of COVID-19, especially when 17% to 20% of COVID-19 infected people are asymptomatic with pre-symptomatic transmissions even more common (11).

Most of the studies on medical students to date have focussed on the impact of Covid-19 on the psychological well-being of medical students, adaptation, and effectiveness of online learning (4,6). To the best of our knowledge, both locally and abroad, there was no published data on the exposure of medical students to COVID-19 infection. Only very few studies were on their functional difficulties and concerns during this pandemic and the studies were conducted at the earlier phase of the pandemic in 2020. One of the studies reported deterioration of mental well-being in 68% of Australian medical students (12). The main concerns detected in them were uncertainty of end of the situation, family members getting the illness and self-isolation (12). Abdulghani et al. (6) discovered that COVID-19 pandemic caused stress and changes in the learning attitudes and approach among medical students in Saudi Arabia.

To fill the knowledge gap, this study aims to find out the degree of exposure to COVID-19 infection among medical students at a medical college in Malaysia, identify the COVID-related functional difficulties and concerns faced by the students after one year of the COVID-19 crisis, and recognise the associated factors. The COVID-related concerns examined in this study are essentially worries in a variety of domains associated with COVID-19 pandemic situation which may be subjective or objective (13).

The information gathered may reflect the effectiveness of the measures taken to mitigate the problems so far and serves as a guide to step up existing interventions and help to formulate and implement further strategies against the adverse impacts of COVID-19 on medical student and medical education.

MATERIALS AND METHODS

This cross-sectional online study was carried out from 16th February 2021 until 25th February 2021. Undergraduate medical students enrolled for year one to year five studies of the Bachelor of medicine and bachelor of surgery (MBBS) degree course for the academic year of 2020-2021 at Universiti Kuala Lumpur Royal College of Medicine Perak (UniKL RCMP), Malaysia were eligible. Those who were not proficient in English or did not response after three reminders were excluded. Stratified sampling according to the year of studies, followed by systematic random sampling on each year was applied. Using OpenEpi sample size calculator, the sample size required for 95% confidence level was 240. Out of 636 medical students, 250 were approached and 243 of them responded (97.2% response rate).

Data was collected using a structured self-administered online questionnaire which was adapted from a study by Schiff et al. (13). The questionnaire comprised of four sections:
A.   Socio-demographic data of the participants: age, gender, year of study in MBBS, total monthly income and main financial support.
B.   The exposure of students to COVID-19 infection: Six questions with responses in Yes, No or Not sure. Cronbach's alpha was 0.76.
C.   Functional difficulties faced by respondents during COVID-19 pandemic: Ten questions (2 questions on health, 4 questions on learning difficulties and 4 questions about psychosocial difficulties). Responses in 4-point Likert Scale of 1 (No difficulty), 2 (Slight difficulty), 3 (Moderate difficulties), and 4 (A lot of difficulties). Cronbach's alpha was 0.87.
D.   COVID-19 related concerns: Ten questions. Responses in 5-point Likert Scale of 1 (Not concerned at all), 2 (Slightly concerned), 3 (Moderately concerned), 4 (Very concerned), and 5 (Extremely concerned). Cronbach's alpha was 0.86.

Content validation was done by a panel of five experts, three specialists from public health and two from family medicine. The questionnaire was also edited based on a pilot study done among 26 participants to identify practical limitations, and to assess and improve the internal consistency of the questionnaire. The questions for exposure to COVID-19 (B), functional difficulties (C) and concerns (D) was found to have good internal consistency.

Google Form link of the questionnaire was distributed to the selected respondents using social media, mainly WhatsApp.

Ethical Clearance
Ethical approval was granted by Medical Research Ethics Committee of UniKL RCMP, No. MREC/2021/SSM-109. The respondents were invited to read and understand the patient information sheet at the beginning of the google form, then click "yes" to give consent before they could proceed to complete the online questionnaire. Their responses were kept confidential and anonymous.

