



Research Paper

Smoking, health risks, coping mechanisms and depression in the age of COVID-19: A cross-sectional study of the Lebanese population

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ABSTRACT

Introduction: We compared depression of people who smoke and those who do not, depending on whether they have an underlying disease making them at risk for COVID-19. Moreover, we analyzed the factors associated with their depression.

Methods: We recruited 948 Lebanese residents, ages 18 and above. Our survey included the Patient Health Questionnaire-9 (PHQ-9) to assess depression. We divided participants, based on smoking and having a disease making one at risk for a COVID19 infection into four groups: non-smokers not at risk (NSNR), non-smokers at risk (NSR), smokers not at risk (SNR), and smokers at risk (SR).

Results: SR had PHQ-9 scores higher than other groups. The diet was not changed during the pandemic, whereas weight increased in all groups but SR. Those not at risk slept longer, while sports were decreased in NSR and SNR. Hobbies were decreased in all groups except SNR. Depending on the group, factors such as age, sex, residency, diet, exercise, sleep duration, and hobbies were associated with PHQ-9 scores.

Limitations: we cannot draw causal relationships. Participation required internet access, and participants might not represent the actual population due to the snowball effect. Also, recall bias might skew results. We did not inquire about sexual activity, which could be an essential coping mechanism.

Conclusion: Factors associated with depression for one group did not necessarily do so for another. Controlling the underlying risk or smoking cessation could move a patient to a group with more options associated with depression, thereby additional methods to decrease depression.

1. Introduction

The SARS-CoV-2 virus is an ongoing pandemic that began in December 2019, in Wuhan China, and has since taken over virtually every country, leaving sick individuals and death. With over 275 million confirmed cases and more than 5.3 million deaths, governments worldwide have not left a stone unturned in their efforts to combat the virus's spread. Mandatory lockdowns and other precautionary measures have taken a massive toll on the countries' economies that implemented them, albeit for humanitarian reasons. In 2020, the global economy was set to lose 2.7 trillion dollars (Kickbusch et al., 2020). Therefore,

governments are juggling the responsibility of saving as many lives as possible and salvaging their economy from the impending crash they will face.

On top of the health crisis that the pandemic has imposed on the country, with 711 thousand confirmed cases and 9 thousand deaths recorded to date, Lebanon has been facing an economic collapse. Since October 2019, the local currency lost over 94% of its value amidst protests and riots against a corrupt government. The mixture of the already crashing economy and deaths caused by the new virus trickles down to the average citizen, leaving their mental health in shambles. Studies have found high levels of depression (Özdin and Bayrak Özdin,

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2020) and psychological distress (Qiu et al., 2020) in other countries.

Not only are Lebanese individuals subjected to the different, never tried before, precautionary measures, but also an already crashing economy, the fear of contracting the virus, potential complications due to risk factors, and unhealthy coping mechanisms. In fact, 52.77% of the Lebanese population are either overweight or obese (Mallat et al., 2016). Despite it being less than some other Western countries, its associated BMI is still related to higher hospitalization rates, mechanical ventilation, and mortality (Dafallah Albashir, 2020). Another risk factor is smoking, which is significantly related to the progression of a COVID-19 infection (Patanavanich and Glantz, 2020). This association is theorized to be caused by the up-regulation of the Angiotensin-Converting Enzyme-2 receptor – the same receptor used by the SARS-CoV-2 virus to enter the host's cells and cause the symptoms caused by the pathogen (Kashyap et al., 2020). These symptoms include, among others, fever, chills, cough, dyspnea, anosmia, sore throat, and a runny nose. According to the World Health Organization, in 2015, Lebanon ranked third globally for the highest number of smokers per capita, with 8-9 cigarettes consumed per capita daily on average. Smoking is associated with depression and a lower quality of life (Goldenberg et al., 2014). Also, individuals use smoking to improve their depressive symptoms (Rubin et al., 2020). With the depression associated with the pandemic and smoking and underlying diseases, we decided to assess the depression of smokers and non-smokers with and without an underlying disease that could worsen the prognosis of potential COVID-19 infection and discover the factors associated with their depression.

2. Materials and methods

2.1. Survey development and measures

Our study was produced in both English and Arabic on Google Forms. It included a consent form detailing the anonymity of the responses, which would only be handled by the research team, and assuring the participants that they were free to quit at any time for any or no reason. We included a questionnaire about sociodemographic status (sex, age, area of residency), lifestyle behavior before and after the start of the pandemic – smoking (did/do you smoke before/after the pandemic started? Yes/No), diet ("did/do you try to eat healthily?"), sleep duration ("How long do you sleep per night in minutes?"), physical activity duration ("How long do you exercise each week in minutes?"), engagement in hobbies, precautionary measures taken against COVID-19 (e.g., wearing masks), and their satisfaction with the support system (from not satisfied at all to very satisfied).

We also included the Patient Health Questionnaire-9 (PHQ-9), which we used to score each participant's depression levels. The official Arabic translation of the PHQ-9 was used. The items included in the PHQ-9 were scored from 0-3 with response options of "not at all" to "nearly every day". We used 5, 10, 15, and 20 as cut-off scores for mild, moderate, moderately severe, and severe depression, respectively.

2.2. Data collection

We sent our study to potential participants on the messaging application WhatsApp. The Lebanese national suicide prevention hotline also helped us reach a larger crowd by posting the survey on their Instagram account. We started receiving answers on March 30, 2020, until April 7, 2020 – when we decided we had enough responses. The data collection period shortly followed after the government had issued the medical emergency and the issuance of a lockdown order.

We had included that the participant must be a Lebanese resident in the consent form. Further inclusion criteria included being at least 18 years of age. We also excluded participants who did not give their consent. Hence, we cut down our initial 1,117 responses to 948.

2.3. Data analysis

We used SPSS 26 for the analysis of the data we had compiled. We divided our study into four groups: non-smokers not at risk (NSNR), non-smokers at risk (NSR), smokers not at risk (SNR), and smokers at risk (SR). A person at risk is an individual with a disease that could worsen the prognosis of a potential COVID-19 infection (e.g., cardiovascular disease, diabetes, hypertension...). Smokers were deemed individuals who smoked before the pandemic or started smoking after the pandemic. We conducted a One Way ANOVA to analyze the PHQ-9 scores of all four groups. Then, we used a Paired Sample Test to study changes in factors before and during the pandemic. Following that, we used a Chi-Square and a One Way ANOVA to analyze which factors were associated with each group. Finally, a Multivariate Test assessed how those factors were related to PHQ-9 scores and depression severity. Any p -value less than .05 was noted as being statistically significant.

