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Burnout rates among Lebanese pre-final and final year medical students during the COVID-19 pandemic: A multi-centered survey-based study

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Abstract.
BACKGROUND: Burnout among medical students has always been a major concern.
OBJECTIVE: To evaluate changes in the prevalence rates of burnout among Lebanese pre-final and final year medical students while taking into consideration the impact of coronavirus 2019 (COVID-19) on both the academical and clinical experiences.
METHODS: This is a multi-centered, survey-based, cross-sectional study conducted in October 2021. The Copenhagen Burnout Inventory questionnaire was used on 120 medical students from three different medical schools in Lebanon.
RESULTS: The overall burnout prevalence was 40.01%. When further dividing it into domains, 39.36% of students had personal burnout, 41.52% had work-related burnout, and 39.16% had pandemic-related burnout. Theoretical learning and clinical training were reported to be affected in respectively 66.70% and 71.70%. However, only 10.00% of the students have regretted choosing medicine and 67.50% felt comfortable to get to the next academic level.
CONCLUSION: High levels of burnout were reported among pre-final and final year medical students with a subsequent negative impact on their academic life and clinical training. Medical schools should start adopting a conscious view of how to guide medical students in finding adequate coping mechanisms during these times of crisis.

Keywords: Burnout, clinical training, coronavirus, medical learning, medical students

1. Introduction

On the 21st of February 2020, Lebanon reported its first case of the novel coronavirus 2019 (COVID-19) [1]. Since then, it has been sliding into a worsening outbreak that is now threatening to overwhelm the country's fragile healthcare system [2]. As the

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number of new cases spike, all healthcare workers (HCWs), from attending physicians to residents and medical students, became directly involved in providing care to infected citizens [2, 3]. Despite growing knowledge about the virus, the Lebanese health care system is still having a hard time to cope with this pandemic, leading to physical/emotional/mental exhaustion, a sense of reduced accomplishment, and a loss of personal identity among healthcare workers [3]. This condition is known as burnout and is increasingly being recognized worldwide as a mental health issue [3] among medical students [4, 5]. It is well established in the literature that similar conditions of heavy human interactions, emotional commitment, overwhelming work, unclear job expectations, and lack of social support [3, 6] can explain the high rates of burnout reported among pre-final and final year medical students (6th and 7th years of medical education respectively): 75% in Lebanon, 52.8% in the United States of America (USA), 37.5% in Spain, and 27% in Sweden [6, 7].

In Lebanon, starting their pre-final year of general medicine, medical students start in-hospital clinical training where they can gradually learn technical, clinical, and interpersonal skills [8]. This is a crucial period where they put in action their theoretical education. Their role is not limited to learning, but it also includes taking the medical history, performing a complete clinical examination, elaborating a tailored plan of investigation, developing a diagnosis hypothesis, and communicating with families [8]. However, during 2020, this experience has been dramatically altered by the pandemic that has weighed heavily on major aspects of national and global society, including education [9]. Medical schools tried their best to keep the students safe by delivering all courses virtually. In addition, considering the serious shortage in personal protective equipment (PPE) and in attempt to avoid unnecessary exposure, some institutions have suspended students' clerkships and have forbidden any student-patient contact in line with the recommendations of the American Association of Medical Colleges (AAMC) [10, 11]. Conversely, other hospitals have recruited students to serve as front-liners in imitation of what was done in Pennsylvania during the Spanish-flu outbreak in 1918, and in Denmark during the Polio epidemic in 1952 [11], given that students are also clinicians who care for patients.

Whether being directly involved or not, it is hard to stay unaffected. It was widely speculated that the COVID-19 pandemic could affect all aspects of students' life [3, 12]: psychologically, given the high risk of acquiring the virus while performing their duty [3], professionally, with the belief that the pandemic will affect how they will practice medicine long after it subsides [13], and academically, given the rapid transition to online learning [9]. It is worth noting that previous surveys have been conducted in developed countries where this novel pandemic was a sole problem to be handled. However, no study has evaluated the impact of this pandemic in Lebanon where many heavy challenges are superimposed, including the ongoing financial crisis, the increase in extreme poverty rate, and the decrease in health personnel due to economic constraints [14]. In this paper, our primary objective was to evaluate for the first time in Lebanon, the effect that was imposed by the novel coronavirus on burnout rates only among pre-final and final-year medical students; given that they are at a vulnerable stage in life [12], new to the overwhelming clinical experience, and have the least medical experience, making them the most fragile population at the hospital. Our secondary objective was to evaluate the pandemic's impact on these students' academic journey and clerkship.

