

The Role of Resilience as an Emotional Protective Factor to Mental Fatigue During the COVID-19 Lockdown: The Experience of Undergraduate Medical Students in Oman

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Abstract - The impact of COVID-19 on mental health across the globe has been colossal. Student mental health and well-being during the pandemic has caused increasing concern due to the drastic transition to online classes, lowered opportunities for socialization and stress related to COVID-19. The aim of the present study was to explore the prevalence of mental fatigue among undergraduate medical students at the College of Medicine and Health Sciences (COMHS), National University of Science and Technology, Sultanate of Oman and study the impact of resilience as a protective factor during the COVID-19 pandemic. Results indicated that participants experienced mild levels of mental fatigue. Normal levels of resilience capacity were seen among medical students. Significant negative correlation was seen between Mental Fatigue and Resilience. Linear regression analysis indicated that gender was a moderate predictive factor in the experience of mental fatigue. Post-lockdown survey results indicated that medical students continued to experience signs of mental fatigue, though restrictions have eased. They also continued to exhibit normal levels of resilience capacity. Students at the COMHS experienced mild levels of mental fatigue during the pandemic lockdown period. Normal level of resilience capacity effectively contributed as an emotional protective factor. Medical students continue to experience mild levels of mental fatigue, though lockdown restrictions have eased. Enhancing campus-based counselling support services to target COVID-19 related psychological distress and improve resiliency capacity is vital.

Keywords: COVID-19; students, medical; mental fatigue; resilience, psychological; Oman

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Introduction

The impact of COVID-19 on mental health across the globe has been colossal. Most nations in the world are locked down. There have been drastic shifts in people's routines and socialization opportunities. Individuals face other additional restrictions that are imposed to control the spread of the infection like bans

on public events, social distancing, and night curfews. Psychological distress is often associated to lockdown regulations. COVID-19 research also indicates that a longer period of confinement was associated with higher risk of distress [1]. Studies indicate that lockdown measures due to COVID-19 have impacted the well-being of individuals across all age groups- children, adolescents and adults [2-4].

On a global level, student mental health and well-being during the pandemic has caused increasing concern due to the drastic transition to online classes, lowered opportunities for socialization and stress related to COVID-19. A recent survey conducted by UNICEF indicates that the mental health of young people in Latin America and Caribbean is significantly impacted due to the COVID-19 crisis [5]. Study participants from Zurich reported increased levels of perceived stress and anger during the pandemic compared to before [6]. Similarly, young adults in Canada also experienced symptoms of depression, anxiety and post-traumatic stress disorder related to the pandemic [7]. A rapid narrative review that focused on the psychological impact of the pandemic on the mental health outcomes among young people indicated that reduction of academic opportunities, transition to e-learning, economic challenges, social restrictions, and implications to daily routine mainly contributed to the experience of psychological distress [8]. Results of a multi-country study with participants from the middle eastern countries of Oman, Saudi Arabia, Jordan, Iraq, United Arab Emirates and Egypt indicated that COVID-19 had greatly impacted the experience of depression, anxiety and stress among young people in the region [9]. In Oman, the common psychological consequences reported during the pandemic include isolation, boredom, fear and stigmatization [10].

The psychological impact of COVID-19 is high among college students. Research in the United States of America concluded that having poor general health status, 8 hours or more of screentime and knowing someone infected with COVID-19 predicted higher

levels of psychological impact [11]. Other common stressors included the impact of financial constraints, remote online learning and uncertainty related to future academic and career prospects [12]. College students in Oman also reported low psychological adjustment to the pandemic. The factors that attributed to this challenge included current academic requirements, lowered social communication and future academic stress [13]. Another study in Oman showed that college students reported experiencing moderate to severe levels of stress due to e-learning during COVID-19 [14].

Recent research has also indicated that medical students experienced elevated levels of baseline depression, anxiety, and stress during this period of lockdown [15]. Medical students in Turkey reported high levels of perceived stress and increased anxiety about being infected by COVID-19 [16]. Results from another study indicated that medical students were also concerned about aspects of physical fitness, social relationships, and inability to have access to clinical sessions and labs [17]. Students also reported that they experienced higher levels of stress and exhaustion after shifting to the online mode of study [18,19]. Features of depression and loss of confidence and a sense of competence was also reported [20].