3. Results

3.1. Population analysis

The 948 participants have different ages mean: NSNR (26.52 years, standard deviation = 10.051), NSR (33.26 years, standard deviation = 15.672), SNR (29.55 years, standard deviation = 11.314), and SR (34.39 years, standard deviation = 12.193). In addition to the variables we have included in our study, we inquired about, but not limited to, the marital status and the highest level of education the participant has received (Table 1).

3.2. PHQ-9

A One-Way ANOVA Test (Table 2) allowed us to analyze the difference in PHQ-9 scores between all four groups. The PHQ-9 means for each group were: NSNR (8.06, SE = 6.549), NSR (7.67, SE = 6.56), SNR (8.35, SE = 6.32), SR (11.9, SE = 7.226). SR had significantly higher PHQ-9 scores than NSNR ($p < .001$), NSR ($p = .003$) and SNR ($p = .003$). NSNR, NSR, and SNR did not have significantly different PHQ-9 scores.

3.3. Changes compared to before the pandemic

Using a Paired Sample Test (Table 3), we found that NSNR significantly increased their weight by .494 kg ($p < .001$) and sleep duration by 64.284 min per night ($p < .001$) and engaged in fewer hobbies ($p = .039$), NSR had significantly increased their weight by .836 kg ($p = .014$), decreased their sports duration by 46.192 min s per week ($p = .020$) and engaged in fewer hobbies ($p = .005$), SNR increased their weight by 1.035 kg ($p = .001$), sleep duration by 54.732 min per night ($p < .001$), and decreased their sports duration by 24.589 min a week ($p = .041$), and SR only decreased their hobbies ($p = .027$). Diet was not changed in all four groups.

3.4. Factors associated with smoking and with each group

In the Chi-Square test analysis (Table 4), NSNR were more likely to be female than SNR, live in rural areas, and have a healthier diet before the pandemic than smokers (SNR, SR), have a healthier diet after the pandemic than SNR. After the pandemic, SR had a diet comparable to all other groups. There were no significant differences in sex, residency, and diet of NSR compared with the other groups. We did not find significant differences among the four in mask-wearing or hobbies.

Using a One-Way ANOVA Test (Table 5), we found that NSNR were significantly younger and weighed less than the other groups and that SNR were significantly younger than SR. Additionally, NSNR had significantly fewer children than individuals at risk (NSR and SR). Finally, people not at risk (NSNR, SNR) sleep significantly longer than SR. We found no differences in the number of roommates or sports

Table 1

Population analysis

NSNR: non-smokers not at risk; NSR: non-smokers at risk; SNR: smokers not at risk; SR: smokers at risk; N: number; %: percentage; before: before the pandemic; after: after the pandemic.

| Factors | | NSNR | | NSR | | SNR | | SR | |
|----------------------------|---------------|------|------|-----|------|-----|------|-----|------|
| | | N | % | N | % | N | % | N | % |
| Sex | Male | 106 | 29.3 | 88 | 28.8 | 54 | 38 | 56 | 40.6 |
| | Female | 256 | 70.7 | 218 | 71.2 | 88 | 62 | 82 | 59.4 |
| Residency | Urban | 176 | 48.6 | 154 | 50.3 | 83 | 58.5 | 93 | 67.4 |
| | Rural | 186 | 51.4 | 152 | 49.7 | 59 | 41.5 | 45 | 32.6 |
| Marital status | Single | 280 | 77.3 | 225 | 73.5 | 91 | 64.1 | 92 | 66.7 |
| | Married | 79 | 21.8 | 78 | 25.5 | 46 | 32.4 | 43 | 31.2 |
| | Divorced | 2 | .6 | 1 | .3 | 5 | 3.5 | 2 | 1.4 |
| | Widow/er | 1 | .3 | 3 | .7 | 0 | 0 | 1 | .7 |
| Highest level of education | Middle school | 3 | .8 | 2 | .7 | 6 | 4.2 | 6 | 4.3 |
| | High school | 18 | 5 | 15 | 4.9 | 13 | 9.2 | 15 | 10.9 |
| | University | 341 | 94.2 | 289 | 94.4 | 123 | 86.6 | 117 | 84.8 |
| Diet before | Unhealthy | 82 | 22.7 | 74 | 24.2 | 43 | 30.3 | 50 | 36.2 |
| | Healthy | 280 | 77.3 | 232 | 75.8 | 99 | 69.7 | 88 | 63.8 |
| Diet after | Unhealthy | 82 | 22.7 | 67 | 21.9 | 41 | 28.9 | 47 | 34.1 |
| | Healthy | 280 | 77.3 | 239 | 78.1 | 101 | 71.1 | 91 | 65.9 |
| Hobbies before | No | 154 | 42.5 | 124 | 40.5 | 61 | 43 | 51 | 37 |
| | Yes | 208 | 57.5 | 182 | 59.5 | 81 | 57 | 87 | 63 |
| Hobbies after | No | 173 | 47.8 | 147 | 48 | 72 | 50.7 | 65 | 47.1 |
| | Yes | 189 | 52.2 | 159 | 52 | 70 | 49.3 | 73 | 52.9 |

Table 2

One-Way ANOVA Test between four groups in terms of PHQ-9 scores.

NSNR: non-smokers not at risk; NSR: non-smokers at risk; SNR: smokers not at risk; SR: smokers at risk; SE: standard error; *p*: *p*-value.

| Group | Other groups | Mean Difference | SE | <i>p</i> |
|-------|--------------|-----------------|-------|-----------|
| NSNR | NSR | .384 | .810 | 1 |
| | SNR | -.295 | .506 | 1 |
| | SR | -3.842 | .971 | < .001*** |
| NSR | NSNR | -.384 | .810 | 1 |
| | SNR | -.679 | .877 | 1 |
| | SR | -4.227 | 1.206 | .003** |
| SNR | NSNR | .295 | .506 | 1 |
| | NSR | -.679 | .877 | 1 |
| | SR | -4.227 | 1.027 | .003** |
| SR | NSNR | 3.842 | .971 | < .001*** |
| | NSR | 4.227 | 1.206 | .003** |
| | SNR | 3.547 | 1.027 | .003** |

Table 3

Paired Sample Test for different factors.

