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Original article

# Effect of COVID-19 on mental health among the young population in Lebanon



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## ABSTRACT

**Background.** – COVID-19 is a global pandemic that has raised worldwide public health concerns. The wide spread of the virus has led to unprecedented disturbance to regular life for people around the globe and impacted their mental health.

**Aims.** – The aims of the current study were to investigate the prevalence of psychiatric symptoms related to insomnia, depression, and anxiety, and identify risk factors contributing to psychological stress in Lebanese young population during COVID-19 pandemic.

**Method.** – A cross-sectional study was done on the Lebanese young population. Participants were 4397 males and females aged 18 to 35 years who filled a self-administered online questionnaire. Three validated scales were used to measure the mental health status of the participants during the COVID-19 pandemic: 7-item Insomnia Severity Index for insomnia, the Patient Health Questionnaire 9-item depression module for depression, and the 7-item Generalized Anxiety Disorder scale for anxiety.

**Results.** – The median interquartile range scores for anxiety, insomnia, and depression, were 8 (4–13), 10 (5–14), and 9 (5–12) respectively. Higher anxiety scores were reported with female gender ( $P < 0.001$ ) and alcohol usage ( $P = 0.04$ ). Moderate to severe insomnia was associated with single ( $P = 0.02$ ) and divorced marital status ( $P = 0.003$ ), university education ( $P < 0.001$ ), consumption of caffeinated beverages ( $P = 0.02$ ) and energy drinks ( $P = 0.03$ ). Higher depression scores were associated with status of being the only person working at home ( $P = 0.01$ ), family income more than 500 USD ( $P = 0.008$ ), multiple insurance plans ( $P = 0.01$ ), and contact with a confirmed COVID-19 case ( $P = 0.01$ ).

**Conclusions.** – The findings of this study demonstrate the considerable impact of COVID-19 pandemic and lockdown on Lebanese young population's mental status such as anxiety, depression and insomnia. Further follow-up studies are warranted to assess the long-term mental effects that can be imposed by the pandemic.

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## 1. Introduction

In December 2019, a novel disease outbreak originated in Wuhan city, Hubei province, China, when a cluster of clinical

presentations greatly resembling viral pneumonia was reported [1,2]. Soon thereafter, the outbreak was attributed to a novel coronavirus, [3] known as the severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) [4]. The disease, named coronavirus disease 2019 (COVID-19), became both domestically and internationally spread, and was declared as pandemic by the World Health Organization (WHO) on March 11, 2020 [5].

Not only did COVID-19 raise worldwide public health concerns, but it had also led to unprecedented disturbance to regular life for people around the globe, with social distancing, self-isolation, work interruptions, as well as travel restrictions robustly recommended [6]. As a consequence of such turbulence, it was expected that worrying psychological effects like confusion, anxiety, depression and fear would inevitably emerge [7,8]. Studies reporting the impact of COVID-19 on mental health detected a major psychological burden

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attributed to the pandemic among different populations. In China, higher prevalence of anxiety disorders and depressive symptoms was reported in younger adults [9]. In India, anxiety, sleep difficulties, paranoia about acquiring COVID-19 infection, and distress were reported, together with perceived need for mental healthcare [8]. Insomnia and poor sleep hygiene associated with COVID-19 were also reported in individuals free from infection. Marked anxiety and depressive symptoms during the outbreak were associated with fear of getting infected, rapidly increasing number of cases, economic-related stress, confinement, travel restrictions, changes in daily life, and female gender. [10] Another implication of COVID-19 on health behavior is alcohol use, whereby predictions on increased consumption of alcohol for some populations, particularly males, did arise due to distress experienced as a result of the pandemic [11].

Previous research tackling mental health of individuals during outbreaks has shown adverse psychological reactions that resulted from fear and uncertainty. For instance, in a study about SARS outbreak survivors, high levels of depression, anxiety, and posttraumatic symptoms were detected, with an alarming proportion of psychiatric morbidity [12]. In a report from Korea about mental health status of isolated individuals during the Middle East Respiratory Syndrome (MERS) outbreak, anxiety symptoms and feelings of anger were observed, and persisted for 4 to 6 months following release from isolation [12]. Apart from coronavirus outbreaks, an investigation of mental health during H1N1 influenza outbreak showed mental distress significantly associated with fear from infection, with one tenth of the participants panicking, feeling depressed, or feeling emotionally disturbed as a result of H1N1; even a higher proportion were fearful about the WHO's H1N1 pandemic announcement [13].

In Lebanon, cases of COVID-19 have been officially announced as of February 21st, 2020, and governmental lockdown with an emergency status were declared early in March. Lebanon is still facing the consequences of COVID-19, which has grasped the country on top of previous economic crisis, recession, and political instability, caused by protests that started in October 2019. The investigation of the impact of COVID-19 on population mental health status in Lebanon is, therefore, imperative, and may have implications in the preparedness and provision of mental health and support of individuals in need. The objectives of the current study were to investigate the prevalence of psychiatric symptoms related to insomnia, depression, and anxiety, and identify risk factors contributing to psychological stress in Lebanese young population during COVID-19 lockdown.

## 2. Methods

### 2.1. Design, setting, and participants

A cross-sectional study was performed via an anonymous online questionnaire from April 28 to May 10, 2020. During this period, complete governmental closure was imposed on all sectors of the country, including commerce, schools, universities, entertainment, small and large businesses, as well as airport shutdown. Data collection was carried out across the eight governorates (Mohafazat) of Lebanon using a snowball sampling technique targeting young individuals living in Lebanon during the COVID-19 pandemic. Participants aged between 18 and 35 years were included in the study; whereas, individuals younger than 18 years, older than 35 years, or those diagnosed with any mental health condition were excluded.

### 2.2. Minimal sample size calculation

With reference to Epi-info software, a minimum sample size of 1067 persons was needed based on a 95% confidence level with a

margin of error of  $\pm 3$ , knowing that the Lebanese population 18 to 35 years old comprises around 2 million individuals.

### 2.3. Data collection

An online questionnaire was developed in English language by using Google forms. The investigators forwarded the link of the questionnaire to their personal contacts and sent it to their university students and colleagues via WhatsApp Messenger application, as this is the most commonly used mobile application in Lebanon for texting and communication. Participants were also encouraged to disseminate the survey to others; therefore, the link reached people apart from the first point of contact. The study scope and purpose were explained at the beginning of the questionnaire. Participants were informed that their participation in the study is voluntary and they were assured that their responses would remain anonymous and confidential. Completion of the questionnaire till the end was considered as informed consent to participate. The Institutional Review Board of the School of Pharmacy at the Lebanese International University approved the study and was granted the following number: 2020RC-042-LIUSOP.