Mental fatigue is a condition triggered by prolonged cognitive activity and can impact individuals who experience stress. It makes individuals feel overwhelmed, emotionally drained, and negatively impacts productivity [21]. Mental fatigue represents a failure to complete mental tasks that require self-motivation and internal cues in the absence of demonstrable cognitive failure or motor weakness [22]. Thus, reduction in work or study efficiency in daily life is seen in individuals with mental fatigue. Emotional challenges experienced during this pandemic period coupled with high demands to actively engage in virtual learning may contribute to the experience of mental fatigue by students. Research has indicated that college students experienced moderate levels of fa-

tigue during the lockdown [23]. Similar results were seen in a study among medical students, where prevalence of sleep disorders and emotional challenges, especially mental fatigue, was significant [24].

One of the protective factors to this negative effect is resilience [23]. Psychologists define resilience as the process of adapting well in the face of adversity, trauma, tragedy, threats, or significant sources of stress. As much as resilience involves “bouncing back” from these difficult experiences, it can also involve profound personal growth [25].

Research in Oman on mental fatigue due to the COVID-19 pandemic has been carried out among nurses and other frontline workers [26,27]. There is a lacuna of research related to the experience of medical students in Oman. The outcomes of previous experiences worldwide also indicate that when crisis or disaster strikes, the burden of psychological distress will far outlast the physical impact or injuries [28]. As the impact of COVID-19 is drastic and seems long-drawn-out & predicting the lingering psychosocial effect on individuals, it is vital that the mental health needs of medical students be assessed and addressed to prevent the long-term consequences of this disaster.

The aim of the present study was to explore the prevalence of mental fatigue among undergraduate medical students and study the impact of resilience as a protective factor during the COVID-19 pandemic. The results of the study provide valuable insights to plan and implement effective student counseling services.

Subjects and Methods

The present study was conducted among the students at the College of Medicine and Health Sciences (COMHS), National University of Science and Technology, Sultanate of Oman. A cross-sectional research design, using the online survey method was employed. Approval from the institution's Ethics and Biosafety Committee, with serial number NU/COMHS/EBC0013/2020, was obtained before the commence-

ment of the study. Informed consent was obtained from all participants.

The MD degree offered at the COMHS is a six-year undergraduate medical program. Students undergo three phases of training: Premedical (MD1); Preclinical (MD2, MD3 and MD4) and Clinical (MD5 and MD6). This study was conducted during the time period when lockdown restrictions were present in the Sultanate of Oman and students had transitioned to the online mode for classes. Convenience sampling technique was utilized. All students across the six years in the medical program were invited to be part of the study. One hundred and sixty-nine students consented to be part of the study.

The online survey was conducted via Google Forms. Invitation for participation was forwarded through class group emails. A follow-up reminder was sent to students after one week to maximize the response rate. Following the consent form, the survey questionnaire was divided into three sections- (1) Basic demographic details, (2) Items adapted from the Mental Fatigue Scale and (3) Items from the Brief Resilience Scale. Information for basic demographic details included age, gender, year of study and place of residence.

The self-report Mental Fatigue Scale included fifteen questions that measured mental fatigue. Items included information on affective, cognitive, and sensory symptoms and duration of sleep. Other domains included lack of initiative, physical and mental fatigue, mental recovery, concentration difficulties, memory problems, slowness of thinking, sensitivity to stress and emotional lability. Item scores range from zero to three, a score of zero indicating no problems and a score of three indicating serious problems [29]. The cut-off score for this scale is 10.5, indicating that scores greater than this value indicated an experience of mental fatigue [30]. The instructions for the Mental Fatigue Scale were adapted to represent the current lockdown experience due to the COVID-19 pandemic.

The Brief Resilience Scale included six items and is a reliable means of assessing resilience as the ability to bounce back or recover from stressful experiences [31]. Items were scored on a 5-point Likert scale ranging from ‘strongly agree’ to ‘strongly disagree’. The mean score is an indicator of resilience capacity and is interpreted as: Low resilience (1.00 - 2.99), Normal Resilience (3.00 - 4.30) and High Resilience (4.31 - 5.00) [32].