NSNR: non-smokers not at risk; NSR: non-smokers at risk; SNR: smokers not at risk; SR: smokers at risk; kg: kilograms; mins: minutes; SD: standard deviation; *t*: the size of the difference relative to the variation in the data; *df*: degrees of freedom associated with the sources of variance; *p*: *p*-value (2-tailed).

| Factor | Group | Mean before | Mean after | Mean difference | SD | <i>t</i> | <i>df</i> | <i>p</i> |
|-----------------------------|-------|-------------|------------|-----------------|---------|----------|-----------|-----------|
| Diet | NSNR | .78 | .78 | -.008 | .44 | -.466 | 594 | .641 |
| | NSR | .68 | .71 | -.027 | .44 | -.532 | 72 | .596 |
| | SNR | .68 | .69 | -.009 | .511 | -.258 | 230 | .797 |
| | SR | .59 | .65 | -.061 | .626 | -.685 | 48 | .497 |
| Weight (kg) | NSNR | 65.94 | 66.43 | -.494 | 2.021 | -5.963 | 594 | < .001*** |
| | NSR | 73.22 | 74.05 | -.836 | 2.843 | -2.511 | 72 | .014* |
| | SNR | 71.06 | 72.09 | -1.035 | 4.641 | -3.388 | 230 | .001** |
| | SR | 75.94 | 76.09 | -.153 | 2.598 | -.412 | 48 | .682 |
| Sleep duration (mins/night) | NSNR | 431.34 | 495.63 | -64.284 | 121.288 | -12.928 | 594 | < .001*** |
| | NSR | 441.78 | 470.55 | -28.767 | 145.897 | -1.685 | 72 | .096 |
| | SNR | 438.20 | 492.94 | -54.732 | 147.885 | -5.625 | 230 | < .001*** |
| | SR | 433.55 | 434.80 | -1.245 | 174.491 | -.050 | 48 | .96 |
| Sports duration (mins/week) | NSNR | 127.48 | 223.50 | 3.980 | 203.914 | .476 | 594 | .634 |
| | NSR | 123.15 | 76.96 | 46.192 | 165.585 | 2.383 | 72 | .020* |
| | SNR | 121.52 | 96.93 | 24.589 | 182.253 | 2.051 | 230 | .041* |
| | SR | 98.33 | 67.57 | 30.755 | 147.423 | 1.46 | 48 | .151 |
| Hobbies | NSNR | .58 | .53 | .047 | .555 | 2.070 | 594 | .039* |
| | NSR | .60 | .41 | .192 | .569 | 2.879 | 72 | .005** |
| | SNR | .60 | .53 | .069 | .547 | 1.924 | 230 | .056 |
| | SR | .59 | .41 | .184 | .565 | 2.274 | 48 | .027* |

duration before or after the pandemic.

3.5. Smoking associated with depression

Using a Multivariate Regression Test (Table 6), we noted different results in each group.

For NSNR, PHQ-9 scores and depression severity were negatively linked to being male, age, rural areas, a healthy diet, and exercise after the pandemic, and were positively linked to searching for COVID-19 related information. Weight before the pandemic was negatively linked to PHQ-9 scores while being positively linked to it after the pandemic.

In NSR, there were no links between the studied factors and PHQ-9 scores and depression severity.

As for SNR, PHQ-9 scores and depression severity were negatively tied to being male, age, living in rural areas, and having a good support system. Depression severity was negatively linked to a healthier diet after the pandemic had started.

Meanwhile, we found a negative association between PHQ-9 scores

Table 4

Chi-Square for different factors' association with the four groups.

NSNR: non-smokers not at risk; NSR: non-smokers at risk; SNR: smokers not at risk; SR: smokers at risk; %: percentage; before: before the pandemic; after: after the pandemic; *p*: *p*-value (2-tailed)

Each subscript letter denotes a subset of the smoker groups whose column proportions do not differ significantly from each other at the .05 level.

| Factor | | Numbers | NSNR | NSR | SNR | SR | <i>p</i> |
|---------------------|----------------|-----------------|------------------|--------------------|------------------|--------------------|----------|
| Sex | Male | Count | 173 _a | 21 _{a, b} | 92 _b | 18 _{a, b} | .021* |
| | | Expected count | 190.8 | 23.4 | 74.1 | 15.7 | |
| | | % within Groups | 29.1 | 28.8 | 39.8 | 36.7 | |
| | Female | Count | 422 _a | 52 _{a, b} | 139 _b | 31 _{a, b} | |
| | | Expected count | 404.2 | 49.6 | 156.9 | 33.3 | |
| | | % within Groups | 70.9 | 71.2 | 60.2 | 63.3 | |
| Residency | Urban | Count | 293 _a | 37 _{a, b} | 142 _b | 34 _b | .001** |
| | | Expected count | 317.6 | 39.0 | 123.3 | 26.2 | |
| | | % within Groups | 49.2 | 50.7 | 61.5 | 69.4 | |
| | Rural | Count | 302 _a | 36 _{a, b} | 89 _b | 15 _b | |
| | | Expected count | 277.4 | 34.0 | 107.7 | 22.8 | |
| | | % within Groups | 50.8 | 49.3 | 38.5 | 30.6 | |
| Diet before | Unhealthy diet | Count | 133 _a | 23 _{a, b} | 73 _b | 20 _b | .002** |
| | | Expected count | 156.3 | 19.2 | 60.7 | 12.9 | |
| | | % within Groups | 22.4 | 31.5 | 31.6 | 40.8 | |
| | Healthy diet | Count | 462 _a | 50 _{a, b} | 158 _b | 29 _b | |
| | | Expected count | 438.7 | 53.8 | 170.3 | 36.1 | |
| | | % within Groups | 77.6 | 68.5 | 68.4 | 59.2 | |
| Diet after | Unhealthy diet | Count | 128 _a | 21 _{a, b} | 71 _b | 17 _{a, b} | .012* |
| | | Expected count | 148.8 | 18.3 | 57.8 | 12.3 | |
| | | % within Groups | 21.5 | 28.8 | 30.7 | 34.7 | |
| | Healthy diet | Count | 467 _a | 52 _{a, b} | 160 _b | 32 _{a, b} | |
| | | Expected count | 446.3 | 54.8 | 173.3 | 36.8 | |
| | | % within Groups | 78.5 | 71.2 | 69.3 | 65.3 | |
| Mask-wearing | No | Count | 258 _a | 32 _a | 77 _a | 14 _a | .017* |
| | | Expected count | 239.1 | 29.3 | 92.8 | 19.7 | |
| | | % within Groups | 43.4 | 43.8 | 33.3 | 28.6 | |
| | Yes | Count | 337 _a | 41 _a | 154 _a | 35 _a | |
| | | Expected count | 355.9 | 43.7 | 138.2 | 29.3 | |
| | | % within Groups | 56.6 | 56.2 | 66.7 | 71.4 | |

and depression severity with a good support system in the SR category.