### 2.4. Measurement tools

The questionnaire consisted of a set of questions divided into five sections. The first section concerned the participants' sociodemographic data: age, gender, nationality, area of residence, marital status, household size, educational level, working status, smoking status, monthly family income and health insurance. Furthermore, participants were asked about their lifestyle including consumption of alcohol, caffeinated beverages, energy drinks, fruits and vegetables, and water normally and during the COVID-19 time. Physical activity, body weight status, and activities done at home during lockdown were also assessed. In addition, participants were asked about their contact history with COVID-19 in the previous 14 days.

The second section assessed the participants' knowledge and concerns about COVID-19, which comprised routes of transmission, source of information, and level of satisfaction with the available health information. Likelihood of personal or other family members contracting the disease and the chance of surviving in case of infection were also evaluated.

In the following sections, three validated scales that served the purpose of the study in measuring the mental health status of the participants during the COVID-19 pandemic were included as follows:

#### 2.4.1. The 7-item Insomnia Severity Index (ISI)

This self-report instrument that is composed of 7 items was used to assess the nature, severity, and impact of insomnia. Each item is rated on a 5-point Likert scale from 0 to 4 with a total score ranging from 0 to 28. The total score was calculated and interpreted as follows: normal with no insomnia (0–7), subthreshold (8–14), moderate (15–21), and severe (22–28) insomnia [14,15].

#### 2.4.2. The Patient Health Questionnaire 9-item depression module (PHQ-9)

Participants' depressive symptoms during the COVID-19 pandemic were assessed using PHQ-9, which scores each of the nine Diagnostic and Statistical Manual of Mental Disorders, 4th edition (DSM-IV) criteria of depression on a scale ranging from "0" (not at all) to "3" (nearly every day). The total sum of the responses ranging from 0 to 27 suggests varying levels of depression: no/minimal depression (0–4), mild (5–9), moderate (10–14), moderately severe (15–19), and severe (20–27) [16,17].

2.4.3. The 7-item Generalized Anxiety Disorder (GAD-7) Scale

This 7-item self-rated tool was used to measure participants' anxiety symptoms over the previous two weeks. Each item is assigned a score from "0" (not at all) to "3" (nearly every day). The total score of GAD-7 ranges from 0 to 21 and is grouped into four categories as follows: no/minimal anxiety (0–4), mild (5–9), moderate (10–14), and severe (15–21) [18].

2.5. Statistical analysis

Descriptive statistics were performed to represent the participants' characteristics, COVID-19 related information, the GAD-7 anxiety score, ISI insomnia severity score, and PHQ-9 depression severity score, and were expressed as percentages. The original scores of the 3 measurement tools were presented as medians with interquartile ranges (IQRs).

The GAD-7 anxiety score was expressed as "moderate and severe" versus "minimum and mild", the insomnia severity index as "clinical insomnia (moderate and severe)" versus "no clinically significant insomnia and subthreshold insomnia", and the depression score as "moderate, moderately severe, and severe depression" versus "minimal and mild depression". Moreover, the associations between the scores and the participants' characteristics were assessed using the Chi-square test. Three binary logistic regression models were used to evaluate the association between the scores and the potential confounders. In the first regression, the anxiety score was the dependent variable, while in the second and third regressions, the insomnia and depression scores respectively were the dependent variables. The participants' characteristics having a P-value of less than 0.05 in the bivariate analysis (such as age, gender, smoking, educational level, marital status. . .) were included as covariates. The model was tested for adequacy in all the analysis.

An alpha of 0.05 was used to determine statistical significance. All analyses were performed using the IBM's Statistical Package for the Social Sciences (SPSS) version 22.0 (IBM, Inc, Chicago, IL).

3. Results

3.1. Sociodemographic characteristics

A total of 4397 respondents completed the questionnaire. Sociodemographic characteristics of the participants are shown in Table 1. The analyzed sample included participants from all Lebanese districts, of whom 2924 (66.5%) were females, and those who received university education were 3664 (83.3%). The recruited participants were young adults between 18–35 years old, among which 3439 (78.2%) aged between 18 and 25 years and less than half (42.3%) belonged to the middle socioeconomic class with an average family income of 500–1500 USD per month. Among this sample, 2669 (60.7%) were living in a household size of 3–5 people and 493 (13.3%) stated that they were the only person working at home. In terms of occupation, 3095 (71.2%) were students, 483 (11.1%) were non-healthcare workers, 406 (9.3%) were unemployed, and 360 (8.3%) were healthcare workers; it is noteworthy that almost 34.4% had no health insurance whatsoever.

3.2. Lifestyle changes during COVID-19 time

The lifestyle of the participants was affected during COVID-19 pandemic, where alcohol intake was increased by 22.5% among alcohol consumers (639 [14.5%]). As for smoking, 14.2% were cigarette and 29% hookah (nargileh) smokers respectively, and more than half of those reported increased smoking during the COVID-19 time. Caffeinated beverages were consumed by 72.7% and less than half (43.8%) increased their consumption during COVID-19. Energy drinks consumption was reported by 21.8%, of

**Table 1**  
Sociodemographic characteristics of the study population (n = 4397).

	n (%)
Gender	2924 (66.5)
Females	
Age	3439 (78.2)
[18–25[	958 (21.8)
[25–35]	
Nationality	3975 (90.4)
Lebanese	422 (9.6)
Non-Lebanese	
Area of residence	1026 (23.3)
Beirut	221 (5)
Akkar	208 (4.7)
Baalback-Hermel	521 (11.8)
Bekaa	944 (21.5)
Mount Lebanon	166 (3.8)
Nabatieh	687 (15.6)
North	624 (14.2)
South	
Marital status	479 (10.9)
Married	3886 (88.4)
Single	32 (0.7)
Divorced/widowed	
Household size	131 (3)
One person	330 (7.5)
Two persons	2669 (60.7)
Three to five	1267 (28.8)
Six or more	
Educational level	170 (3.9)
Primary or less	563 (12.8)
Secondary	3664 (83.3)
University	
Occupation	360 (8.3)
Healthcare workers	483 (11.1)
Non-healthcare workers	3095 (71.2)
Student	406 (9.3)
Unemployed	
Being the only person working at home	493 (13.3)
Yes	
Family income per month in USD	759 (17.3)
< 500	1859 (42.3)
[500–1500[	1100 (25)
[1500–2500[	679 (15.4)
2500 or above	
Health insurance	1513 (34.4)
None	1099 (25)
NSSF	270 (6.1)
COOP	1263 (28.7)
Private	252 (5.8)
2 insurances or more	

USD: United States Dollars; NSSF: National Social Security Fund; COOP: Cooperatives.

whom 25.8% also had raised consumption during the pandemic. Only 6.8% reported contact with a suspected COVID-19 case and 4.1% with a confirmed case. Lockdown due to COVID-19 affected work status (33%) and family income (49.8%), and many were obliged to work from home which was reported to be acceptable by 36.7% of the respondents. During quarantine, more than half stated that they consumed fruits and vegetables, drank at least 2L of water per day, and were physically active. A considerable proportion of participants had symptoms of anxiety (1850 [42%]), insomnia (941 [21.4%]), and depression (1874 [42.6%]). Further details are shown in Table 2.