2. Methods

2.1. Study design

This was an online, descriptive, cross-sectional study that was conducted in October 2021, during the COVID-19 pandemic. It was approved by the ethics committee of the Notre Dame des Secours University Hospital. Participation was on a voluntary basis and since the research was of no foreseeable risks and only involved a survey for which written consent is not normally sought, participants have signed an electronic consent before filling the survey.

2.2. Study settings

With seven medical schools offering medical degrees, Lebanon has the highest number of medicine faculties to population ratio in the region [8]. To increase the external validity of the study findings, three medical schools from three different Lebanese governorates, were chosen to be enrolled: the American University of Beirut (AUB) located in the Beirut governorate, the Holy Spirit University of Kaslik (USEK) in Mount-Lebanon, and the Lebanese American University (LAU) in the North governorate.

These faculties have almost similar curricula, clinical clerkships, and clinical training programs.

2.3. Sampling procedure and data collection

During data collection, Lebanon was in total lockdown and educational institutions were closed. Subsequently, for enrolling potential participants, a Google Forms (Google Inc.) questionnaire was elaborated and sent via WhatsApp Messenger (Facebook Inc.). Each faculty provided us with the contacts of her pre-final and final year medical students, with an overall number of 298 medical students pursuing education in these faculties. We decided to enroll 120 participants given that based on the Raosoft software, a minimal sample size of 119 was required to ensure sufficient statistical power, using a margin of error of $\pm$ 7%, a population size of 298 medical students, a 50% response distribution (as there are no similar studies in Lebanon), and a confidence level of 95%. To randomly choose the participants, a computer-generated list was created using "randomiz-r", which is a small package for R-studio software that ensures adequate randomization and comparable groups. The software gave to each student of the three enrolled faculties a number. Invitations were progressively sent to participants until obtaining 40 responses from each faculty. After collecting the fully completed data, all 120 valid questionnaires were exported for analysis.

2.4. Questionnaire

The main study tool was a self-reported questionnaire written in English, which is, to varying degrees, the official language for medical instruction in Lebanon. It included 44 closed-ended questions, divided into four sections:

(1) The electronic consent form preceded by an introductory note briefing the survey's intent and assuring response anonymity and confidentiality.
(2) Participants' sociodemographic characteristics (age, gender, governorate) and general considerations (social habits, history of a chronic medical condition, year of medical education and medical school).
(3) Educational and clinical considerations: evaluating the impact of the current pandemic on students' clinical training, academic learning, and preparations for the upcoming academic level. In the conducted study, the Cronbach's alpha was 0.76.
(4) The Copenhagen Burnout Inventory (CBI) which is a comprehensive and validated scale known for its psychometric properties in evaluating burnout [3, 15]. It consists of three domains, the first one incorporates five items evaluating personal burnout, regardless of the occupational status (e.g., How often are you emotionally exhausted?), the second one consists of six items that detect work-related burnout (e.g., Do you feel that your work is emotionally exhausting?), and the third one made of 14 items that evaluate pandemic-related burnout (e.g., Do you hesitate to work during this current scenario?) [15]. In the conducted study, the Cronbach's alpha was 0.78.

All questions in the fourth section and three from the third one were rated on a 5-point Likert-type scale with scores ranging from "never" to "always" when enquiring about the frequency of an event, and from "very low degree" to "very high degree" when enquiring about the presence of others. The overall score in each domain of the CBI ranged from 0 to 100 points, and respondents with a mean score of > 50 were classified as experiencing the corresponding burnout.

Given that we used a self-reported questionnaire, a prior introductory session was given to students by a professional in the psychology field, to make them understand the true definitions of personal, work-related, and pandemic-related burnout. A pilot study was conducted on 15 students to ensure adequate comprehension of all questions; however, its results were not included in the final analysis.