4. Discussion

4.1. Smoking, Depression, and COVID-19

Since the pandemic started, we noted that SR (with a health risk such as cardiovascular disease) had a higher depression than all other groups. Smoking in itself did not suffice to be related to higher depression scores, but its addition to that health risk produced a significant difference. The fact that smoking alone did not show higher depression scores could be explained by increased depression in general due to the pandemic (Choi et al., 2020). A recent study showed that smoking is a risk factor for depression, with an odds ratio of 1.99 (Wootton et al., 2020). Also, should one have a disease that could worsen a prognosis should they contract the Sars-CoV-2 virus, depression could exacerbate that disease. Depression can affect a person's heart rate, blood viscosity, blood pressure, pro-inflammatory activity (Raič, 2017), worsening hypertension or diabetes, or other underlying diseases. Therefore, smoking, health risk, and the current pandemic significantly increase the PHQ-9 scores compared to the other participants.

4.2. Non-smokers not at risk (NSNR)

This group had a significantly lower PHQ-9 score than SR. During the pandemic, NSNR increased their weight, sleep duration and decreased their hobbies. Weight was linked to higher PHQ-9 scores and depression severity, while the latter two did not show any such effect. A recent study indicated that decreasing weight was associated with lower depression (Patsalos et al., 2021). It mentioned behavioral changes in obese patients, often seen in depression, including rumination (Minkwitz et al., 2019) and reduction in physical activity (Sander et al., 2018). Another study noted that the abdominal fat distribution as a

potential link between obesity and depression, rather than the BMI per se, concluding that the potential link could be due to metabolic disturbances which involve the hypothalamic-pituitary-adrenocortical axis (Rivenes et al., 2009). Therefore, weight and depression can be visualized as a vicious circle where each drives an increase in the other.

Hobbies could be decreased due to the government's lockdowns or anhedonia from depression or the loss of motivation one might have because of having to do a hobby on their own at home. This point of view could explain the weight they put on – while the sports' duration was unchanged, its intensity could have been limited to the household due to the lockdown and closing of gyms. Maintaining the same sports duration is generally substantial since physical activity can not only reduce the symptoms of depression and prevent its relapse but can be as effective as psychotherapy and antidepressant medication (Physical activity as good as CBT or medications for depression, 2021). This antidepressant effect could be explained by exercise decreasing inflammation, especially in patients who already have increased TNF- α , or via neuroplasticity (Kandola et al., 2019). However, we did not find a link between the reduction of hobbies and depression, so other factors or coping mechanisms may be implemented. Therefore, it is likely that the exercise they maintained after the pandemic started could be one of those factors since we found a negative association with both PHQ-9 scores and depression severity.

Compared to the other groups, NSNR are younger than the other groups, and age was related to higher PHQ-9 scores and depression severity. Multiple studies have corroborated these findings, such as the effect of age on depression (Romans et al., 2011). NSNR were more likely to be women with healthier diets than SNR and live in rural areas than non-smokers. A European study found similar results when analyzing data from six European countries (Idris et al., 2007). However, other studies (including data from the American Psychological Association) found the opposite results, citing higher poverty records and lower educational levels as potential culprits (Buettner-Schmidt

Table 5

One-Way ANOVA Test for different factors between all four groups. NSNR: non-smokers not at risk; NSR: non-smokers at risk; SNR: smokers not at risk; SR: smokers at risk; kg: kilograms; mins: minutes; SE: standard error; *p*: *p*-value.

| Factor | Group (mean ± standard deviation) | Other Groups | Mean Difference | SE | <i>p</i> |
|--|-----------------------------------|--------------|-----------------|--------|-----------|
| Age (years) | NSNR (26.52 ± 10.051) | NSR | -6.739 | 1.364 | < .001*** |
| | | SNR | -3.033 | .853 | .002** |
| | | SR | -7.867 | 1.635 | < .001*** |
| | NSR (33.26 ± 15.672) | NSNR | 6.739 | 1.364 | < .001*** |
| | | SNR | 3.706 | 1.477 | .074 |
| | | SR | -1.127 | 2.032 | 1 |
| | SNR (29.55 ± 11.314) | NSNR | 3.033 | .853 | .002** |
| | | NSR | -3.706 | 1.477 | .074 |
| | | SR | -4.834 | 1.73 | .032* |
| | SR (34.39 ± 12.193) | NSNR | 7.867 | 1.635 | < .001*** |
| | | NSR | 1.127 | 2.032 | 1 |
| | | SNR | 4.834 | 1.73 | .032* |
| Number of children | NSNR (.43 ± .962) | NSR | -.429 | .128 | .005** |
| | | SNR | -.125 | .080 | .717 |
| | | SR | -.464 | .154 | .015* |
| | NSR (.86 ± 1.262) | NSNR | .429 | .128 | .005** |
| | | SNR | .305 | .139 | .170 |
| | | SR | -.035 | .191 | 1 |
| | SNR (.56 ± 1.101) | NSNR | .125 | .080 | .717 |
| | | NSR | -.305 | .139 | .170 |
| | | SR | -.340 | .163 | .222 |
| | SR (.90 ± 1.159) | NSNR | .464 | .154 | .015* |
| | | NSR | .035 | .191 | 1 |
| | | SNR | -.340 | .163 | .222 |
| Weight after the pandemic (kg) | NSNR (66.43 ± 14.059) | NSR | -7.621 | 1.905 | <.001*** |
| | | SNR | -5.657 | 1.191 | < .001*** |
| | | SR | -9.658 | 2.283 | < .001*** |
| | NSR (74.05 ± 19.497) | NSNR | 7.621 | 1.905 | <.001*** |
| | | SNR | 1.964 | 2.063 | 1 |
| | | SR | -2.037 | 2.837 | 1 |
| | SNR (72.09 ± 15.983) | NSNR | 5.657 | 1.191 | < .001*** |
| | | NSR | -1.964 | 2.063 | 1 |
| | | SR | -4.001 | 2.416 | .271 |
| | SR (76.09 ± 20.028) | NSNR | 9.658 | 2.283 | < .001*** |
| | | NSR | 2.037 | 2.837 | 1 |
| | | SNR | 4.001 | 2.416 | .271 |
| Sleep duration after the pandemic (mins/day) | NSNR (495.63 ± 113.165) | NSR | 25.077 | 15.353 | .616 |
| | | SNR | 2.690 | 9.597 | 1 |
| | | SR | 60.829 | 18.4 | .006** |
| | NSR (470.55 ± 123.984) | NSNR | -25.077 | 15.353 | .616 |
| | | SNR | -22.387 | 16.622 | 1 |
| | | SR | 35.752 | 22.863 | .709 |
| | SNR (492.94 ± 141.204) | NSNR | -2.690 | 9.597 | 1 |
| | | NSR | 22.387 | 16.622 | 1 |
| | | SR | 58.139 | 19.471 | .017* |
| | SR (434.8 ± 56.027) | NSNR | -60.829 | 18.4 | .006** |
| | | NSR | -35.752 | 22.863 | .709 |
| | | SNR | -58.139 | 19.471 | .017* |