3.3. Knowledge and concerns about COVID-19

Participants were also assessed for their knowledge and concerns about COVID-19. Table 3 shows that the responses regarding transmission of the virus varied considerably, whereby the most common perceived route of transmission was through respiratory droplets (78.7%), followed by indirect contact (46.8%), and airborne

**Table 2**  
Lifestyle Changes during COVID-19 Time (n = 4397).

	n (%)
Alcohol intake	639 (14.5)
Yes	
Drinking more during COVID-19 time	143 (22.5)
Yes	
Smoking cigarettes	626 (14.2)
Yes	
Smoking more during COVID-19 time	348 (56.4)
Yes	
Smoking hookah (nargileh)	1275 (29)
Yes	
Smoking more during COVID-19 time	647 (51.3)
Yes	
Consuming caffeinated beverage	3196 (72.7)
Yes	
Consuming more during COVID-19 time	1385 (43.8)
Yes	
Consuming energy drinks	959 (21.8)
Yes	
Consuming more during COVID-19 time	337 (35.8)
Yes	
In contact with a confirmed COVID-19 case (past 14 days)	179 (4.1)
Yes	
In contact with a suspected COVID-19 case (past 14 days)	297 (6.8)
Yes	
Work status affected by lockdown	
No	1768 (40.2)
Yes	1450 (33)
Somehow	1179 (26.8)
Family income affected by lockdown	
No	1328 (30.2)
Yes	2191 (49.8)
Somehow	878 (20)
Body weight during lockdown	
Decreased	929 (21.1)
Increased	1380 (31.4)
No change	2088 (47.5)
Consuming fruits and vegetables during lockdown	
Yes	3387 (77)
Drinking 2L of water or more/day during lockdown	
Yes	2417 (55)
Physical activity during lockdown	
None	2012 (45.8)
2 to 3 times/week	1648 (37.5)
More than 3 times/week	737 (16.8)
Working from home	
Easy	438 (13.1)
Acceptable	1222 (36.7)
Hard	664 (19.9)
Prefer regular work	1010 (30.3)
GAD-7 anxiety score	
Minimum	1229 (28)
Mild	1318 (30)
Moderate	1145 (26)
Severe	705 (16)
Insomnia severity index score	
No clinically significant insomnia	1589 (36.1)
Subthreshold insomnia	1867 (42.5)
Clinical insomnia (moderate)	811 (18.4)
Clinical insomnia (severe)	130 (3)
PHQ-9 depression severity score	
Minimal depression	985 (22.4)
Mild depression	1538 (35)
Moderate depression	1181 (26.9)
Moderately severe depression	538 (12.2)
Severe depression	155 (3.5)

COVID-19: Coronavirus disease 2019; GAD-7: 7-item Generalized Anxiety Disorder; PHQ-9: Patient Health Questionnaire 9-item depression module.

transmission (17.2%). More so, most of the respondents (81.6%) utilized social media/internet as major sources of information about COVID-19, and 58.5% were at least satisfied with the amount of available information. Regarding concerns about COVID-19, 43.1% believed the risk of contracting COVID-19 during the

**Table 3**  
COVID-19 related information (n = 4397).

	n (%)
Transmission of COVID-19	
Respiratory droplets	3462 (78.7)
Indirect contact	2058 (46.8)
Airborne transmission	757 (17.2)
Don't know	513 (11.7)
Main source of information about COVID-19	
Family members & friends	1321 (30)
Social media/internet	3590 (81.6)
TV/Radio	2370 (53.9)
Other sources	834 (19)
Satisfaction with amount of information available on COVID-19	
Very satisfied	657 (15.1)
Satisfied	1884 (43.4)
Moderately satisfied	1428 (32.9)
Dissatisfied	271 (6.2)
Very dissatisfied	102 (2.3)
Likelihood to contract COVID-19 during the current outbreak	
Not likely at all	566 (12.9)
Not very likely	1330 (30.2)
Somewhat likely	1091 (24.8)
Very likely	405 (9.2)
Don't know	1005 (22.9)
Likelihood of surviving if infected with COVID-19	
Not likely at all	1176 (26.7)
Not very likely	586 (13.3)
Somewhat likely	1489 (33.9)
Very likely	1138 (25.9)
Don't know	8 (0.2)
Worrying about family members getting COVID-19 infection	
Not worried at all	221 (5)
Not very worried	698 (15.9)
Somewhat worried	1444 (32.8)
Very worried	1906 (43.3)
Don't have family members	128 (2.9)
Average numbers of hours at home due to lockdown	
0 to 9 hours per day	415 (9.6)
10 to 19 hours per day	1255 (28.9)
20 to 24 hours per day	2668 (61.5)

COVID-19: Coronavirus disease 2019; TV: television.

**Table 4**  
Scores of measurements.

Score	GAD-7 anxiety score	ISI insomnia score	PHQ-9 depression score
Mean ± SD	8.52 ± 5.78	9.85 ± 5.86	8.94 ± 5.32
Median IQR	8 (4, 13)	10 (5, 14)	9 (5, 12)
Minimum	0	0	0
Maximum	21	28	24

GAD-7: 7-item Generalized Anxiety Disorder; ISI: Insomnia Severity Index; PHQ-9: Patient Health Questionnaire 9-item depression module; SD: standard deviation; IQR: interquartile range.

current outbreak was not very likely or not likely at all, and 59.8% believed they were very likely or somewhat likely to survive if infected. Nevertheless, the majority (76.1%) were very worried or somewhat worried about family members getting infected. Interestingly, 61.5% reported staying an average of 20–24 hours per day at home during lockdown.

### 3.4. Scores of measurement and association of possible influence factors with gad, insomnia, and depression during COVID-19 pandemic

The median IQR scores on the GAD-7 for anxiety, the ISI for insomnia, and the PHQ-9 for depression, for all respondents were 8 (4–13), 10 (5–14), and 9 (5–12) respectively (Table 4).