One year after the initial survey, when lockdown restrictions had eased and students were attending a hybrid mode of study, participants were invited to re-

take the online survey questionnaire. Forty-two students completed the survey, that included items from the Mental Fatigue Scale and the Brief Resilience Scale.

Data obtained were analyzed using IBM's Statistical Package for Social Sciences version 22 (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp). Descriptive statistics were employed to analyze demographic data. Reliability analysis was carried out using Cronbach's alpha to assess internal consistency. Non-parametric tests, such as Chi Square, Kruskal Wallis test and Correlation methods were employed to interpret data. Linear regression analysis was carried out to explore the strength of association. The Wilcoxon Sign Rank test was used to analyse comparisons.

Results

One hundred sixty nine students from COMHS participated in the study. The mean age of participants was 21.76 years (SD = 2.17). 89.3 % (n = 151) of participants were female and 10.7 % (n = 18) were male.

Students from the pre-medical (MD1), pre-clinical (MD2, MD3 and MD4) and clinical

years (MD5 and MD6) participated in the study. The proportion of participants across the various MD years is shown in figure 1. In addition, participants were residing across all governorates of Oman during the lockdown period, a majority of whom (44 %) were from the Muscat governorate.

Results indicate good internal consistency for the survey items used. Full scale Cronbach's Alpha for all the 23 survey items was 0.71. Reliability value obtained for the 17 items of the Mental Fatigue Scale was 0.85. The Cronbach's Alpha value for the 6 items of the Brief Resilience Scale was 0.68. Results of the Shapiro-Wilk test of normality for all survey items ($p = 0.000$) indicate that participant's responses were not normally distributed as shown in Figure 2.

Mental Fatigue Scale

The mean score obtained by participants on the Mental Fatigue Scale was 11,59 (SD = 7,55) indicating that participants experienced