2.5. Statistical analysis

Data analysis was conducted using SPSS software version 25. Cronbach's alpha values were recorded for reliability analysis for all scales. Testing skewness and kurtosis in the study was used to detect whether the normality distribution of every variable is met. Values for all variables were within the acceptable range (–2 and +2) [16], and since the sample was normally distributed, parametric tests were used. A descriptive analysis was done using counts and percentages for categorical variables and means with standard deviations for continuous measures. For independent samples, T-test was used to compare the difference in means of variables with two groups. Welch Test was used to compare the means differ-

Table 1
Participants' sociodemographic characteristics

Characteristics	N=120[1]
Age range (Years)	
20–24	92 (76.67%)
25–30	28 (23.33%)
Gender	
Female	74 (61.67%)
Male	46 (38.33%)
Governorate	
Mount Lebanon	60 (50.00%)
Beirut	34 (28.34%)
North	13 (10.83%)
South	7 (5.83%)
Bekaa	4 (3.33%)
Akkar	1 (0.83%)
Nabatieh	1 (0.83%)
Medical school	
AUB	40 (33.33%)
LAU	40 (33.33%)
USEK	40 (33.33%)
Medical year	
Pre-final year	50 (41.67%)
Final year	70 (58.33%)
Social habits	
Heavy smoker (≥20 per day)	22 (18.33%)
Occasional excessive alcohol drinker (Once a week)	26 (21.66%)
Major comorbidities	
Chronic lung disease (Moderate to severe asthma)	4 (3.33%)
Chronic/ serious heart condition	0 (0.00%)
Liver disease	
Chronic kidney disease	
Diabetes mellitus	
In an immunocompromised status	1 (0.83%)
Obesity (BMI>40)	1 (0.83%)
None	114 (95.00%)

[1]Statistics presented: *n* (%).

AUB: American University of Beirut; *BMI:* Body-Mass Index; *LAU:* Lebanese American University; *USEK:* Holy-Spirit University of Kaslik.

ence in means of variables with more than two groups. The Chi-square test was used to study the relationship between two categorical variables. A P-value<0.05 was considered significant.

3. Results

3.1. General information

Participants' sociodemographic and general characteristics are summarized in Table 1. Equally, 40 students were enrolled from each faculty and 76.67% of them were between 20 and 24 years of age. 61.67% were females and 58.33% were in their final year of education. Heavy smoking (≥20 cigarettes per day) was reported by 18.33% of our participants and 21.66% were occasional excessive alcohol drinkers (once a week). The vast majority (95.00%) of participants was healthy with no co-morbidities. (Table 1).

3.2. Educational and clinical considerations

Academically, despite scoring above 50/100 on theoretical learning interruption in 66.70% of cases, 67.50% of students have reported feeling comfortable moving up to the next academic level and only 10.00% have regretted choosing medicine (Table 2). No significant association was found between educational and clinical parameters, and all the independent variables (age, gender, governorate, medical school, medical year, social habits, and prior medical history) thus regression analysis was not done for these parameters.

Practically, 71.70% of students reported disruption in clinical training with 5.83% taking direct care

Table 2
Educational considerations

Variable	Never or to a very low degree *N* (%)	Seldom or to a low degree *N* (%)	Sometimes or somewhat *N* (%)	Often or to a high degree *N* (%)	Always or to a very high degree *N* (%)	Mean score (S.D.)[1]
Did the COVID-19 pandemic disrupted your academic learning?	6 (5.00)	15 (12.50)	19 (15.80)	41 (34.20)	39 (32.50)	69.17 (20.08)
Did the COVID-19 pandemic disrupted your clinical training?	4 (3.30)	17 (14.20)	13 (10.80)	54 (45.00)	32 (26.70)	69.40 (19.84)
Do you feel comfortable moving up to the next academic level by the end of this academic year?	7 (5.80)	14 (11.70)	18 (15.00)	58 (48.30)	23 (19.20)	65.85 (20.10)
Do you regret choosing medicine?	43 (35.80)	48 (40.00)	17 (14.20)	8 (6.70)	4 (3.30)	25.42 (25.92)

[1] S.D.: Standard deviation.

Table 3
Clerkship considerations

Variables	Yes *N* (%)
Was your clerkship suspended temporarily during the pandemic?	16 (13.34)
Were you involved in the management of patients not having the COVID-19 infection?	48 (40.00)
Were you involved in the management of patients with suspected COVID-19 infection?	49 (40.83)
Were you involved in the management of patients with documented COVID-19 infection?	7 (5.83)

of hospitalized COVID-19 infected patients, 40.83% treating patients with a suspected infection, 40.00% rotating on regular non COVID-19 units and 13.34% having their clerkships suspended. (Table 3).