Statistical Analysis
Data was analysed using IBM SPSS Statistics Subscription Version 2020. Statistical significance was set at p < 0.05. Descriptive statistics was tabulated for the socio-demographic data. The year of studies was classified into study categories: pre-clinical (Year 1 and Year 2) and clinical (Year 3 to Year 5). The monthly household income was categorised based on the Malaysian income categories: Bottom 40 (B40): RM4,849 or less, Middle 40 (M40): RM4,850 to RM10,959 and Top 20 (T20): RM10,960 or more. The dependent variables consisted of the exposure to COVID-19 infection, COVID-19 related functional difficulties and COVID-19 related concerns. The data for all the dependent variables were not normally distributed. Thus, medians and interquartile ranges were tabulated as the measure of central tendency.

For the questions on exposure to COVID-19 infection, each question was given a composite scores of 1 for 'Yes' and 0 for 'No' or 'Not sure' answers. Mann Whitney U tests were applied to test the difference of exposure to COVID-19 infection between the groups of gender, study categories and family income.

For the COVID-19 related functional difficulties with 10 questions. Composite score ranges from 1 for 'no difficulty' to 4 for 'a lot of difficulties' was created. The minimum total score was 10 while the maximum total score was 40. Using the midpoint, we categorised the score of 10 to 25 as 'Low level of functional difficulties', whereas the score of 26 to 40 as 'High level of functional difficulties'.

For COVID-19 related concerns section which consisted of 10 questions. Composite score ranges from 1 for 'not concerned at all' to 5 for 'extremely concerned', was created. This gave a minimum score of 10 and maximum score of 50. Using the midpoint, we categorised the composite score of 10 to 30 as 'Low level of COVID-related concerns', whereas the score of 31 to 50 as 'High level of COVID-related concerns'.

Chi-Square tests were applied to identify the significance of the differences in level of COVID-19 related functional difficulties and the level of COVID-19 related concerns among the gender, study category and Malaysian income categories and the main financial supports of the respondents.

Pearson correlation analysis was performed to investigate the relationship between COVID-related functional difficulties with the level of COVID-related concerns,. Multiple logistic regression using stepwise regression method were performed to ascertain the effect of the independent variables and total exposure to COVID-19 infection in predicting the level of COVID-related functional difficulties (Low: 0; High: 1) and COVID-related concerns (Low: 0; High: 1) among the respondents.

RESULTS

Demographic information
Majority of the total 243 participants were females (67.9%). Their age ranged from 18 to 26 years old with the mean age at 22 years old. There were almost equal numbers of pre-clinical (114) and clinical students (129). Most of the students (53.1%) came from families which belongs to M40 (Middle 40) of the Malaysian income category while 21.0% were from the lower income category of B40. As for funding of their study, majority of the students (89.7%) were receiving either student loans or scholarships (Table I).

Exposure to COVID-19
The study indicated that generally the exposure to COVID-19 among the students was low (Table II). The median scores for all the COVID exposure questions were 0.00, with interquartile ranges (IQR) of between 0.00(Q1) and 2.00(Q3). Although the median values

Table I: Demographic information of respondents (n=243)

Variables		Value, n(%)
Gender	**Male**	78 (32.1)
	Female	165 (67.9)
Age	**18 - 21**	121 (49.8)
	22 - 25	120 (49.4)
	26 - 28	2 (0.8)
Study Category[a]	**Preclinical**	114 (46.9)
	Clinical	129 (53.1)
Total Monthly Family Income[b]	**B40**	51 (21.0)
	M40	129 (53.1)
	T20	63 (25.9)
Main Financial support	**Student loan**	192 (79.0)
	Parental support	25 (10.3)
	Scholarship	26 (10.7)

Values are presented as number(%).
[a]Study category: Preclinical = Year 1 and 2; clincal = Year 3, 4 and 5.
[b]Total monthly family income: B40 (RM4,849 or less); M40 (RM4,850 to RM10,959); T20 (RM10,960 or more).