In the bivariate analysis, multiple factors were significantly associated with GAD, insomnia, and depression in the Lebanese

**Table 5**  
Bivariate and multivariable associations for GAD-7 anxiety scale.

	Bivariate analysis		Multivariable analysis n = 3709	
	Minimum & mild (n = 2547) n (%)	Moderate & severe (n = 1850) n (%)	aOR (95% CI)	P-value
Gender				
Males	919 (36.1)	554 (29.9)***	Reference	<0.001
Females	1628 (63.9)	1296 (70.1)	1.50 (1.29; 1.75)	
Age				
[18–25[	1957 (76.8)	1482 (80.1)**	Reference	<0.001
[25–35]	590 (23.2)	368 (19.9)	0.72 (0.61; 0.85)	
Nationality				
Lebanese	2338 (91.8)	1637 (88.5)***	Reference	0.006
Non-Lebanese	209 (8.2)	213 (11.5)	1.37 (1.10; 1.70)	
Area of residence				
Beirut	573 (22.5)	453 (24.5)	–	
Akkar	135 (5.3)	86 (4.6)		
Baalback-Hermel	131 (5.1)	77 (4.2)		
Bekaa	296 (11.6)	225 (12.2)		
Mount Lebanon	548 (21.5)	396 (21.4)		
Nabatieh	104 (4.1)	62 (3.4)		
North	383 (15)	304 (16.4)		
South	377 (14.8)	247 (13.4)		
Marital status				
Married	290 (11.4)	189 (10.2)	–	
Single	2239 (87.9)	1647 (89)		
Widow/Divorced	18 (0.7)	14 (0.8)		
Educational level				
Primary or less	106 (4.2)	64 (3.5)	–	
Secondary	337 (13.2)	226 (12.2)		
University	2104 (82.6)	1560 (84.3)		
Occupation				
HCW	227 (9)	133 (7.3)	–	
Non-HCW	293 (11.6)	190 (10.4)		
Student	1771 (70.2)	1324 (72.7)		
Unemployed	233 (9.2)	173 (9.5)		
Alcohol intake				
No	2219 (87.1)	1539 (83.2)***	Reference	0.04
Yes	328 (12.9)	311 (16.8)	1.24 (1.01; 1.51)	
Smoking cigarettes				
No	2219 (87.1)	1552 (83.9)**	Reference	0.03
Yes	328 (12.9)	298 (16.1)	1.26 (1.02; 1.54)	
Smoking hookah (nargileh)				
No	1890 (74.2)	1232 (66.6)***	Reference	0.009
Yes	657 (25.8)	618 (33.4)	1.22 (1.05; 1.42)	
Consuming caffeinated beverage				
No	749 (29.4)	452 (24.4)***	Reference	0.4
Yes	1798 (70.6)	1398 (75.6)	1.07 (0.92; 1.26)	
Consuming energy drinks				
No	2038 (80)	1400 (75.7)**	Reference	0.2
Yes	509 (20)	450 (24.3)	1.11 (0.94; 1.31)	
Being the only person working at home				
No	1829 (87.8)	1387 (85.3)*	Reference	0.2
Yes	254 (12.2)	239 (14.7)	1.15 (0.93; 1.42)	
Family income per month in USD				
< 500	418 (16.4)	341 (18.4)	–	
[500–1500[	1098 (43.1)	761 (41.1)		
[1500–2500[	621 (24.4)	479 (25.9)		
2500 or above	410 (16.1)	269 (14.5)		
Health insurance				
None	904 (35.5)	609 (32.9)	–	
NSSF	652 (25.6)	447 (24.2)		
COOP	151 (5.9)	119 (6.4)		
Private	711 (27.9)	552 (29.8)		
2 insurances or more	129 (5.1)	123 (6.6)		
In contact with a confirmed COVID-19 case <sup>a</sup>				
No	2469 (96.9)	1749 (94.5)***	Reference	0.6
Yes	78 (3.1)	101 (5.5)	1.10 (0.75; 1.62)	
In contact with a suspected COVID-19 case <sup>a</sup>				
No	2423 (95.1)	1677 (90.6)***	Reference	0.002
Yes	124 (4.9)	173 (9.4)	1.62 (1.20; 2.19)	
Body weight status during lockdown				
Decreased	498 (19.6)	431 (23.3)***	Reference	
Increased	692 (27.2)	688 (37.2)	1.18 (0.98; 1.42)	0.09
No change	1357 (53.3)	731 (39.5)	0.71 (0.60; 0.85)	<0.001

Table 5 (Continued)

	Bivariate analysis		Multivariable analysis n = 3709	
	Minimum & mild (n = 2547) n (%)	Moderate & severe (n = 1850) n (%)	aOR (95% CI)	P-value
Consuming fruits and vegetables during lockdown				
No	537 (21.1)	473 (25.6)***	Reference	0.05
Yes	2010 (78.9)	1377 (74.4)	0.85 (0.72; 1.00)	
Drinking 2L of water or more/day during lockdown				
No	1063 (41.7)	917 (49.6)***	Reference	<0.001
Yes	1484 (58.3)	933 (50.4)	0.74 (0.65; 0.86)	
Physical activity during lockdown (per week)				
No	1133 (44.5)	879 (47.5)**	Reference	
2 to 3 times	951 (37.3)	697 (37.7)	1.08 (0.93; 1.25)	0.3
>3 times	463 (18.2)	274 (14.8)	0.88 (0.72; 1.08)	0.2
Working from home				
Easy	271 (14.5)	167 (11.4)	–	
Acceptable	737 (39.3)	485 (33.2)		
Hard	313 (16.7)	351 (24)		
Prefer regular work	553 (29.5)	457 (31.3)		
Likelihood to contract COVID-19				
Not or not very likely	1068 (41.9)	828 (44.8)	–	
Somewhat or very likely	872 (34.2)	624 (33.7)		
Don't know	607 (23.8)	398 (21.5)		
Likelihood of surviving if infected with COVID-19				
Not or not very likely	984 (38.6)	778 (42.1)*	Reference	
Somewhat or very likely	1560 (61.2)	1067 (57.7)	0.80 (0.70; 0.92)	0.002
Don't know	3 (0.1)	5 (0.3)	1.49 (0.32; 6.94)	0.6
Worrying about family members getting COVID-19 infection				
Not or not very worried	560 (22)	359 (19.4)	–	
Somewhat or very worried	1911 (75)	1439 (77.8)		
No family members	76 (3)	52 (2.8)		

GAD-7: 7-item Generalized Anxiety Disorder scale; aOR: Adjusted Odds ratio; CI: Confidence Interval; HCW: Healthcare workers; USD: United States Dollars; NSSF: National Social Security Fund; COOP: Cooperatives; COVID-19: Coronavirus Diseases 2019. For the bivariate analysis: \*Significant at  $P < 0.05$ , \*\*Significant at  $P < 0.01$ , \*\*\*Significant at  $P < 0.001$ .