3.3. The Copenhagen Burnout Inventory (CBI)

Overall burnout was noted in 40.01% of surveyed students. When further dividing it into domains, 39.36% had personal burnout, 41.52% faced work-related burnout and 39.16% reported pandemic-related burnout (Table 4). The parameters with the highest mean score in each domain were respectively, "emotional exhaustion" (65.17 ± 23.68) from the first domain, "frustration" (59.59 ± 20.94) from the second one and "fear that a family member will catch the virus" (86.25 ± 12.52) from the third domain.

Regression analysis was not done, given that among the seven independent variables, only two (gender and medical year) were significant on bivariate analysis for each type of burnout (Table 5). In comparison to males, bivariate analysis showed that females had significantly higher means of physical exhaustion (53.38 vs 35.33; $p = 0.001$), emotional exhaustion (69.59 vs 57.61; $p = 0.01$), fear of death while working in the current scenario (49.32 vs 33.70; $p = 0.001$) and support by colleagues (56.42 vs 47.28; $p = 0.02$). However, males had significantly higher means of frustration (57.80 vs 49.32; $p = 0.04$) with less training (33.15 vs 46.28; $p = 0.01$) and access to PPEs (27.17 vs 44.93; $p = 0.0007$) when compared to females. Moreover, bivariate analysis showed that pre-final-year medical students had significantly higher means of "feeling it is hard to work in the current scenario" (66.31 vs 54.79; $p = 0.002$) with lower means of "feeling welcomed by the community given their work" (66.00 vs 73.93; $p = 0.03$).

3.4. Safety measures

Taking part of the third domain, safety measures in workplace were evaluated. Overall, 30.83% of all medical students had adequate training in their workplace for the use of PPEs, and only 25.00% had adequate access to protective clothing.

4. Discussion

Taking into consideration the proven impact of the COVID-19 pandemic on undergraduate medical students in developed countries [13, 17], this is the first study to shed light on its influence on burnout rates, academic learning, and clinical training among pre-final and final-year medical students in a developing country such as Lebanon.

Table 4
Distribution of responses ($n = 120$) for the three domains of burnout

Variable	Never or to a very low degree *N* (%)	Seldom or to a low degree *N* (%)	Sometimes or somewhat *N* (%)	Often or to a high degree *N* (%)	Always or to a very high degree *N* (%)	Mean score (S.D.)[1]
Personal burnout (Score>50 in 39.36% of cases)						
1. How often are you physically exhausted?	17 (14.20)	35 (29.20)	26 (21.70)	32 (26.70)	10 (8.30)	46.40 (30.10)
2. How often are you emotionally exhausted?	3 (2.50)	14 (11.70)	27 (22.50)	60 (50.00)	16 (13.50)	65.17 (23.68)
3. How often do you think: "I can't take it anymore?"	40 (33.30)	46 (38.30)	21 (17.50)	10 (8.30)	3 (2.50)	27.08 (25.84)
4. How often do you feel weak and susceptible to illness?	5 (4.20)	23 (19.20)	27 (22.50)	53 (44.20)	12 (10.00)	59.17 (25.91)
5. How often do you feel extremely tired?	7 (5.83)	26 (21.66)	35 (29.16)	21 (17.50)	31 (25.80)	58.92 (22.11)
Work-related burnout (Score>50 in 41.52% of cases)						
1. Are you exhausted in the morning at the thought of another day at work?	2 (1.70)	21 (17.50)	70 (58.30)	23 (19.20)	4 (3.30)	51.25 (18.85)
2. Do you feel that every working hour is tiring for you?	4 (3.30)	18 (15.00)	73 (60.80)	22 (18.30)	3 (2.50)	50.42 (18.89)
3. Do you have enough energy for family and friends during leisure time?	4 (3.30)	17 (14.20)	44 (36.70)	48 (40.00)	7 (5.80)	57.71 (22.64)
4. Do you feel that your work is emotionally exhausting?	14 (11.70)	15 (12.50)	19 (15.80)	57 (47.50)	15 (12.50)	59.17 (30.04)
5. Does your work frustrate you?	6 (5.00)	20 (16.67)	30 (25.00)	50 (41.67)	14 (11.67)	59.59 (20.94)
6. Do you feel burnt out (complete physical or mental exhaustion) because of your work?	9 (7.50)	26 (21.70)	29 (24.20)	41 (34.20)	15 (12.50)	55.63 (28.70)
Pandemic-related burnout (Score>50 in 39.16% of cases)						
1. Do you feel it is hard to work in the current scenario?	11 (9.16)	12 (10.00)	29 (24.16)	50 (41.67)	18 (15.00)	60.83 (22.50)
2. Does it drain more of your energy to work during the current scenario?	7 (5.83)	15 (12.50)	70 (58.34)	25 (20.83)	3 (2.50)	50.41 (17.56)
3. Do you find it fruitful while performing your work during the current scenario?	8 (6.70)	20 (16.70)	65 (54.20)	22 (18.30)	5 (4.20)	49.17 (22.20)
4. Do you feel that you are giving more than what you get back while working in the current scenario?	7 (5.83)	28 (23.33)	27 (22.50)	35 (29.16)	23 (19.16)	58.11 (22.45)
5. Do you hesitate to work during this current scenario?	43 (35.80)	48 (40.00)	17 (14.20)	8 (6.70)	4 (3.30)	25.42 (25.92)
6. Do you feel depressed because of the current scenario?	12 (10.00)	19 (15.83)	25 (20.83)	44 (36.66)	20 (16.67)	58.53 (23.81)
7. Do you feel that your patience is tested while working in the current scenario?	6 (5.00)	24 (20.00)	65 (54.16)	21 (17.50)	4 (3.30)	48.5 (17.68)
8. Do you feel lockdown due to the current scenario has added stress on you?	5 (4.16)	12 (10.00)	23 (19.16)	60 (50.00)	20 (16.67)	66.25 (19.45)
9. Are you afraid of getting the COVID-19 virus while working in the current scenario?	2 (1.67)	13 (10.83)	10 (8.34)	45 (36.80)	50 (41.66)	49.65 (22.56)
10. Do you have a fear of family members catching the COVID-19 virus because of your work-exposure?	1 (0.84)	4 (3.34)	15 (12.50)	20 (16.66)	80 (66.67)	86.25 (12.52)