et al., 2019; Vander Weg et al., 2011; Smoking and Tobacco Use in Rural Populations, 2021; Singh and Sahoo, 2013). Although regarding depression, studies have suggested that urban residents are more likely to suffer from it (McKenzie et al., 2013; Gruebner et al., 2017) and indicated they even had higher suicide rates (Chandra et al., 2018). This finding could be due to the increased stress one might endure in such a busy environment, pollution, violence, and over-crowdedness, instead of the somewhat steadier life in rural areas (Srivastava, 2009). As for one's eating behavior, we found research agreeing with our findings, noting that high-quality diets are associated with a lower risk of

depression (Molendijk et al., 2018). Lastly, many articles have shown that depression is more prevalent among women, specifically between mid-puberty and menopause (Faravelli et al., 2013), which could be due to hormonal changes (Thériault and Perreault, 2019). So, while we found immutable factors (e.g., age and sex) associated with depression, the environmental factors surrounding a person play an important role in balancing potential risk factors.

A valuable example of such environmental factors is a support system, which appears to be linked to depression in this group. This factor had the most consistent effect on lower depression in almost every group. Such a support system comprising family and friends is significantly tied to depression and quality of life (Alsubaie et al., 2019). Adults usually tend to find this sort of support from their spouses, then family, then friends (Gariépy et al., 2016). In fact, loneliness has been found to worsen depression symptoms, recovery from it, and deteriorate social functioning (Wang et al., 2018). This factor is critical during lockdowns when all communication is almost passed on to online conversations, as it could either be a protective mechanism or a risk factor depending on each person's situation.

They also slept longer than SR, but this did not relate to depression in either group. This difference could be because NSNR is younger and have fewer children than SR, who might be more likely to have jobs to attend to and additional responsibilities to handle.

4.3. Non-smokers at risk (NSR)

The depression score for NSR is significantly lower than SR. While the difference in PHQ-9 scores between this group and SR is lower than NSNR and SR, this is probably because the individuals in this group also have the underlying disease making them at risk should they contract the virus.

During the pandemic, they increased their weight and decreased their hobbies and sports duration. None of these changes affected the PHQ-9 levels of this group. The diet and sleep duration were not altered; hence they could not cause the rise in weight. The decrease in exercise and hobbies could explain the increase in weight during the pandemic. Therefore, with the routine still somewhat similar to the pre-pandemic era, the lockdown most likely thwarted their opportunity to exercise.

Additionally, NSR were older than NSNR and had more kids, meaning compared to that group, they most likely had more responsibilities to handle. With kids learning online, parents have to care for them as well, further taking away time that could be spent on personal hobbies or exercise.

We found no factors associated with depression in this group.

4.4. Smokers not at risk (SNR)

Individuals of this group also had significantly lower PHQ-9 scores than SR. Both of these groups are smokers, which is a risk factor for depression (Wootton et al., 2020), but lack the underlying disease – this plays a considerable role in the age of a worldwide pandemic.

After the outbreak began, SNR increased their weight, sleep duration and decreased their sports duration but did not change their diet or hobbies. None of these factors were related to depression for this group. We noticed that individuals not at risk (NSNR and SNR) were the only groups that increased their sleep duration to almost the same duration. This sleep duration was greater than NSR and SR, but only significantly greater between the SR and individuals not at risk. People at risk might be more on edge, realizing their potential vulnerability to the virus. There were no age differences between SNR and NSR; hence age had less to do in this regard. However, SNR were still younger than SR, probably because smoking takes a long duration to render individuals at risk.

Exercising less and sleeping more could increase weight, despite maintaining the same diet. However, this group did have an unhealthy diet than NSNR before and after the pandemic. A healthy diet after the pandemic was associated with lower depression severity. The fact that

Table 6

Multivariate analysis between PHQ-9 scores and depression severity with different factors in each group.

NSNR: non-smokers not at risk; NSR: non-smokers at risk; SNR: smokers not at risk; SR: smokers at risk; Bef: before the pandemic; Aft: after the pandemic; Residency: higher values indicate rural residency; diet: higher values indicate a healthier diet; weight: weight in kilograms; sleep: sleep duration (minutes/day); sports: sports duration (minutes/week); search freq: higher values indicate higher search frequency for COVID-19 related information; support system: satisfaction in support system; SE: standard error; t: the size of the difference relative to the variation in the data; p: p-value; 95% CI: 95% Confidence Interval; LB: lower bound; UB: upper bound.