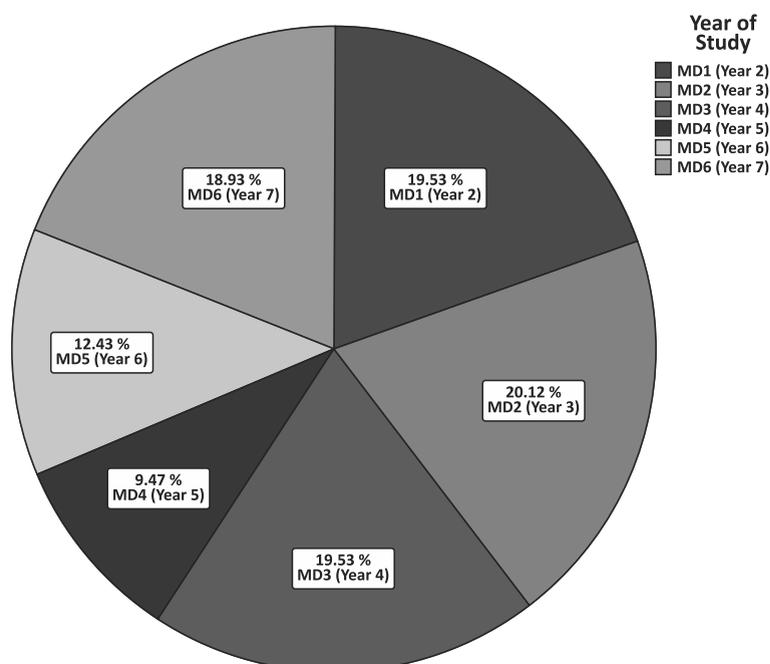


Figure 1. Proportion of participants across the various MD years

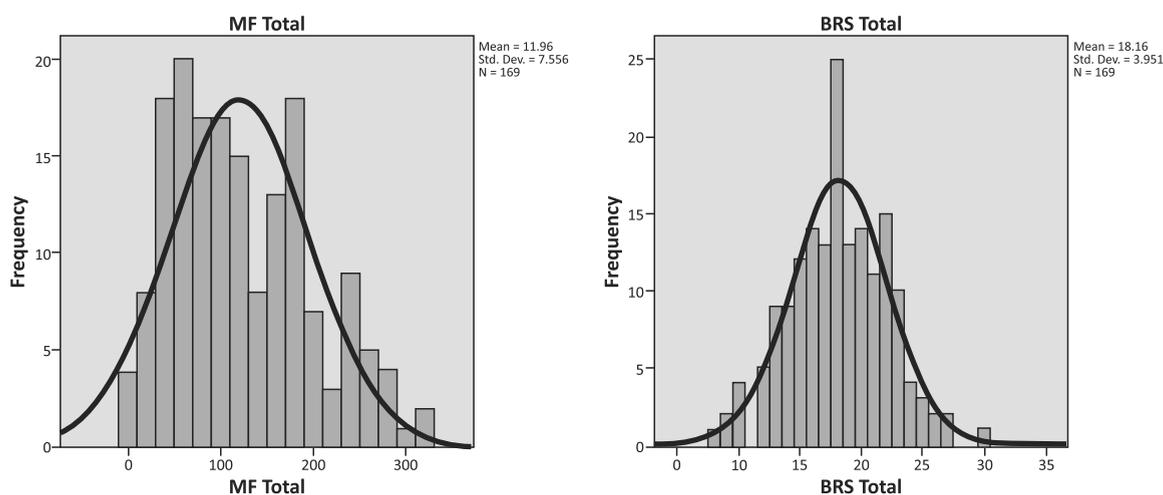


Figure 2. Distribution of participant's responses

mild levels of mental fatigue. The mean scores obtained by participants on the various dimensions of the Mental Fatigue Scale are shown in Table 1.

Participants' responses indicated that the areas highly impacted during the lockdown included experience of increased physical and mental fatigue, lack of initiative, difficulty with concentration, increased sensitivity to stress and difficulty with emotional regulation. Impact on the cognitive functions of memory and comprehension was not high. Most of the students reported that they felt at their best in the morning (35.5 %) and felt their worst in the afternoon (37.2 %).

Results of the Kruskal Wallis test indicates that there is no significant difference in the experience of mental fatigue among students in the pre-medical, pre-clinical and clinical years ($p = 0.921$).

Brief Resilience Scale

The mean score obtained by participants on the Brief Resilience Scale was 3.02 (SD = 0.65). This indicates that participants showed normal levels of resilience capacity. The mean scores

Table 1. Mean scores obtained by participants on the various dimensions of the Mental Fatigue Scale

| MF Domain | Mean | SD |
|----------------------------|------|------|
| Fatigue | 1.05 | 0.87 |
| Lack of Initiative | 0.91 | 0.73 |
| Mental Fatigue | 0.77 | 0.89 |
| Mental Recovery | 0.98 | 0.90 |
| Concentration Difficulties | 0.80 | 0.78 |
| Memory Problems | 0.58 | 0.76 |
| Slowness of Thinking | 0.53 | 0.62 |
| Sensitivity to stress | 0.88 | 0.99 |
| Emotional lability | 0.76 | 0.91 |
| Irritability | 0.81 | 0.85 |
| Light sensitivity | 0.71 | 0.87 |
| Noise sensitivity | 0.74 | 0.75 |
| Decreased sleep | 0.75 | 0.88 |
| Increased sleep | 1.11 | 1.11 |
| 24-hour variations | 0.52 | 0.64 |

Table 2. Mean scores of participants obtained on the items of the Brief Resilience Scale

| BRS Item | Mean | SD |
|----------|------|------|
| 1 | 3.05 | 0.93 |
| 2 | 3.01 | 1.13 |
| 3 | 3.17 | 1.03 |
| 4 | 2.82 | 1.05 |
| 5 | 3.07 | 0.97 |
| 6 | 3.00 | 1.14 |

of participants obtained on the items of the Brief Resilience Scale is shown in Table 2.

Items scores indicate that participants reported that they usually had an adequate tendency to bounce back quickly after hard times, come through difficult times with little trouble and recover from stressful events.

Results of the Kruskal Wallis test indicates that there is no significant difference in the resilience capacity among students in the pre-medical, pre-clinical and clinical years ($p = 0.825$).