(*Continued*)

Table 4
(*Continued*)

Variable	Never or to a very low degree *N* (%)	Seldom or to a low degree *N* (%)	Sometimes or somewhat *N* (%)	Often or to a high degree *N* (%)	Always or to a very high degree *N* (%)	Mean score (S.D.)[1]
11. Do you feel welcomed by the community because you are a health care worker and working in the current scenario?	1 (0.84)	7 (5.80)	23 (19.20)	70 (58.30)	19 (15.80)	70.63 (19.89)
12. Are you indulging in any substance abuse (alcohol/drugs/smoking) during this period of lockdown?	60 (50.00)	32 (26.67)	10 (8.34)	8 (6.67)	10 (8.34)	24.18 (24.18)
13. Do you have a fear of death while working in the current scenario?	15 (12.50)	39 (32.50)	32 (26.70)	31 (25.80)	3 (2.50)	43.33 (26.47)
14.a. Have you received adequate training in your workplace for the use of personal protective equipment?	22 (18.33)	38 (31.67)	23 (19.17)	34 (28.33)	3 (2.50)	41.25 (28.74)
14.b. Do you have adequate access to personal protective equipment in your workplace?	25 (20.83)	41 (34.17)	24 (20.00)	26 (21.67)	4 (3.33)	38.13 (28.61)
15. Do you feel you are being supported by colleagues during the current scenario?	5 (4.20)	18 (15.00)	59 (49.20)	34 (28.30)	4 (3.30)	52.92 (21.29)

[1] S.D.=Standard deviation.

The disruptive effect of the current pandemic has prompted the adoption of distance learning at all academical levels [17]. When evaluating the impact on students' learning, our findings paint a pessimistic picture. With no noted significant difference for all independent variables, 10.00% of surveyed students have regretted choosing medicine and 66.67% believed that their academic learning was disrupted, leading to fear of inadequate preparedness for the next academic level in approximately one third of cases. Regardless of their sociodemographic characteristics, students are facing an increasingly uncertain environment. The pandemic only exacerbated the huge disruption in learning that Lebanon was already experiencing during 2019 following the widespread anti-government protests and the crippling economic situation [14]. Given that academic learning is directly influenced by mental health [18], chronic stress from rapid transition to online teaching along with unclear expectations about residency programs and fears of contracting the virus, can impair students' cognitive skills such as concentration, attention, and memory [18]. Aucejo et al. reported similar impact on learning, but his findings were contributed to the significant decrease in study hours [17]. However, according to "The Medscape Medical Student & Life Education Report 2020" a negative impact on academic learning was reported in higher percentages (87%), but with almost the same percentage of students feeling underprepared for the next academic level (33%) [13]. Furthermore, 74.7% of students surveyed by Harries et al. have agreed that the pandemic had significantly disrupted their medical education [19]. The long-term impact of the collective shock imposed by the migration to online learning on students' achievement is difficult to assess. Thus, despite being more experienced in online teaching, educators should closely follow students' academic progress throughout 2022, to identify hidden long-term ramifications of this pandemic.