| Group | PHQ-9 Score Factor | PHQ-9 Score | | | | | Depression Severity | | | | | | | | |
|-------|--------------------|-------------|----------------------------------|--------|----------|---------|---------------------|----------------------------------|-------|--------|----------|--------|-------|----|----|
| | | B | SE | t | p | 95% CI | | B | SE | t | p | 95% CI | | | |
| | | | | | | | LB | UB | | | | | | LB | UB |
| NSNR | Intercept | 16.903 | 2.643 | 6.396 | <.001*** | 11.712 | 22.093 | 3.830 | .552 | 6.942 | <.001*** | 2.746 | 4.914 | | |
| | Sex | 1.333 | .643 | 2.072 | .039* | .070 | 2.597 | .287 | .134 | 2.135 | .033* | .023 | .551 | | |
| | Age | -.095 | .038 | -2.492 | .013* | -.170 | -.020 | -.017 | .008 | -2.184 | .029* | -.033 | -.002 | | |
| | Residency | -1.382 | .489 | -2.823 | .005** | -2.343 | -.420 | -.335 | .102 | -3.276 | .001* | -.535 | -.134 | | |
| | Children | -.026 | .396 | -.066 | .947 | -.803 | .751 | -.001 | .083 | -.008 | .993 | -.163 | .162 | | |
| | Roommates | .122 | .300 | .406 | .685 | -.468 | .712 | .020 | .063 | .316 | .752 | -.103 | .143 | | |
| | Diet Bef | 1.046 | .670 | 1.561 | .119 | -.270 | 2.363 | .159 | .140 | 1.140 | .255 | -.115 | .434 | | |
| | Diet Aft | -2.512 | .697 | -3.601 | <.001*** | -3.881 | -1.142 | -.471 | .146 | -3.232 | .001* | -.757 | -.185 | | |
| | Weight Bef | -.258 | .125 | -2.057 | .040* | -.504 | -.012 | -.049 | .026 | -1.857 | .064 | -.100 | .003 | | |
| | Weight Aft | .269 | .126 | 2.136 | .033* | .022 | .516 | .049 | .026 | 1.878 | .061 | -.002 | .101 | | |
| | Sleep Bef | -.001 | .003 | -.325 | .745 | -.007 | .005 | -5.066E-5 | .001 | -.076 | .939 | -.001 | .001 | | |
| | Sleep Aft | -.001 | .002 | -.238 | .812 | -.005 | .004 | -4.063E-5 | .000 | -.086 | .932 | -.001 | .001 | | |
| | Sports Bef | .003 | .002 | 1.486 | .138 | -.001 | .006 | .000 | .000 | 1.352 | .177 | .000 | .001 | | |
| | Sports Aft | -.004 | .001 | -2.731 | .007** | -.006 | -.001 | -.001 | .000 | -2.345 | .019* | -.001 | .000 | | |
| | Hobbies Bef | -.494 | .557 | -.887 | .376 | -1.588 | .600 | -.128 | .116 | -1.105 | .270 | -.357 | .100 | | |
| | Hobbies Aft | .069 | .537 | .129 | .897 | -.986 | 1.125 | .048 | .112 | .429 | .668 | -.172 | .268 | | |
| | Search freq | .545 | .210 | 2.600 | .010* | .133 | .957 | .123 | .044 | 2.800 | .005** | .037 | .209 | | |
| | Support system | -2.163 | .270 | -8.023 | <.001*** | -2.692 | -1.633 | -.438 | .056 | -7.774 | <.001*** | -.548 | -.327 | | |
| | Mask-wearing | .605 | .503 | 1.203 | .229 | -.383 | 1.594 | .139 | .105 | 1.323 | .186 | -.067 | .345 | | |
| | R squared | | .225 (Adjusted R Squared = .201) | | | | | .212 (Adjusted R Squared = .188) | | | | | | | |
| NSR | Intercept | 9.239 | 9.968 | .927 | .358 | -10.747 | 29.224 | 3.461 | 2.226 | 1.555 | .126 | -1.002 | 7.923 | | |
| | Sex | 1.552 | 2.009 | .773 | .443 | -2.475 | 5.579 | .455 | .448 | 1.015 | .315 | -.444 | 1.354 | | |
| | Age | -.044 | .082 | -.531 | .598 | -.209 | .121 | -.013 | .018 | -.715 | .478 | -.050 | .024 | | |
| | Residency | -.255 | 1.765 | -.145 | .886 | -3.794 | 3.283 | -.012 | .394 | -.029 | .977 | -.802 | .779 | | |
| | Children | -.917 | 1.000 | -.917 | .363 | -2.921 | 1.088 | -.167 | .223 | -.747 | .458 | -.614 | .281 | | |
| | Roommates | -.082 | .869 | -.095 | .925 | -1.824 | 1.659 | -.020 | .194 | -.103 | .918 | -.409 | .369 | | |
| | Diet Bef | -1.106 | 2.467 | -.448 | .656 | -6.052 | 3.839 | -.206 | .551 | -.375 | .709 | -1.311 | .898 | | |
| | Diet Aft | .299 | 2.692 | .111 | .912 | -5.097 | 5.695 | -.126 | .601 | -.209 | .835 | -1.331 | 1.079 | | |
| | Weight Bef | -.349 | .318 | -1.099 | .277 | -.987 | .288 | -.043 | .071 | -.608 | .546 | -.185 | .099 | | |
| | Weight Aft | .343 | .332 | 1.034 | .306 | -.323 | 1.010 | .039 | .074 | .529 | .599 | -.109 | .188 | | |
| | Sleep Bef | .014 | .011 | 1.308 | .196 | -.008 | .036 | .002 | .002 | .635 | .528 | -.003 | .006 | | |
| | Sleep Aft | -.012 | .008 | -1.423 | .161 | -.028 | .005 | -.002 | .002 | -1.340 | .186 | -.006 | .001 | | |
| | Sports Bef | -.004 | .006 | -.739 | .463 | -.015 | .007 | -.001 | .001 | -.706 | .483 | -.003 | .002 | | |
| | Sports Aft | -.001 | .008 | -.131 | .896 | -.018 | .016 | .000 | .002 | -.059 | .953 | -.004 | .004 | | |
| | Hobbies Bef | 1.870 | 1.838 | 1.018 | .313 | -1.815 | 5.556 | .454 | .410 | 1.106 | .2874 | -.369 | 1.277 | | |
| | Hobbies Aft | -2.563 | 1.684 | -1.522 | .134 | -5.939 | .812 | -.515 | .376 | -1.369 | .177 | -1.268 | .239 | | |
| | Search freq | .217 | .728 | .298 | .767 | -1.243 | 1.676 | .062 | .163 | .378 | .707 | -.264 | .387 | | |
| | Support system | -.340 | .889 | -.382 | .704 | -2.122 | 1.443 | -.139 | .199 | -.702 | .485 | -.538 | .259 | | |
| | Mask-wearing | 1.483 | 1.637 | .906 | .369 | -1.800 | 4.766 | .346 | .366 | .948 | .347 | -.386 | 1.079 | | |
| | R squared | | .323 (Adjusted R Squared = .097) | | | | | .307 (Adjusted R Squared = .076) | | | | | | | |
| SNR | Intercept | 16.374 | 3.777 | 4.335 | <.001*** | 8.928 | 23.820 | 4.118 | .792 | 5.198 | <.001*** | 2.556 | 5.680 | | |
| | Sex | 2.243 | .961 | 2.334 | .021* | .349 | 4.137 | .544 | .202 | 2.697 | .008** | .146 | .941 | | |
| | Age | -.125 | .052 | -2.386 | .018* | -.228 | -.022 | -.023 | .011 | -2.058 | .041* | -.044 | -.001 | | |
| | Residency | -1.649 | .783 | -2.107 | .036* | -3.192 | -.107 | -.374 | .164 | -2.281 | .024* | -.698 | -.051 | | |
| | Children | -.010 | .534 | -.019 | .985 | -1.063 | 1.043 | 6.283E-5 | .112 | .001 | 1.000 | -.221 | .221 | | |
| | Roommates | .422 | .486 | .870 | .386 | -.535 | 1.380 | .120 | .102 | 1.177 | .240 | -.081 | .321 | | |
| | Diet Bef | .186 | .890 | .209 | .834 | -1.569 | 1.941 | .036 | .187 | .195 | .846 | -.332 | .404 | | |
| | Diet Aft | -1.645 | .939 | -1.751 | .081 | -3.496 | .207 | -.408 | .197 | -2.072 | .040* | -.797 | -.020 | | |
| | Weight Bef | -.057 | .083 | -.678 | .498 | -.221 | .108 | -.019 | .018 | -1.072 | .285 | -.053 | .016 | | |
| | Weight Aft | .081 | .088 | .914 | .362 | -.093 | .255 | .021 | .019 | 1.159 | .248 | -.015 | .058 | | |
| | Sleep Bef | .003 | .004 | .742 | .459 | -.005 | .011 | -9.266E-6 | .001 | -.011 | .991 | -.002 | .002 | | |
| | Sleep Aft | -.002 | .003 | -.792 | .429 | -.008 | .003 | .000 | .001 | -.688 | .492 | -.002 | .001 | | |
| | Sports Bef | .000 | .003 | .185 | .853 | -.005 | .005 | .000 | .001 | .509 | .611 | -.001 | .001 | | |
| | Sports Aft | .001 | .003 | .374 | .709 | -.004 | .006 | 5.750E-5 | .001 | 1.100 | .920 | -.001 | .001 | | |
| | Hobbies Bef | 1.171 | .855 | 1.370 | .172 | -.514 | 2.857 | .190 | .179 | 1.062 | .290 | -.163 | .544 | | |
| | Hobbies Aft | -1.112 | .820 | -1.357 | .176 | -2.728 | .504 | -.169 | .172 | -.983 | .327 | -.508 | .170 | | |
| | Search freq | .163 | .300 | .543 | .588 | -.429 | .755 | .015 | .063 | .237 | .813 | -.109 | .139 | | |
| | Support system | -2.663 | .413 | -6.457 | <.001*** | -3.477 | -1.850 | -.532 | .087 | -6.144 | <.001*** | -.702 | -.361 | | |
| | Mask-wearing | 1.301 | .782 | 1.664 | .098 | -.240 | 2.841 | .284 | .164 | 1.734 | .084 | -.039 | .607 | | |
| | R squared | | .319 (Adjusted R Squared = .261) | | | | | .310 (Adjusted R Squared = .251) | | | | | | | |
| SR | Intercept | 23.836 | 10.779 | 2.211 | .035* | 1.822 | 45.850 | 4.236 | 2.226 | 1.903 | .067 | -.310 | 8.782 | | |
| | Sex | 2.906 | 3.174 | .916 | .367 | -3.576 | 9.388 | .736 | .655 | 1.123 | .270 | -.602 | 2.075 | | |
| | Age | -.224 | .127 | -1.767 | .087 | -.483 | .035 | -.034 | .026 | -1.288 | .207 | -.087 | .020 | | |
| | Residency | -.892 | 2.324 | -.384 | .704 | -5.638 | 3.854 | -.043 | .480 | -.089 | .930 | -1.023 | .938 | | |
| | Children | 1.640 | 1.503 | 1.092 | .284 | -1.428 | 4.709 | .151 | .310 | .486 | .631 | -.483 | .784 | | |
| | Roommates | .775 | 1.355 | .572 | .571 | -1.991 | 3.542 | .167 | .280 | .597 | .555 | -.404 | .738 | | |
| | Diet Bef | -1.947 | 2.791 | -.697 | .491 | -7.646 | 3.753 | -.434 | .576 | -.753 | .457 | -1.611 | .743 | | |