Table II: Total exposure of respondents to COVID-19 infection (n=243)

Predictors	Questions	Had COVID Test n (%)		Quarantined n (%)		Diagnosed COVID +ve n (%)		Know COVID +ve patient n (%)		COVID +ve family/close friend n (%)		Had Close contact n (%)		Total Exposure score Median* (IOR)	P-value**
		Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No		
Gender	Male	5 (6.4)	73 (93.6)	8 (10.3)	70 (89.7)	0 (0)	78 (100)	23 (29.5)	55 (70.5)	16 (20.5)	62 (79.5)	4 (5.1)	74 (94.9)	0.00 (0.00 - 1.25)	0.816[a]
	Female	18 (10.9)	147 (89.1)	24 (14.5)	141 (85.8)	0 (0)	165 (100)	52 (31.5)	113 (68.5)	28 (17.0)	137 (83.0)	6 (3.6)	159 (96.4)	0.00 (0.00 - 1.00)	
Study category	Pre-clinical	8 (7.0)	106 (93.0)	15 (13.2)	99 (86.8)	0 (0)	114 (100)	29 (25.4)	85 (74.6)	18 (15.8)	96 (84.2)	0 (0)	114 (100)	0.00 (0.00 - 1.00)	0.045[a]
	Clinical	15 (11.6)	114 (88.4)	17 (13.2)	112 (86.8)	0 (0)	129 (100)	46 (35.7)	83 (64.3)	26 (20.2)	103 (79.8)	10 (7.8)	119 (92,2)	0.00 (0.00 - 2.00)	
Family Income Category	B40	0 (0)	51 (100)	4 (7.8)	47 (92,2)	0 (0)	51 (100)	17 (33.3)	34 (66.7)	10 (19.6)	41 (80.4)	1 (2.0)	50 (98)	0.00 (0.00 - 1.00)	0.188[b]
	M40	14 (10.9)	115 (89.1)	14 (10.9)	115 (89.1)	0 (0)	129 (100)	35 (27.1)	94 (72.9)	22 (17.1)	107 (82.9)	5 (3.9)	124 (96.1)	0.00 (0.00 - 1.00)	
	T20	9 (14.3)	54 (85.7)	14 (22.2)	49 (77.8)	0 (0)	63 (100)	23 (36.5)	40 (63.5)	12 (19.0)	51 (81.0)	4 (6.3)	59 (93.7)	0.00 (0.00 - 2.00)	
Total Respondents		23 (9.5)	220 (90.5)	32 (13.2)	211 (86.8)	0 (0)	243 (100)	75 (30.9)	168 (69.1)	44 (18.1)	199 (81.9)	10 (4.1)	233 (95.9)	0.00 (0.00 - 1.00)	

Values are presented as number (%) or *median (IQR). IQR = Interquartile range, presented as first quartile (Q1) – third quartile (Q3).
P-values** for comparison of total exposure score between groups of independent variables. Calculated using non-parametric tests: [a] Mann Whitney U test for gender and study category; [b] Kruskal Wallis test for family Income category. P < 0.05 indicate statistical significance.

were similar for both pre-clinical [median of 0.00 (IQR = 0.00 - 1.00)] and clinical students [median of 0.00 (IQR = 0.00 - 2.00)], the interquartile range for the clinical students were higher. The result indicated that the clinical students had significantly higher exposure to COVID-19 (P = 0.045). None of the students had been diagnosed COVID-19 positive and more than 90% of them had not been required to undergo a COVID-19 test, had not been in close contact with COVID-19 positive or suspected COVID-19 patients. The exposure to COVID-19 were not significantly different between other groups.

COVID-related functional difficulties
The students demonstrated low to moderate level of functional difficulties with a median score of 22.00 and an interquartile range (IQR) between 18.00(Q1) and 27.00(Q3) (Table III). The minimum score was 10, and maximum score was 40. The students had main difficulties in the aspect of learning with a high median score of 3.00 (IQR = 2.00 - 3.00) or 3.00 (IQR = 2.00 - 4.00) for all the questions on learning. They had slight difficulties [median of 2.00 (IQR = 1.00 - 2.00) or median of 2.00 (IQR = 1.00 - 3.00)], for dealing with psychosocial issues including "boredom", "loneliness" and "relationships", and reported no difficulties with family financial situation and personal or family health [median of 1 (IQR = 1.00 - 2.00)].

COVID-related concerns
Generally, COVID-related concerns among the students were high, demonstrated by median scores of between 4.00 (very concerned) to 5.00 (very much concerned) for all the questions, with interquartile ranges between

3.00(Q1) to 5.00(Q3). The median score for the total COVID-19 related concern score, was 43.00 with the interquartile range between 39.00(Q1) and 47.00(Q3). The minimum total score was 15 while the maximum was 50. The students were generally very concerned about the spread of the disease [median scores of 4.00 (IQR = 4.00 – 5.00) to 5.00 (IQR = 4.00 – 5.00)]. Practical issues which included limitation of daily activities and problem with online learning and assessments were very concerning to the students with median scores of 4.00 (IQR = 4.00 – 5.00) respectively.