Regarding medical students' clerkships, whether directly involved in treating COVID-19 infected cases or even quarantined at home, many factors have contributed to disrupting students' clinical training. Our findings showed that 56.67% of students felt that it was hard to work during the current scenario, with significantly pre-final-year students, who still lack adequate experience to handle stressful situations, reporting higher rates. In addition, given the serious shortage in equipment, 78.46% of respondents were afraid of catching the virus or transmitting it to a family member (83.34%). This would lead to avoidance of physical examination, and thus indirectly compromising students' clinical skills. Another factor was fear of death reported in 28.33% of cases, with women showing significantly more concern, like what was

Table 5
Bivariate analysis of gender and medical year on developing personal, pandemic-related and work-related burnout

Variables	Male ($N=46$) mean (S.D.)[1]	Female ($N=74$) mean (S.D.)[1]	p-value	Pre-final year ($N=50$) mean (S.D.)[1]	Final year ($N=70$) mean (S.D.)[1]	p-value
First domain: Personal burnout						
1. How often are you physically exhausted?	**35.33 (25.59)**	**53.38 (30.77)**	**0.001**	52.5 (31.23)	42.14 (28.72)	0.06
2. How often are you emotionally exhausted?	**57.61 (23.49)**	**69.59 (22.76)**	**0.01**	64 (27.27)	65.71 (20.92)	0.70
3. How often do you think: "I can't take it anymore?"	23.91 (23.54)	29.05 (27.14)	0.29	29.5 (23.52)	25.36 (27.41)	0.39
4. How often do you feel weak and susceptible to illness?	53.80 (25.25)	30.77 (25.92)	0.07	57.0 (26.26)	60.71 (25.74)	0.44
5. How often do you feel extremely tired?	55.71 (24.14)	60.50 (20.26)	0.26	50.03 (20.57)	54.27 (20.90)	0.26
Second domain: Work-related burnout						
1. Are you exhausted in the morning at the thought of another day at work?	47.83 (18.87)	53.38 (18.65)	0.12	55.00 (17.49)	48.57 (19.45)	0.07
2. Do you feel that every working hour is tiring for you?	46.20 (15.78)	53.04 (20.25)	0.053	53.50 (18.90)	48.21 (18.70)	0.13
3. Do you have enough energy for family and friends during leisure time?	57.07 (17.99)	58.11 (25.20)	0.81	60.50 (20.26)	55.71 (24.14)	0.26
4. Do you feel that your work is emotionally exhausting?	60.87 (26.69)	58.11 (32.08)	0.63	59.50 (32.29)	58.93 (28.56)	0.92
5. Does your work frustrate you?	**57.80 (23.34)**	**49.32 (22.45)**	**0.04**	59.06 (25.24)	62.76 (20.31)	0.39
6. Do you feel burnt out (complete physical or mental exhaustion) because of your work?	56.52 (30.01)	55.07 (28.05)	0.79	55.00 (31.94)	56.07 (26.38)	0.84
Third domain: Pandemic-related burnout						
1. Do you feel it is hard to work in the current scenario?	53.04 (20.25)	48.57 (19.45)	0.23	**66.31 (20.12)**	**54.79 (21.45)**	**0.002**
2. Does it drain more of your energy to work during the current scenario?	49.32 (27.06)	52.50 (17.80)	0.47	50.04 (20.25)	45.02 (21.01)	0.18
3. Do you find it fruitful while performing your work during the current scenario?	44.57 (21.02)	52.03 (22.57)	0.07	53.00 (21.21)	46.43 (22.63)	0.11
4. Do you feel that you are giving more than what you get back while working in the current scenario?	53.07 (28.41)	54.52 (27.01)	0.70	53.01 (27.91)	54.07 (24.38)	0.82
5. Do you hesitate to work during this current scenario?	27.72 (26.99)	23.99 (25.32)	0.45	29.00 (30.45)	22.86 (22.01)	0.20
6. Do you feel depressed because of the current scenario?	59.62 (28.39)	58.17 (26.09)	0.77	50.00 (25.74)	51.07 (21.48)	0.81
7. Do you feel that your patience is tested while working in the current scenario?	52.73 (23.87)	57.38 (22.75)	0.29	59.01 (21.49)	52.67 (23.55)	0.12
8. Do you feel that the lockdown due to the current scenario has added stress on you?	65.67 (18.76)	62.62 (21.49)	0.41	61.12 (24.37)	62.61 (18.87)	0.71
9. Are you afraid of getting the COVID-19 virus while working in the current scenario?	86.74 (11.56)	88.15 (10.22)	0.49	85.15 (11.78)	87.13 (11.15)	0.35
10. Do you have a fear of family members catching the COVID-19 virus because of your work-exposure?	90.33 (5.40)	91.08 (5.01)	0.44	91 (4.10)	92.1 (5.10)	0.19
11. Do you feel welcomed by the community because you are a health care worker and working in the current scenario?	69.02 (21.84)	71.62 (18.65)	0.49	**66.00 (23.56)**	**73.93 (16.17)**	**0.03**