(continued on next page)

Table 6 (continued)

| Group | PHQ-9 Score Factor | B | SE | t | p | 95% CI | | Depression Severity | | | | | |
|-------|--------------------|----------------------------------|-------|--------|-------|--------|-------|----------------------------------|------|--------|-------|-----------|-------|
| | | | | | | LB | UB | B | SE | t | p | 95% CI LB | UB |
| | Diet Aft | .869 | 2.528 | .344 | .733 | -4.295 | 6.033 | .119 | .522 | .227 | .822 | -.948 | 1.185 |
| | Weight Bef | .483 | .409 | 1.179 | .248 | -.353 | 1.319 | .096 | .085 | 1.130 | .267 | -.077 | .268 |
| | Weight Aft | -.510 | .419 | -1.218 | .233 | -1.365 | .345 | -.097 | .086 | -1.125 | .269 | -.274 | .079 |
| | Sleep Bef | .013 | .013 | .952 | .349 | -.015 | .040 | .002 | .003 | .789 | .437 | -.003 | .008 |
| | Sleep Aft | -.015 | .008 | -1.807 | .081 | -.032 | .002 | -.002 | .002 | -1.193 | .242 | -.006 | .001 |
| | Sports Bef | .011 | .011 | 1.034 | .309 | -.011 | .033 | .002 | .002 | .879 | .386 | -.003 | .006 |
| | Sports Aft | -.006 | .010 | -.617 | .542 | -.027 | .015 | -.001 | .002 | -.589 | .561 | -.006 | .003 |
| | Hobbies Bef | .415 | 2.510 | .165 | .870 | -4.711 | 5.541 | .031 | .518 | .059 | .953 | -1.028 | 1.089 |
| | Hobbies Aft | -.271 | 2.323 | -.117 | .908 | -5.016 | 4.473 | -.025 | .480 | -.052 | .959 | -1.005 | .955 |
| | Search freq | 1.169 | 1.047 | 1.117 | .273 | -.970 | 3.309 | .177 | .216 | .818 | .420 | -.265 | .619 |
| | Support system | -2.966 | 1.082 | -2.741 | .010* | -5.177 | -.756 | -.496 | .224 | -2.219 | .034* | -.952 | -.039 |
| | Mask-wearing | 2.316 | 2.468 | .939 | .355 | -2.724 | 7.357 | .519 | .510 | 1.019 | .317 | -.522 | 1.560 |
| | R squared | .508 (Adjusted R Squared = .213) | | | | | | .448 (Adjusted R Squared = .117) | | | | | |

the diet was unhealthy compared to their non-smoker counterparts before and after the pandemic might introduce a pattern of behavior in which smokers could be more likely to partake in unhealthy behavior. Indeed, smokers tended to be more risk-takers (Ert et al., 2013; Garner and Ratschen, 2013), being involved in more traffic accidents (The relationship of smoking to motor vehicle accidents and traffic violations, 2021), less seat-belt wearing (Dillow et al., 2016; Eiser et al., 1979), and risky sexual activity (Valois et al., 1999).