Comparison of COVID-related functional difficulties between groups
Majority of the respondents experienced low level of functional difficulties (70.4%) as can be seen in Table IV. However, there was a statistically significant difference in the percentage of students who experience high level of functional difficulties between the Malaysian household income categories, P = 0.010. Almost half (45.1%) of students from the bottom (B40) income category, 28.7% of those from the middle (M40) income category and only (19%) of students from the Top, T20 income group had high functional difficulties.

From the multiple logistic regression model for COVID-related functional difficulties (Table V), out of the four predictor variables tested, only the lowest family income category was found to be a statistically significant predictor. Students with lowest family income from the B40 category had 3.88 times higher odds of having high level of functional difficulties compared to the students with highest family income, T20 (OR = 3.878, 95% CI: 1.651, 9.110, P = 0.002). The students with middle

Table III: Median scores of COVID-related functional difficulties and COVID-related concerns of respondents

COVID-related functional difficulties		COVID-related concerns	
Questions	Value Median (IQR)	Questions	Value Median (IQR)
Health issues		**Practical issues**	
Personal Health situation	1.00 (1.00 – 2.00)	Limitation of daily activities	4.00 (4.00 -5.00)
Family health situation	1.00 (1.00 – 2.00)	Problems with online learning and assessments	4.00 (4.00 -5.00)
Learning issues		**Spread of Disease**	
Handling learning assignment	3.00 (2.00 -3.00)	Easy and rapid spread of virus worldwide	4.00 (4.00 -5.00)
Learning Clinical skills, Practical skills and communication skills	3.00 (2.00 – 4.00)	Nation's number of cases is still high and/or rising	5.00 (4.00 -5.00)
Dealing with online learning	3.00 (2.00 – 4.00)	Getting infected by others (family / relatives)	4.00 (4.00 -5.00)
Dealing with online assessment	3.00 (2.00 – 3.00)	Spreading the infection to family or other	5.00 (4.00 -5.00)
Psychosocial issues		**Other issues**	
Dealing with boredom	2.00 (1.00 – 3.00)	Uncertainty of when this pandemic will end	4.00 (4.00 - 5.00)
Dealing with loneliness	2.00 (1.00 -3.00)	COVID-19 vaccine not widely available locally	4.00 (3.00 - 5.00)
Dealing with relationships	2.00 (1.00 – 2.00)	Preventive measures not fully practiced	4.00 (4.00 - 5.00)
Financial situation in the family	1.00 (1.00 – 2.00)	Uncertainty of vaccine side effects and efficacy	4.00 (3.00 - 5.00)
Total Score for functional difficulties	22.00 (18 – 27.00)	Total score for COVID-related concerns	43.00 (39.00 - 47.00)

Values are presented as median (IQR). IQR = Interquartile range, presented as first quartile (Q1) – third quartile (Q3).

Table IV: Comparison of the Levels COVID-related functional difficulties and COVID-related concerns between gender, study category and family Income

Variable		Level of COVID-related functional difficulties			Level of COVID-related concerns		
		Low	High	P	Low	High	P
Gender	**Male**	52 (66.7)	26 (33.3)	0.385	9 (11.5)	69 (88.5)	0.002
	Female	119 (72.1)	46 (27.9)		3 (1.8)	162 (98.2)	
Study category[a]	**Pre-clinical**	79 (69.3)	35 (30.7)	0.731	6 (5.3%)	108 (94.7%)	0.826
	Clinical	92 (71.3)	37 (28.7)		6 (4.7)	123 (95.3)	
Malaysian income category[b]	**B40**	28 (54.9)	23 (45.1)	0.010	0 (0)	51 (100)	0.187
	M40	92 (71.3)	37 (28.7)		8 (6.2)	121 (93.8)	
	T20	51 (81.0)	12 (19.0)		4 (6.3)	59 (93.7)	
Main Financial Support	**Study Loan**	131 (68.2)	61 (31.8)	0.355	10 (5.2)	182 (94.8)	0.931
	Parental support	20 (80.0)	5 (20.0)		1 (4.0)	24 (96.0)	
	Scholarship	20 (76.9)	6 (23.1)		1 (3.8)	25 (96.2)	
Total		171 (70.4)	72 (29.6)		12 (4.9)	231 (95.1)	