(*Continued*)

Table 5
(*Continued*)

Variables	Male ($N=46$) mean (S.D.)[1]	Female ($N=74$) mean (S.D.)[1]	*p*-value	Pre-final year ($N=50$) mean (S.D.)[1]	Final year ($N=70$) mean (S.D.)[1]	*p*-value
12. Are you indulging in any substance abuse (alcohol/drugs/smoking) during this period of lockdown?	10.15 (5.01)	9.08 (4.06)	0.22	11.10 (5.23)	9.51 (4.50)	0.08
13. Do you have a fear of death while working in the current scenario?	**33.70 (27.49)**	**49.32 (24.11)**	**0.001**	41.50 (28.39)	44.64 (25.14)	0.52
14.a. Have you received adequate training in your workplace for the use of personal protective equipment?	**33.15 (26.90)**	**46.28 (28.87)**	**0.01**	36.5 (29.97)	44.64 (27.54)	0.13
14.b. Do you have adequate access to personal protective equipment in your workplace?	**27.17 (26.26)**	**44.93 (28.05)**	**<0.001**	39 (27.73)	37.5 (29.41)	0.78
15. Do you feel you are being supported by colleagues during the current scenario?	**47.28 (18.43)**	**56.42 (22.30)**	**0.02**	56.50 (21.90)	50.36 (20.63)	0.12

[1] S.D. = Standard deviation. Values in bold are significant.

mentioned in previous studies [13]. Our findings were higher than the ones reported in the "COVID-19 Rapid-Cycle Survey 2" where 55.3% of physicians are afraid of getting the disease and 66.9% are afraid of carrying it to a family member [20]. Also, our findings were significantly higher than those reported by Khasne et al. in a similar study conducted among Indian graduated HCWs [3]. Despite all available data, it is still difficult to decide whether one must agree with the abovementioned recommendations. In our opinion, to avoid any shortage in workforce, which would lead to an imminent breaking point, the Lebanese authorities must seek help from the international community to provide sufficient PPEs and train medical students so they can start serving in the COVID-19 units. In addition, other effective alternatives with no risk for disease transmission, should be provided to resume students' clerkship, such as remotely involving students in patient care (telemedicine), recruiting them in post-COVID units, or even engaging them in online simulation sessions to refresh their memories. These steps will help students learn about new specialties, gain experience, build relationships, and eventually excel their career as future physicians.

As for burnout, it has been always considered a major public health concern among medical students. In comparison to the previously reported rates of burnout among medical students prior to the COVID-19 pandemic, our findings (40.01%) tell a more optimistic story than what was expected. A meta-analysis that evaluated 24 studies conducted between 2010 and 2017, showed an estimated prevalence of approximately 44% [21]. Another meta-analysis conducted during the pandemic and involving 26,842 students showed comparable overall rates [5]. In both reviews, rates varied across countries with the highest ones being reported in the Middle East and Oceania regions [21]. The following percentages were reported among medical students in our region: in Lebanon 75.00% in 2016 [6], 43.00% in 2018 [22], 46.90% in 2019 [23]; in Oman 7.40% in 2017 [24]; in Iran 45.70% in 2016 [25]; and in Saudi Arabia 67.10% in 2017 [26] and 56.50% in 2019 [27]. In the USA, large multi-centered studies reported a prevalence rate of 39.00% to 55.00% in 2006 [28], 49.60% in 2007 [29] and 55.90% in 2012 [30]. European rates of burnout among medical students were 37.50% in 2011 and 2012 [31, 32]. Worldwide, the rapidly evolving COVID-19 pandemic, has presented unprecedented challenges to HCWs [33, 34]. Putting the entire country under national lockdown and enforcing social distancing measures [14, 35] have disrupted all aspects of students' life with profound impact on their academic, personal, professional, and financial situations. These increasing challenges found common ground with the academic and lifestyle demands as well as the chronic psychosocial stress that medical students are already facing in the Middle East region, from low income to difficult working conditions, heavy workload, ongoing political violence, and social instability [14, 22, 23].