Mental Fatigue and Resilience Capacity

Chi square analysis indicated a significant association between mental fatigue and resilience ($p = 0.002$). This indicates that the experience of fatigue is highly associated to individuals' resiliency capacity. Spearman's correlation analysis across all the mean scores of mental fatigue and resilience is shown in Table 3.

Results indicate a significant negative correlation between Mental Fatigue and Resilience. This indicates that as levels of resilience increase it results in the experience of low levels of mental fatigue. Alternatively, higher the levels of mental fatigue lower the capacity for resilience. Significant negative correlation is also seen in item-wise correlation analysis across the mental fatigue and resilience survey items.

Linear Regression Analysis

Though a significant association is seen between resilience and mental fatigue, linear

Table 3. Spearman's correlation analysis across all the mean scores of mental fatigue and resilience

| | Mental Fatigue | Resilience |
|-----------------|----------------|------------|
| Mental Fatigue | 1.000 | -0.369** |
| Sig. (2 tailed) | --- | 0.000 |
| Resilience | -0.369** | 1.000 |
| Sig. (2 tailed) | 0.000 | --- |

** Correlation is significant at the 0.01 level (2-tailed)

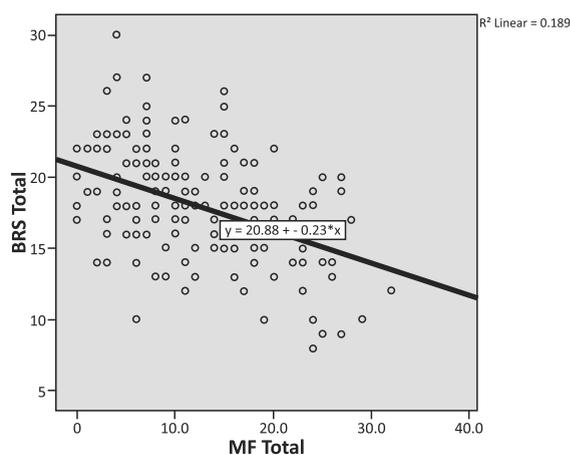
regression analysis indicates that they are not predictive of each other ($R^2 = 0.189$), as seen in Figure 3.

However, the year of study seems to be a predictive factor in the experience of mental fatigue ($R^2 = 0.948$) and resilience capacity ($R^2 = 0.978$), as seen in Figure 4.

In addition, as seen in Figure 5 gender is also a moderate predictive factor in the experience of mental fatigue ($R^2 = 0.528$) and resilience ($R^2 = 0.543$).

Post-lockdown Survey Results

The survey was repeated one year after the pandemic lockdown began. Students had re-