<sup>a</sup> In the past 14 days.

young adults. In the multivariable logistic regression models, those associations weakened but there were still statistical difference. Tables 5–7 show the association of possible influence factors with GAD, insomnia, and depression during COVID-19 pandemic.

Female gender (aOR = 1.50, 95% CI: 1.29–1.75), as well as, alcohol usage (aOR = 1.24, 95% CI: 1.01; 1.51) were significantly associated with higher GAD scores. Regarding area of residence, Akkar (aOR = 0.35, 95% CI: 0.21; 0.58) and North (aOR = 0.72, 95% CI: 0.56; 0.92) areas were significantly associated with lower insomnia scores, together with, consumption of fruits and vegetables (aOR = 0.80, 95% CI: 0.66; 0.95). Surprisingly, higher perceived likelihood of contracting COVID-19 (aOR = 0.67, 95% CI: 0.56; 0.79) resulted in no clinical or subthreshold insomnia. On the other hand, single marital status (aOR = 1.43, 95% CI: 1.05; 1.93), divorced marital status (aOR = 3.33, 95% CI: 1.50; 7.39), university education (aOR = 2.50, 95% CI: 1.51; 4.16), consumption of caffeinated beverages (aOR = 1.24, 95% CI: 1.03; 1.49) and energy drinks (aOR = 1.22, 95% CI: 1.02; 1.47) were significantly associated with moderate to severe insomnia. Furthermore, status of being the only person working at home (aOR = 1.30, 95% CI: 1.06; 1.60), family income more than 500\$ (aOR = 0.77, 95% CI: 0.64; 0.93), multiple insurance plans (aOR = 1.50, 95% CI: 1.10; 2.04), and contact with a confirmed COVID-19 case (aOR = 1.69, 95% CI: 1.13; 2.52) were significantly associated with higher depression scores. Moreover, age group of 25–35 years was significantly associated with less GAD scores (aOR = 0.72, 95% CI: 0.61–0.85) and insomnia scores (aOR = 0.77, 95% CI: 0.62–0.96) as compared to lower age group of 18–25 years. However, cigarette smoking was significantly associated with higher GAD (aOR = 1.26, 95% CI: 1.02; 1.54) and insomnia (aOR = 1.53, 95% CI: 1.25; 1.88) scores.

Regarding lifestyle modifications associated with the pandemic, hookah (nargileh) smoking was significantly associated with higher GAD (aOR = 1.22, 95% CI: 1.05; 1.42) and depression (aOR = 1.18, 95% CI: 1.02; 1.37) scores. Similarly, contact with suspected COVID-19 case was significantly associated with higher GAD (aOR = 1.62, 95% CI: 1.2; 2.19) and depression (aOR = 1.53, 95% CI: 1.13; 2.08) scores. Higher perceived likelihood of survival if infected with COVID-19 was significantly associated with lower GAD (aOR = 0.80, 95% CI: 0.70; 0.92) and depression (aOR = 0.74, 95% CI: 0.64; 0.85) scores. Besides, physical activity of more than 3 times per week during lockdown were significantly associated with less insomnia (aOR = 0.65, 95% CI: 0.52; 0.83) and depression (aOR = 0.74, 95% CI: 0.60; 0.90) scores.

Being a non-Lebanese was significantly associated with higher GAD (aOR = 1.37, 95% CI: 1.10; 1.70), insomnia (aOR = 1.42, 95% CI: 1.12; 1.81), and depression (aOR = 1.25, 95% CI: 1.00; 1.57) scores. While, drinking 2L of water or more during lockdown was significantly associated with lower GAD (aOR = 0.74, 95% CI: 0.65; 0.86), insomnia (aOR = 0.76, 95% CI: 0.65; 0.88), and depression (aOR = 0.74, 95% CI: 0.64; 0.85) scores. Nevertheless, no change in body weight status during lockdown was significantly associated with lower GAD (aOR = 0.71, 95% CI: 0.60; 0.85), insomnia (aOR = 0.71, 95% CI: 0.58; 0.86), and depression (aOR = 0.65, 95% CI: 0.54; 0.77) scores; yet it is noteworthy that increase in body weight status (aOR = 1.24, 95% CI: 1.03; 1.50) was significantly associated with higher depression scores.

#### 4. Discussion

This study is among the very few ones addressing mental health in Lebanon during COVID-19 pandemic, and is the first to explore

**Table 6**  
Bivariate and multivariable associations for Insomnia severity score.

	Bivariate analysis		Multivariable analysis n = 4397	
	No clinical or subthreshold n = 3456 n (%)	Moderate/severe insomnia n = 941 n (%)	aOR (95% CI)	P-value
Gender				
Males	1178 (34.1)	295 (31.3)	–	
Females	2278 (65.9)	646 (68.7)		
Age				
[18–25]	2661 (77)	778 (82.7)**	Reference	0.02
[25–34]	795 (23)	163 (17.3)	0.77 (0.62; 0.96)	
Nationality				
Lebanese	3144 (91)	831 (88.3)*	Reference	0.004
Non-Lebanese	312 (9)	110 (11.7)	1.42 (1.12; 1.81)	
Area of residence				
Beirut	780 (22.6)	246 (26.1)***	Reference	
Akkar	202 (5.8)	19 (2)	0.35 (0.21; 0.58)	<0.001
Baalback-Hermel	167 (4.8)	41 (4.4)	0.85 (0.58; 1.25)	0.4
Bekaa	410 (11.9)	111 (11.8)	0.94 (0.72; 1.22)	0.6
Mount Lebanon	720 (20.8)	224 (23.8)	1.05 (0.84; 1.29)	0.7
Nabatieh	133 (3.8)	33 (3.5)	0.90 (0.59; 1.37)	0.6
North	571 (16.5)	116 (12.3)	0.72 (0.56; 0.92)	0.01
South	473 (13.7)	151 (16)	1.03 (0.81; 1.32)	0.8
Marital status				
Married	412 (11.9)	67 (7.1)***	Reference	
Single	3024 (87.5)	862 (91.6)	1.43 (1.05; 1.93)	0.02
Widow/divorced	20 (0.6)	12 (1.3)	3.33 (1.50; 7.39)	0.003
Educational level				
Primary or less	151 (4.4)	19 (2)***	Reference	
Secondary	471 (13.6)	92 (9.8)	1.58 (0.91; 2.73)	0.1
University	2834 (82)	830 (88.2)	2.50 (1.51; 4.16)	<0.001
Occupation				
HCW	295 (8.6)	65 (7)	–	
Non-HCW	386 (11.3)	97 (10.5)		
Student	2413 (70.6)	682 (73.5)		
Unemployed	322 (9.4)	84 (9.1)		
Alcohol intake				
No	2969 (85.9)	789 (83.8)	–	
Yes	487 (14.1)	152 (16.2)		
Smoking cigarettes				
No	3009 (87.1)	762 (81)***	Reference	<0.001
Yes	447 (12.9)	179 (19)	1.53 (1.25; 1.88)	
Smoking hookah (nargileh)				
No	2490 (72)	632 (67.2)**	Reference	0.4
Yes	966 (28)	309 (32.8)	1.07 (0.90; 1.27)	
Consuming caffeinated beverage				
No	997 (28.8)	204 (21.7)***	Reference	0.02
Yes	2459 (71.2)	737 (78.3)	1.24 (1.03; 1.49)	
Consuming energy drinks				
No	2752 (79.6)	686 (72.9)***	Reference	0.03
Yes	704 (20.4)	255 (27.1)	1.22 (1.02; 1.47)	
Being the only person working at home				
No	2502 (86.9)	714 (86.1)	–	
Yes	378 (13.1)	115 (13.9)		
Family income per month in USD				
< 500	603 (17.4)	156 (16.6)	–	
[500–1500]	1474 (42.7)	385 (40.9)		
[1500–2500]	865 (25)	235 (25)		
2500 or above	514 (14.9)	165 (17.5)		
Health insurance				
None	1192 (34.5)	321 (34.1)	–	
NSSF	863 (25)	236 (25.1)		
COOP	208 (6)	62 (6.6)		
Private	1008 (29.2)	255 (27.1)		
2 insurances or more	185 (5.4)	67 (7.1)		
In contact with a confirmed COVID-19 case <sup>a</sup>				
No	3312 (95.8)	906 (96.3)	–	
Yes	144 (4.2)	35 (3.7)		
In contact with a suspected COVID-19 case <sup>a</sup>				
No	3232 (93.5)	868 (92.2)	–	
Yes	224 (6.5)	73 (7.8)		
Body weight status during lockdown				
Decreased	712 (206)	217 (23.1)***	Reference	
Increased	1026 (29.7)	354 (37.6)	1.00 (0.81; 1.23)	0.9
No change	1718 (49.7)	370 (39.3)	0.71 (0.58; 0.86)	0.001