Theoretically, these added stressors would lead to increased burnout levels, similar to what was reported in previous pandemics [3], however, studies conducted during the COVID-19 pandemic revealed burnout rates that are almost similar to the ones reported in the pre-COVID-19 era, with 41.43% in India [3] and 50.00% in Cyprus [36]. In comparison to the Indian [3] study and using the same scale (CBI), we reported lower personal (39.36% vs 52.50%) and pandemic-related burnout rates (39.16% vs 49.70%) but a higher rate on the work-related burnout (41.52% vs 32.90%). Moreover, Portuguese [37] and Lithuanian HCWs [38] scored higher on personal burnouts (53.7% and 44.80% respectively) and work-related burnouts (53.10%; 46.7%) but lower on the pandemic-related one (35.40%; 35.10%). In these studies, as well as in the current one, the prevalence of pandemic-related burnout is surprisingly not higher than the two other evaluated burnouts, possibly because of the high social and emotional supports offered to HCWs by the social media, society, family, and friends. In fact, 74.10% of the surveyed students felt welcomed by the community secondary to their current work, with only 11.00% hesitating to work.

The current study provides many valuable contributions to the literature. Our findings constitute a first step towards encouraging educators to authentically support medical students educationally and emotionally. This would be optimal by creating an educational, protective, respectful, and supportive working environment, maintaining a reasonable number of working hours, developing positive relationships. Another vital step is to mentally prepare the students for crisis management by providing mental health workshops and training programs, as well as encouraging them to routinely fill a self-assessment questionnaire with an opportunity of a free professional psychological evaluation, in case of any alarming result. These major adjustments will not only boost medical students' confidence and moral but will be beneficial for the society in the long run.

When analyzing our results, it is essential to keep in mind some limitations. First, self-reporting bias influenced by respondent's level of interest cannot be ruled out in any similar survey-based study. Second, Mount-Lebanon and Beirut governorates were the most represented in our sample, possibly because most of the medical faculties are in these regions and students themselves live next to their educational institutions. As well, we did not ask about the use of psychotropic drugs by our participants. This parameter is important to evaluate, as it could be a cofounding factor. At last, we did not enquire about some cofounders that may influence the burnout scores, such as the financial background, the presence of a past psychiatric disease, or the intake of psychiatric medications. Despite the study limitations, our findings helped in quantifying the toll that this pandemic has taken on medical students' clinical, academical and psychological wellness, hypothesizing how it may have affected the doctors of tomorrow.

5. Conclusions

Medicine is a highly demanding career and a never-ending path that can take a heavy toll on vulnerable non-experienced medical students [12], especially during these times of crisis. As a result of the current situation in Lebanon, pre-final- and final-year medical students' have reported that their academic life, clerkships, and mental health are being negatively affected. It is the duty of educators, and residency programs to adopt a conscious view of how to guide medical students in finding adequate coping mechanisms to manage stressful situations, improve burnout conditions, manage exhaustion, and subsequently avoid potential professional and personal repercussions.

Ethics statement

This study was conducted in accordance with the fundamental principles of the Declaration of Helsinki. The ethics committee of the Notre Dame des Secours University Hospital approved the study protocol (reference number not available as per the ethics committee).

Informed consent

An online informed consent was obtained from each participant.

Conflict of interest

The authors have nothing to disclose.

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Availability of data and materials

All data generated or analyzed during this study are not publicly available to maintain the privacy of the individuals' identities. The dataset supporting the conclusions is available from the corresponding author upon reasonable request.

Author contributions

CN: conceptualization, data collection, results interpretation and article writing. EBS: results interpretation, writing and editing of the article. CYN: data collection and statistical analysis. GM: editing, critical and medical review of the article. MM: conceptualization, supervision, critical and medical review of the article.

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