Furthermore, compared to their non-smoker counterparts (NSNR), they were more likely to be older, male individuals living in urban areas and weighed more. In this group, being older and male was associated with lower PHQ-9 scores and severity while living in urban areas displayed the opposite effect. As previously mentioned, this aligns with the current literature. Weight could simply be due to SNR being generally older than NSNR.

Finally, this group's PHQ-9 scores and depression severity were associated with a satisfactory support system.

4.5. Smokers at risk (SR)

This group had PHQ-9 scores significantly greater than every other group. As stated, this might very well be explained by the risk smoking, a physical illness, and the fear of a pandemic might have on their mental state, pushing them way farther than what the other groups would have increased in PHQ-9 scores.

They only decreased their hobbies during the pandemic and did not change their sleep, sports duration, diet, or weight. None of these, however, were associated with depression. A notable finding of this study is that SR were only significantly different in some factors compared to individuals not at risk (NSNR, SNR), as they were older and slept less than them. This latter finding could be explained by the fact that older individuals are more likely to be employed with regular schedules. The increased number of children further enhances this explanation compared to NSNR (primarily due to the older age). Having more children comes with more responsibility, requiring a somewhat stable routine, similar to having a job. One might also suggest that the underlying disease may be exerting a physical nuisance leading to less sleep than individuals without that disease. However, we did not inquire about what underlying disease the participants at risk have, so we cannot pinpoint the exact reason for this sleep difference.

SR also most likely weighed more than NSNR due to being much older. They were also more likely to live in urban areas compared to NSNR.

An interesting finding is the diet results before and after the pandemic. Although SR had an unhealthier diet than NSNR, there were no differences in diet among the four groups in diet after the pandemic, despite each group displaying no change in diet. This discrepancy could be due to slight changes towards a healthier diet by SR that, although were not significant, were enough to close the gap between the diet of

both groups.

In general, this group had the most stable transition through the beginning of the pandemic, as they had the fewest changes. Therefore, higher depression rates could be due to economic distress as they are more likely to be in charge of the household salary (due to their older age) or an already existing predisposition to depression. Younger individuals are more likely to be depressed (Fiske et al., 2009), older adults who could not afford medical treatment are more likely to be depressed (Cheruvu and Chiyaka, 2019). Considering the economic crisis Lebanon is facing, this is most certainly the case for many people. Indeed, poverty is tightly related to depression (Heflin and Iceland, 2009).

A healthy support system was the only factor associated with lower PHQ-9 scores and decreased depression severity. Since older individuals might not be as tech-savvy as their younger peers, they might be missing out on being in touch with loved ones as much as younger individuals due to the lockdowns. Depression decreased in older individuals who frequent the internet to socialize and search for entertainment (Yang et al., 2021). Due to the rising poverty levels in Lebanon, more and more people will find it harder to afford an internet connection. In the middle of a lockdown, this could be detrimental to mental health.

4.6. Suggestions to decrease depression during the pandemic

Our study shows that individuals who are not at risk (NSNR and SNR) had more factors associated with their PHQ-9 scores and depression severity than those at risk (NSR and SR). Therefore, the primary option to decrease depression would be to get the underlying disease under control, e.g., controlling the blood pressure and blood sugar in diabetes mellitus. Normalizing a patient's values could be a strategy to eliminate as much as possible the present risk and move these patients closer to NSNR or SNR.

Another option would require smoking cessation, which would not only alleviate the exacerbating effects on depression but would move an individual closer to NSNR or SNR. A mix of the previous two suggestions would move individuals closer to NSNR, which has many factors associated with lower depression rates.

Lastly, depending on which group a patient is in, increasing the respective factors negatively associated with depression could lower and maintain a tolerable depression level.

5. Conclusion

SR have PHQ-9 scores higher than the other three groups. Each group has different factors associated with depression. PHQ-9 scores and depression severity for individuals not at risk (NSNR, SNR) were negatively related to being male, older, living in rural areas, and having a healthy support system. For NSNR, these factors were also negatively linked to a healthy diet and exercise during the pandemic and positively

associated with frequently searching for COVID-19 related information. Weight was positively linked with increased PHQ-9 scores.

Meanwhile, for SNR, a healthy diet was linked to lower depression severity. We did not find factors connected to depression in NSR. Finally, in SR, a satisfactory support system was related to lower PHQ-9 scores and depression severity.

The diet was not significantly changed during the pandemic in all four groups. Weight was increased in all groups except SR, while sleep was increased in individuals who were not at risk. Sports were decreased in NSR and SNR, and hobbies were decreased in all groups except SNR.

Knowing which factors decrease depression in each group and attempting to move from one group to a better one can help treat depression in a targeted, evidence-based manner.

Limitations

Due to the recruitment method used and its snowball effect, the responders of the study do not necessarily represent the Lebanese population at large. Also, because of the topic chosen and the fact that the national suicide hotline shared the link to our study online, individuals with already underlying mental illnesses likely responded to the questionnaire. Due to the lockdowns in place during the launch of the study, a mental health professional could not be asked to diagnose the respondents certainly, hence why we used the Patient Health Questionnaire-9 (PHQ-9). Our study was conducted online, which means individuals unable to afford an internet connection could not be included; these individuals could be at increased risk of suffering from depression. Moreover, some of the questions posed are subjective, and some relating to changes before the pandemic could introduce recall bias. Additionally, we did not inquire about sexual activity, which could be an essential coping mechanism during the pandemic. Finally, being a cross-sectional study, these findings cannot draw causal relationships.

Declaration of Competing Interest

None.

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Authorship statement

Manuscript title: Smoking, Health Risks, Coping Mechanisms and Depression in the age of COVID-19: a cross-sectional study of the Lebanese Population

We certify that all persons who sufficiently contributed to this study and meet authorship criteria are listed as authors of our study. Persons who helped but did not meet authorship criteria appear in the Acknowledgements. All authors state that the material has not been submitted or published in any other publication.

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