**Figure 3.** Linear regression analysis between mental fatigue and resilience

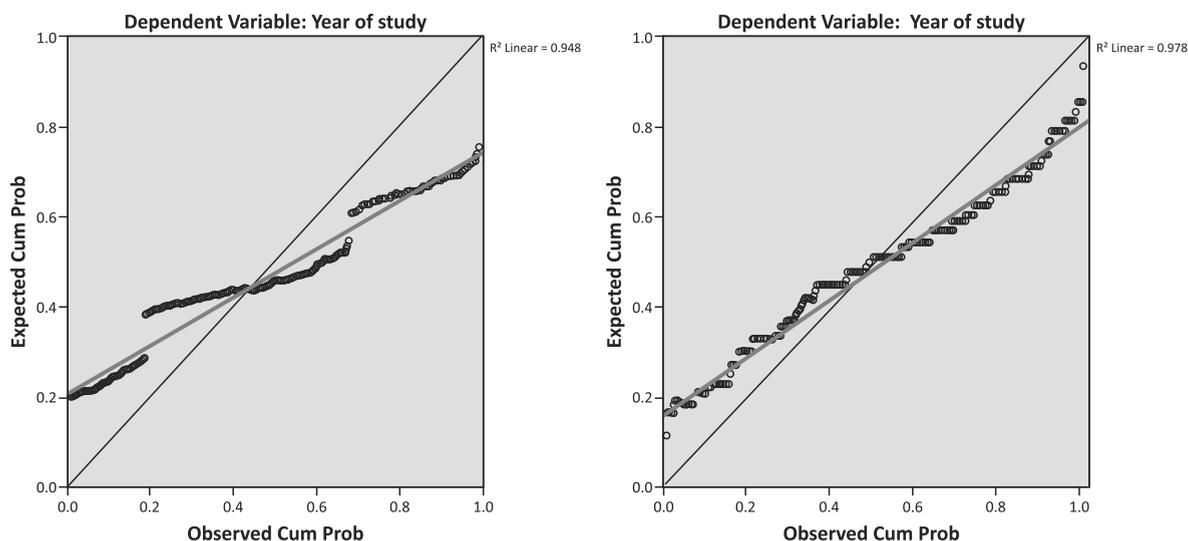


Figure 4. Linear regression analysis of the year of study

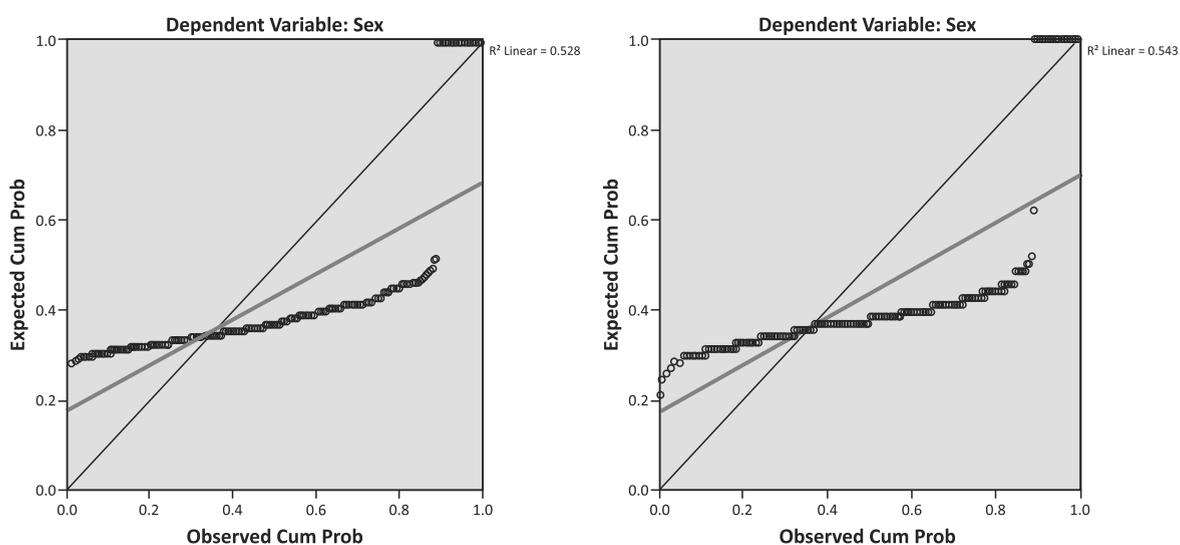


Figure 5. Linear regression analysis of sex

turned to campus and the hybrid model of learning was being followed. Forty-two students across all years of study participated in this survey. Results of the Kruskal Wallis test showed no significant difference in tests scores among the students in the premedical, preclinical and clinical years. The Wilcoxon

signed rank test showed no significant difference in the mean scores on the Mental Fatigue Scale ($p = 0.948$) and the Brief Resilience Scale ($p = 0.760$) during and after lockdown. This indicates that students continued to experience signs of mental fatigue though restrictions have eased, but also continue to exhibit

normal levels of resilience capacity. The psychological impact of the pandemic seems to be long-term. For study participants, as normal levels of resilience levels have been maintained, this seems to be a highly protective factor during this global crisis.

Discussion

Moderate levels of COVID-19 lockdown fatigue have been reported among college students and in particular among medical students [16,23]. Medical students in the present study also reported experiencing mild levels of mental fatigue. The domains greatly impacted among medical students in Oman included the lack of initiative, difficulty with concentration, increased sensitivity to stress and challenges with emotional regulation. These experiences are similar to research that indicated the impact of mental fatigue usually involved decreased energy, lowered motivation and lesser levels of alertness [33].