Table 6 (Continued)

	Bivariate analysis		Multivariable analysis n = 4397	
	No clinical or subthreshold n = 3456 n (%)	Moderate/severe insomnia n = 941 n (%)	aOR (95% CI)	P-value
Consuming fruits and vegetables during lockdown				
No	753 (21.8)	257 (27.3)***	Reference	0.01
Yes	2703 (78.2)	684 (72.7)	0.80 (0.66; 0.95)	
Drinking 2L of water or more/day during lockdown				
No	1488 (43.1)	492 (52.3)***	Reference	<0.001
Yes	1968 (56.9)	449 (47.7)	0.76 (0.65; 0.88)	
Physical activity during lockdown (per week)				
No	1532 (44.3)	480 (51)***	Reference	
2 to 3 times	1301 (37.6)	347 (36.9)	0.95 (0.81; 1.12)	0.6
More than 3 times	623 (18)	114 (12.1)	0.65 (0.52; 0.83)	<0.001
Likelihood to contract COVID-19				
Not likely or not very likely	1437 (41.6)	459 (48.8)***	Reference	
Somewhat or very likely	1231 (35.6)	265 (28.2)	0.67 (0.56; 0.79)	<0.001
Don't know	788 (22.8)	217 (23.1)	0.86 (0.71; 1.04)	0.1
Likelihood of surviving if infected with COVID-19				
Not likely or not very likely	1356 (39.2)	406 (43.1)	–	
Somewhat or very likely	2094 (60.6)	533 (56.6)		
Don't know	6 (0.2)	2 (0.2)		
Worrying about family members getting COVID-19 infection				
Not worried or not very worried	736 (21.3)	183 (19.4)	–	
Somewhat or very worried	2623 (75.9)	727 (77.3)		
No family members	97 (2.8)	31 (3.3)		

aOR: adjusted odds ratio; CI: confidence interval; HCW: healthcare workers; USD: United States Dollars; NSSF: National Social Security Fund; COOP: Cooperatives; COVID-19: Coronavirus Diseases 2019. For the bivariate analysis: \*Significant at  $P < 0.05$ , \*\*Significant at  $P < 0.01$ , \*\*\*Significant at  $P < 0.001$ .

<sup>a</sup> In the past 14 days.

the effect of the pandemic on mental health of the Lebanese young population.

#### 4.1. Limitations

Our study has some limitations. First, the snowball sampling strategy was adopted without being based on random selection; hence, the study population was not reflective of the whole young adults. Second, the method of data collection was based on sending the study questionnaire via smartphones. This may have limited the questionnaire from reaching the less educated, the lower-socioeconomic groups, or those who do not regularly use a smartphone. These might represent a population which is highly vulnerable to mental changes, and who were not accessible to our study. Hence, our results may not be generalizable to the whole population of Lebanese young adults. Third, the response rate could not be assessed because the exact number of those who received the survey link was not known. Fourth, respondents' personal information and contact details were not collected; therefore, it would not be possible to follow up participants who showed anxiety, insomnia, and depressive symptoms. For those, a more focused approach, perhaps with specialized intervention, would have been more effective. Fifth, the use of an online questionnaire for assessing the psychological impact of COVID-19 on young adults' mental health could instill a reporting bias; therefore, the participants' self-reported levels of anxiety, insomnia, and depression may not be aligned with the assessment performed by mental health professionals raising the need for clinical interviews in future studies.

#### 4.2. COVID-19 and mental health

As the COVID-19 pandemic has been sweeping rapidly across the globe, it is leading to an increase in mental health issues among the general population [19]. Feelings of concern, stress, fear, and uncertainty dominate, not only from contracting the virus, but also from the considerable changes brought by COVID-19 to their daily

routines because of quarantine, temporary unemployment, school closures, financial losses, travel restrictions, and many other stressors [20]. This, in turn, leads to higher levels of depression, anxiety, loneliness, and harmful intake of alcohol and drugs, which can possibly have more detrimental effects on the long run compared to the virus itself [21].

In our study, the respondents' lifestyle changes that occurred during COVID-19 time were assessed. Results showed that more than half of the respondents reported increased smoking, and almost one-quarter reported an increase in alcohol intake (22.5%). Concerning smoking, stress was important risk factor for cigarette smoking and many previously conducted studies had stated that smokers usually use cigarettes to relieve stress [22–24]. This may explain the higher rates of smoking among our respondents. On the contrary, a study conducted in Italy [25] reported that smoking habits were reduced during the COVID-19 lockdown as compared to pre-COVID time where the number of those who smoked more than 10 cigarettes per day had decreased by 0.5%. This may be due to the fear of higher mortality rates in smokers because of respiratory distress induced by COVID-19 [26]. Regarding the increase in alcohol consumption, this can be attributed to the psychological distress caused by the interaction of social isolation, financial pressures, altered daily routine, and uncertainty about the future, although a decrease in its consumption was predictable because of decreased physical and financial availability of alcohol [11]. This was triggered by both the pandemic itself and the deteriorating monetary and social status in the country.