Values are presented as numbers (%). P-values were calculated using chi-square tests. P < 0.05 indicate statistical significance.
[a]Study category: Preclinical = Year 1 and 2; clinical = Year 3, 4 and 5.
[b]Total monthly family income: B40 (RM4,849 or less); M40 (RM4,850 to RM10,959); T20 (RM10,960 or more)

Table V: Multiple logistic regression for factors associated with COVID-19 related functional difficulties and COVID-related concerns

Predictor		COVID-related functional difficulties[a]				COVID-related concerns[b]			
		B*	SE**	Adjusted OR (95% CI)	P-value	B*	SE**	Adjusted OR (95% CI)	P-value
Gender	**Female**	-0.282	0.305	0.754 (0.415, 1.371)	0.355	2.001	0.688	7.400 (1.920,28.514)	0.004
	Male	-	-	-	-	-	-	-	-
Study category	**Clinical**	-0.175	0.292	0.840 (0.474, 1.489)	0.550	0.035	0.625	1,035 (0.304, 3.524)	0.956
	Pre-clinical	-	-	-	-	-	-	-	-
Total Exposure to COVID-19 infection		0.224	0.132	1.251 (0.965, 1.621)	0.091	0.024	0.296	1.024 (0.574, 1.829)	0.936
Family Income Category[c]	**B40**	1.355	0.436	3.878 (1.651, 9.110)	0.002	-0.764	0.492	0.466 (0.178, 1.221)	0.120
	M40	0.606	0.383	1.833 (0.866, 3.881)	0.113				
	T20	-	-	-	-	-	-	-	-

Values are presented as Adjusted odd ratio (95% confidence interval). P < 0.05 indicate statistical significance.
[a]For COVID-related functional difficulties: the logistic regression model was statistically significant, $x^2(5) = 12.196$, p = 0.024. The model explained 7.4% (Nagelkerke R^2) of the variance in the level of functional difficulty experienced by the students and correctly classified 70.8% of the subjects.
[b]For COVID-related concerns: the logistic regression model was statistically significant, $x^2(4) = 12.43$, p = 0.014. The model explained 15.3% (Nagelkerke R^2) of the variance in the level of COVID-19 related concerns and correctly classified 91.1% of the subjects.
[c]The family income B40 (lowest) and M40 (middle) categories were compared against the T20 (highest) category.
*B = Coefficient;** SE = Standard Error

family income of M40 also had high odds of increase functional difficulties with odds ratio of 1.83 but the difference was not statistically significant, P= 0.113.

Comparison of COVID-related concerns between groups

As shown in Table IV, the study demonstrated that most of the students (95.1%) had high level of COVID-related concerns. In comparison, there was a statistically significant higher proportion of female students with high level of COVID-19 related concerns (98.2%), compared to male students (88.5%), P = 0.002. Overall, more than 90% of students in the other categories studied had high level of COVID-related concerns. However, there were no significant differences between study categories, family income categories or main financial support categories.

Table V showed that for COVID-related concerns, out of the four predictor variables, only female gender was found to be a statistically significant predictor for high COVID-related concerns. Female students had 7.40 times higher odds of having high level of COVID-19 related concerns compared to the male students (OR = 7.400, 95% CI: 1.920, 28.514, P = 0.004).

Pearson correlation analysis showed that COVID-related functional difficulties had a positive and significant association with the COVID-related concerns with a correlation coefficient of 0.37 and P = 0.0001.

DISCUSSION

Our study demonstrated that the medical students at UniKL RCMP had low degree of exposure to COVID-19 infection. This is a positive situation because exposure of physician trainees exposed to Covid-19 patients at academic medical centres had increased stress and burnout (14). The low exposure to COVID-19 could be explained by the fact that the proper infection and prevention control principles against COVID-19 were implemented at the healthcare facilities in Malaysia during the pandemic (15) and good adherence of the students to the standard operating procedure (SOP) for the prevention and instructions to minimise contact with patients with acute respiratory symptoms during their clinical attachments. Conversion of face-to-face classes to online classes also help to reduce the students' exposure to peers and teachers. However, as expected, clinical students had a significantly higher exposure to COVD-19 infection compared to the preclinical students (P = 0.045).