In comparison to other studies that indicated that students experience moderate levels of mental fatigue, participants in the present study reported experiencing mild levels. They also reported low impact on their memory and comprehension. This may be attributed to adequate levels of intrinsic motivation to maintain task performance [34]. Other studies concluded that two societal conditions that contribute to low levels of fatigue may include socio-economic status and self-perceived health status [35]. Oman, categorized as a high-income country with an accessible and efficacious healthcare system may have contributed to lowered levels of mental fatigue experienced among study participants [36,37]. Further investigation may provide insights in this area

Participants in this study reported normal levels of resilience during the pandemic lockdown. Similar results are seen among university students in Spain, where students reported high levels of resilience during the lockdown duration [38]. An interesting query observed was - Did the pandemic increase resilience?

[39]. However, Polish medical students reported low levels of resilience during this period [40]. The contribution/interaction of internal (motivation, self-efficacy) and external factors (parenting style, educational support) may attribute to this discrepancy of resilience capacity [41].

Study results indicated a significant association between mental fatigue and resilience. A significant negative correlation was also seen between mental fatigue and resilience. Similar results were obtained in a study conducted in the Philippines, where authors concluded that increased personal resilience was associated to lower levels of lockdown fatigue [23]. Conclusions from another study similarly indicated that epidemic rumination was positively related to fatigue while resilience was negatively related to fatigue [42].

The gender of participants in the present study seems to be a predictive factor to mental fatigue and resilience. An Omani study indicated that the psychological impact of the pandemic on females is higher [43]. In addition, though fatigue may be fully understood using a multi-causal model, gender differences is perceived [44]. This may contribute to the development of gender-specific training programs for target groups.

There was no significant difference in the experience between pre-medical, pre-clinical and clinical students in this study. However, a study on perceived stress among medical students in Turkey reported that scores were higher for students among the clinical phase when compared to students in the pre-clinical phase. The authors attributed this difference to the low level of knowledge of students in pre-clinical classes compared to clinical students [16]. In the COMHS, all medical students were exposed to structured information about the pandemic through online awareness sessions and information flyers; many relevant courses adapted to evidence-based content regarding the pandemic & adequate virtual support was provided by the institutions' health and counselling services. Adequate knowledge gained from these interventions may have contribut-

ed to the lack of difference in the knowledge/experience among pre-medical, pre-clinical and clinical students in the present study.

Study results of the survey conducted after lockdown restricted had eased, indicated that participants continued to experience mild levels of mental fatigue. This is an indicator of the long-term psychological impact of the pandemic. Recent research indicates that distress and anxiety associated to COVID-19 was negatively related to psychological coping and general health [45]. It is beneficial to participants that resilience capacity was retained during this stressful period. However, though resilience capacity is an individualistic factor, research has indicated that exposure to chronic stress may negatively impact resilience capacity [46]. This finding highlights the need to enhance counselling support services at the COMHS and design interventions targeting COVID-19 issues and focus on improving resilience capacity among medical students.

The results of the present study portray a hopeful scenario. Though medical students experienced mild levels of fatigue during the pandemic lockdown (and currently continue to do so), it may be concluded that resilience capacity has played a crucial role as an emotional protective factor during this period. This may be attributed to three components - (1) Individual/personal factors (2) Social factors, including the influence of family, peer support, access to adequate information and the most important contributing factor for medical students at COMHS - (3) Institutional support, that included efficient transition to the online learning mode, effective adaptation

of teaching resources to the virtual mode, access to tele-counseling services and support for economic constraints. It is therefore vital that the approach to dealing with the ongoing psychological impact of the pandemic involves intervention at the individual, social and institutional levels.

We identified the following limitations to this study: the disproportion relating to the number of male and female participants is seen in this study, as more females are registered to study at the COMHS. Furthermore, the number of responses obtained during the post-lockdown survey was lower than the initial survey.

In conclusion, students at the COMHS experienced mild levels of mental fatigue during the pandemic lockdown period. Normal level of resilience capacity contributed as an effective emotional protective factor. Medical students continue to experience mild levels of mental fatigue, though lockdown restrictions have eased. Enhancing campus-based counselling support services to target COVID-19 related psychological distress and improve resiliency capacity is vital.

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Conflicts of interest

None to declare.

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