The results had also revealed that more than half of the participants consumed fruits and vegetables and were engaged in physical activity during the COVID-19 pandemic. This importantly reflects on the population's ability to build and maintain good health and immunity during the current times to render them less susceptible to viral infections [27].

Moreover, insufficient knowledge about the virus incubation period, its route of transmission, prevention and treatment may lead to fear and anxiety. With about half of our population were

**Table 7**  
Bivariate and multivariable associations for PHQ-9 depression severity score.

	Bivariate analysis		Multivariable analysis n = 3709	
	Minimum & mild n = 2523 n (%)	Moderate/moderately severe & severe n = 1874 n (%)	aOR (95% CI)	P-value
Gender			–	
Males	873 (34.6)	600 (32)		
Females	1650 (65.4)	1274 (68)		
Age			–	
[18–25]	1954 (77.4)	1485 (79.2)		
[25–34]	569 (22.6)	389 (20.8)		
Nationality			Reference	0.05
Lebanese	2319 (91.9)	1656 (88.4)***		
Non-Lebanese	204 (8.1)	218 (11.6)	1.25 (1.00; 1.57)	
Area of residence			–	
Beirut	582 (23.1)	444 (23.7)		
Akkar	123 (4.9)	98 (5.2)		
Baalbak-Hermel	126 (5)	82 (4.4)		
Bekaa	292 (11.6)	229 (12.2)		
Mount Lebanon	546 (21.6)	398 (21.2)		
Nabatieh	98 (3.9)	68 (3.6)		
North	391 (15.5)	296 (15.8)		
South	365 (14.5)	259 (13.8)		
Marital status			–	
Married	289 (11.5)	190 (10.1)		
Single	2221 (88)	1665 (88.8)		
Widow/divorced	13 (0.5)	19 (1)		
Educational level			–	
Primary or less	91 (3.6)	79 (4.2)		
Secondary	314 (12.4)	249 (13.3)		
University	2118 (83.9)	1546 (82.5)		
Occupation			–	
HCW	228 (9.1)	132 (7.2)		
Non-HCW	283 (11.3)	200 (10.9)		
Student	1772 (70.8)	1323 (71.9)		
Unemployed	221 (8.8)	185 (10.1)		
Alcohol intake			Reference	0.7
No	2193 (86.9)	1565 (83.5)**		
Yes	330 (13.1)	309 (16.5)	1.04 (0.85; 1.27)	
Smoking cigarettes			Reference	0.2
No	2213 (87.7)	1558 (83.1)***		
Yes	310 (12.3)	316 (16.9)	1.15 (0.94; 1.40)	
Smoking hookah (nargileh)			Reference	0.03
No	1876 (74.4)	1246 (66.5)***		
Yes	647 (25.6)	628 (33.5)	1.18 (1.02; 1.37)	
Consuming caffeinated beverage			Reference	0.3
No	730 (28.9)	471 (25.1)**		
Yes	1793 (71.1)	1403 (74.9)	1.09 (0.93; 1.28)	
Consuming energy drinks			Reference	0.2
No	2031 (80.5)	1407 (75.1)***		
Yes	492 (19.5)	467 (24.9)	1.13 (0.96; 1.34)	
Being the only person working at home			Reference	0.01
No	1830 (89.4)	1386 (83.4)***		
Yes	218 (10.6)	275 (16.6)	1.30 (1.06; 1.60)	
Family income per month in USD			Reference	
< 500	383 (15.2)	376 (20.1)***		
[500–1500[	1088 (43.1)	771 (41.1)	0.77 (0.64; 0.93)	0.008
[1500–2500[	646 (25.6)	454 (24.2)	0.78 (0.63; 0.97)	0.03
2500 or above	406 (16.1)	273 (14.6)	0.68 (0.53; 0.87)	0.002
Health insurance			Reference	
None	877 (34.8)	636 (33.9)**		
NSSF	666 (26.4)	433 (23.1)	0.91 (0.76; 1.10)	0.3
COOP	156 (6.2)	114 (6.1)	0.80 (0.60; 1.08)	0.1
Private	702 (27.8)	561 (29.9)	1.17 (0.98; 1.39)	0.08
2 plans or more	122 (4.8)	130 (6.9)	1.50 (1.10; 2.04)	0.01
In contact with a confirmed COVID case <sup>a</sup>			Reference	0.01
No	2465 (97.7)	1753 (93.5)***		
Yes	58 (2.3)	121 (6.5)	1.69 (1.13; 2.52)	
In contact with a suspected COVID case <sup>a</sup>			Reference	0.006
No	2412 (95.6)	1688 (90.1)***		
Yes	111 (4.4)	186 (9.9)	1.53 (1.13; 2.08)	
Body weight status during lockdown			Reference	
Decreased	495 (19.6)	434 (23.2)***		
Increased	653 (25.9)	727 (38.8)	1.24 (1.03; 1.50)	0.03
No change	1375 (54.5)	713 (38)	0.65 (0.54; 0.77)	<0.001

Table 7 (Continued)

	Bivariate analysis		Multivariable analysis n = 3709	
	Minimum & mild n = 2523 n (%)	Moderate/moderately severe & severe n = 1874 n (%)	aOR (95% CI)	P-value
Consuming fruits and vegetables during lockdown				
No	523 (20.7)	487 (26)***	Reference	0.3
Yes	2000 (79.3)	1387 (74)	0.92 (0.78; 1.08)	
Drinking 2L of water or more/day during lockdown				
No	1056 (41.9)	924 (49.3)***	Reference	<0.001
Yes	1467 (58.1)	950 (50.7)	0.74 (0.64; 0.85)	
Physical activity during lockdown (per week)				
No	1099 (43.6)	913 (48.7)***	Reference	
2 to 3 times	941 (37.3)	707 (37.7)	1.04 (0.89; 1.21)	0.6
More than 3 times	483 (19.1)	254 (13.6)	0.74 (0.60; 0.90)	0.003
Likelihood to contract COVID-19				
Not likely or not very likely	1097 (43.5)	799 (42.6)	–	
Somewhat or very likely	836 (33.1)	660 (35.2)		
Don't know	590 (23.4)	415 (22.1)		
Likelihood of surviving if infected with COVID-19				
Not likely or not very likely	944 (37.4)	818 (43.6)***	Reference	
Somewhat or very likely	1576 (62.5)	1051 (56.1)	0.74 (0.64; 0.85)	<0.001
Don't know	3 (0.1)	5 (0.3)	3.06 (0.57; 16.3)	0.2
Worrying about family members getting COVID-19 infection				
Not worried or not very worried	518 (20.5)	401 (21.4)	–	
Somewhat or very worried	1943 (77)	1407 (75.1)		
No family members	62 (2.5)	66 (3.5)		

aOR: adjusted odds ratio; CI: confidence interval; HCW: healthcare workers; USD: United States Dollars; NSSF: National Social Security Fund; COOP: Cooperatives; COVID-19: Coronavirus Diseases 2019. For the bivariate analysis: \*Significant at  $P < 0.05$ , \*\*Significant at  $P < 0.01$ , \*\*\*Significant at  $P < 0.001$ .