Overall, most of the students in this study reported low to moderate level of COVID-related functional difficulties (median scores of 1.00 to 3.00). The most predominant difficulties were related to learning, with most had moderate difficulties in learning of practical and clinical skills, online learning, online assessments and handling of assignments. This concurs with a few previous studies conducted last year, at the earlier phase of the COVID-19 pandemic (6,12,13), and suggested that one year after the onset of the pandemic, adequate adaptation to learning, specifically online learning under the pandemic situation has yet to be achieved among the medical students. This was despite the students' experience of e-learning from the existing minimum 30% blended learning of the course curriculum. The students possibly had problem with sudden addition of large amount of synchronous e-learning to the existing blended learning

which consist mainly of asynchronous e-learning (16). Online learning, especially synchronous e-learning became a big problem probably due to inconveniences such as unstable/poor internet connection, ill affordability of suitable devices ie laptops, desktops, tablets etc, poor computer skills and time constriction (17). The university had distributed free sim cards with internet connectivity to underprivileged students to assist them to keep up with the online lessons. Many private telecommunication companies also offer very affordable internet packages for students. Unfortunately, the problem of internet connectivity and online learning extended beyond financing data subscriptions. Many rural areas in Malaysia including East Malaysia, do not have strong or stable internet connectivity (18). In addition, the speed, type, and quality of device used are also very important. It is not uncommon for students to follow a lecture or tutorial for hours using a smartphone which will not only strain them physically but also mentally (4). Furthermore, although virtual clinical teaching using role plays are attempted, it is impossible to achieve an effective and comprehensive teaching of practical and bedside/clinical skill that way. Logically, secure online examinations systems can be used for theory examinations but unfortunately a stable internet connection and efficient computer is again essential. Students also need to adapt to typing out answers and security features e.g. restriction of time for each question and inability to return to attempted questions which added stress on them. The security of the online exam systems in terms of prevention against cheating was also questionable as the students frequently had to sit for the examinations at home. Additional efforts and resources to set up extra security system like video proctoring, image proctoring, face recognition etc. are available (19), but the resources are lacking.

The percentage of students with high level of functional difficulties were the highest amongst the lowest family income category (B40 group at 45.1%), followed by the middle family income group (M40, at 28.7%) and the highest family income group (T20 group at 19%) with a statistically significant difference between them. This reflects poor affordability of suitable devices (17). Although around 90% of the students were sponsored, the amounts received were probably inadequate to cover extra expenses to get a good computer. Interest-free loans for purchase of computers have been offered by the university to eligible students but it has limitations. Furthermore, students from lower income groups tend to be from a rural setting (20) where the internet coverage are generally weaker compared to urban areas (18), causing more difficulties in learning whenever they had to learn from home during the lockdowns. Home environments also may be less conducive for learning in a lower socio-economic settings. On top of that, common obstacles in online learning such as the lack of interaction and discussions compared to face-to-face learning are inevitable (21).

Another potential contributory factor to the learning difficulty was the lack of preparedness and skills of the academicians and institution for online lessons. The same lesson plans and learning outcomes intended for in-class sessions tend to be used for the online classes, leading to unsuitable teaching materials and delivery method (4,6). Therefore, a revision of the curriculum is required.

In contrary to our expectation, most of the respondents reported only slight difficulties in dealing with psychosocial issues like boredom, loneliness and relationships (median score 2). This can be related to extensive use of online video chats and social media apps among the Malaysian youths (22). This has presumably helped to alleviate the psychosocial impact of COVID-19 on the respondents as discovered by Lyons et al. (12) among Australian medical students.

Majority of our respondents had no problem with their personal and family health conditions. This differs from the findings of Schiff et al. (13) among university students in two nations who demonstrated main functional difficulties in worries about health issues. This could be explained by the fact that Malaysian enjoy comprehensive and affordable healthcare (23). Furthermore, when this study was conducted, the health system in Malaysia was coping well with the COVID-19 situation of the country (24). The students might also worry less as they perceived themselves of lower risk of severe COVID-19 due to their young age (13,25). Most of the respondents also had no financial difficulty, probably because majority (89.7%) of them are funded by study loans and scholarships.