<sup>a</sup> In the past 14 days.

not fully aware of the transmission of the virus, and almost 12% were not familiar with transmission routes. This may perhaps partially explain why over three quarters were worried about their family members getting the infection. Thus, raising knowledge and awareness may contribute to reduce the worry [28–30]. Over 80% of the participants reported the use of social media and internet resources to get information about the pandemic. The reliability of data remains a major concern during the worldwide spread of the disease [31], where an avalanche of information, both precise and imprecise, is circulating, creating an overwhelming infodemic [32]. To cope effectively with such challenges, the governmental health sectors are required to provide general advice to the public about the pandemic using authentic resources. Additionally, focus should be made on the population of young adults to raise their awareness regarding rumors and misleading information commonly conveyed by social media.

Furthermore, the GAD-7 scale, ISI, and PHQ-9 were used to measure the participants' anxiety, insomnia, and depressive symptoms, respectively. Our findings revealed that a significant number of respondents showed symptoms of anxiety (42%), insomnia (21.4%), and depression (42.6%). These results were higher than the findings conveyed by Wang et al. where 28.8% of the participants reported moderate-to-severe anxiety symptoms and 16.5% reported moderate-to-severe depressive symptoms [33]. A similar study conducted in India by Roy et al. found high levels of anxiety where more than 80% of the people were preoccupied with the thoughts of COVID-19. Additionally, sleep difficulties, and paranoia about acquiring COVID-19 infection were reported by 12.5% and 37.8% of the participants, respectively [8]. It is understandable and normal to experience anxiety, fear, depressive symptoms and sleeping disturbances as a mechanism of self-defense when people face emerging and disruptive situations such as the COVID-19 pandemic. However, if the response was inappropriate or extreme, it can impair physical and mental health and even lead to serious physical and mental illness [34,35].

In our study, logistic regression models were used to assess the factors associated with anxiety, insomnia, and depression among the studied adult population. Results found that adults 18–25 years and female gender were associated with higher rates of anxiety than those aged 25–35 years and male gender, respectively. This may indicate that being older and having more experience can pose a greater impact on the young adults' psychological self-regulation ability. Also, females are expected to experience more anxiety than males as they are more sensitive and delicate, as well as, they are playing a vital role in being the lead caregiver in the family. These results are consistent with the findings of a study performed by Wang et al. in some regions of China [7].

Higher GAD scores were also associated with alcohol intake. It is well known that some people usually resort to the consumption of alcohol as a strategy for dealing with anxiety issues and stressful situations. However, this approach has backfires since alcohol reduces anxiety only temporarily and is expected to increase it within just a few hours of consumption [11].

Additionally, our investigation results showed that marital status and education level affected the respondents' sleeping pattern. Being single or divorced was associated with higher insomnia scores, which was expected because usually family members are more likely to spend time together and care for each other in an attempt to cope better with such challenging situations. Moreover, higher rates of insomnia were observed in participants with university education level. This is because highly educated people are used to have busy working schedules and frequent travel which were restricted or interrupted during the current pandemic. This may have led to excessive worrying and more sleeping disturbances than the less educated group. On the contrary, higher rates of insomnia were associated with low education level in an insomnia survey of the general public in China [36]. Another study conducted during the SARS epidemic in China revealed that low education level was associated with fear from SARS and affected their quality of sleep [37]. This can be explained by their less ability

of understanding the outbreak as compared with the more educated population.

As for depressive symptoms, higher scores were observed in those who were the only ones working at home. Lebanon is currently facing its worst economic crisis in decades which has been exacerbated by the lockdown imposed by the Lebanese government in order to contain the virus and stop its spreading. Besides, the Lebanese pound has lost much of its value, further burdening the lives of the Lebanese people. Therefore, being the only person working at home can impose greater financial stress leading to extensive worry and depression. Furthermore, participants who had contact with confirmed or suspected cases of COVID-19 showed higher depressive symptoms. Fear from getting infected was one of the factors associated with marked anxiety and depressive symptoms [10], thus, it is reasonable to experience more depressive symptoms upon contacting an individual with suspected or confirmed case of COVID-19.

It is noteworthy that non-Lebanese participants, who constitute about 10% of the studied population, showed significantly higher rates of the three investigated mental disorders. As of 2020, the Lebanese government estimated the country to host around 1.5 million Syrian refugees. Close to 300,000 Palestinian refugees also live in Lebanon. Existing evidence suggests that mental disorders in long-settled war refugees tend to be highly prevalent, and persists for many years after resettlement. This increased risk originates from exposure to war trauma and can be influenced by post-migration socio-economic factors [38], of which Lebanon currently represents an example. On top of these factors, COVID-19 pandemic has perhaps added to the mental issues of refugee populations in Lebanon. The effect of the pandemic on mental health of displaced populations is evident in our results, and entails further investigation.

## 5. Conclusion

The findings reported in this study reflect a considerable impact of COVID-19 pandemic and the associated lockdown on the Lebanese young population's mental status. As the immediate psychological effects of COVID-19 on anxiety, depression and insomnia were assessed in this study, further follow-up studies are warranted to evaluate the long-term mental effects the pandemic may impose. With the pandemic ongoing, additional analysis of various populations may be needed for better understanding of mental health changes. Additionally, interventional approaches to reduce the burden of the pandemic on mental health may contribute to the improvement of resilience and mental well-being of young adults in our country.

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## Disclosure of interest

The authors declare that they have no competing interest.

## Authors' contributions

The authors confirm contribution to the paper as follows: study conception and design: D.H. and M.A.; acquisition of data: S.Y. and J.S.; analysis and interpretation of results: Z.A., J.S., M.A., and S.Y.; investigation: J.S., S.Y., D.H., and M.A.; methodology: M.A., D.H., and Z.A.; project administration: J.S., S.Y., and D.H.; resources: S.Y. and J.S.; software: Z.A.; visualization: D.H. and M.A.; writing original manuscript draft: D.H., J.S., and S.Y.; revision and editing it critically

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