As for COVID-related concerns, majority of the medical students had high level of concerns about all the issues inquired. This was despite regular virtual activities and counselling services organised by the student development and campus lifestyle (SDCL) department of the university. The activities included talks and sharing sessions on mental wellbeing by the experts, religious talks and recitations, and recreational activities. The medical students were most concerned about the spread of disease. Majority of them reported that they were very concerned or very much concerned about the spread of COVID-19. This is understandable because there is yet to be an effective treatment for COVID-19 which has spread globally across countries and continents at an alarming rate (26). The anxiety about spread of disease could be compounded by frequent exposure to the news regarding COVID-19 which are widely accessible via social media (27). In comparison, there were statistically higher percentage of female students with high COVID-related concerns than the male students. This is consistent with the findings of multiple studies which identified that female university students demonstrated higher level of concerns and anxiety in response to the COVID-19 pandemic (3,5,13). This is

also supported by the discovery that females generally report more intense emotional response to positive or negative stimuli compared to males (28).

Consistent with the explanations above, low family income category was the only a statistically significant predictor identified for the high level of COVID-related functional difficulties, whilst female gender was the significant predictor for high level of COVID-related concerns among the medical students. Similar to the study by Schiff et al. (13) among university students of two countries, exposure to COVID-19 infections was not found to be associated with COVID-related functional difficulties or COVID-related concerns among the medical students but there was a statistically significant positive correlation between their COVID-related functional difficulties and COVID-related concerns. Correspondingly, Gallagher et al. (29) also identified higher COVID-related stress as a major cause for greater functional impairments among American adults.

Our study highlighted that although it has been a year since the onset of the COVID-19 pandemic and several measures has been taken by the authorities, the medical students still have considerable difficulties in online learning particularly among the students with low family income, and there were high levels of concerns among all the students especially the females. These indicate that prompt and coordinated further interventions by the relevant authorities including the higher education ministry, higher educational institutions, educationists, and multimedia authorities are required. The students require assistance to access better devices for learning, improvement of broadband coverage of the country, better IT facilities for students and teachers, and training of both the students and lecturers on the skills needed in online teaching and learning. A revision of the medical study curriculum to one that is appropriate for online mode should also not be overlooked (4,17). Effective strategies to alleviate the functional difficulties of medical students in learning will reduce their concerns and stresses too.

Psychological supports for the students also need to be intensified with emphasis on the female students. This may include improvement of existing counselling services probably with a revision of counselling guideline (26). In addition to face-to-face counselling, easy access online counselling e.g. through social media (4), with a choice of anonymity should be promoted. An ongoing campaign should be held to inform the students regarding the availability of such services, create awareness, promote positive mindset and encourage the medical students to get timely help to improve their coping mechanism (5). This is especially important because Asians has significant barriers to getting professional psychological help (5).
Periodic surveys should be conducted to assess the effectiveness of the interventional measures and improve them. These strategies will not only tackle the issues at hand but also prepare the students, teachers and institutions for any future pandemic or similar crisis.

As far as we are aware, this study represents the first study on exposure to COVID-19, COVID-related functional difficulties, and COVID-related concerns among medical students in Malaysia. The main limitations are related to it being a cross sectional study conducted at a single center. These limit any analysis of intervention and effect over time and generalisation of the results. Furthermore, 95.1% of the students are of Malay ethnicity which does not represent the composition of the Malaysian population. Therefore, further longitudinal, multi-center and multi-regional studies are recommended to assess the situation at other medical colleges and shed more lights into the challenges faced by medical students in Malaysia and globally during the COVID-19 pandemic.

CONCLUSION

Our study revealed that the medical students at UniKL RCMP had low level of exposure to COVID-19 infections. However, majority of them, particularly those from low-income (B40) families still reported moderate difficulties in learning and almost all students experienced high level of concerns in all areas surveyed including in the aspect of learning. If unaddressed, the extended period of learning difficulties and high level of concerns would bring detrimental consequences to the mental health of medical students and compromise the outcome of medical education. This calls for collaborative efforts to mitigate the problems with priority for students from lower socio-economic background and female students.

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