STRESS AND ANXIETY IN ROMANIAN COVID-19 PATIENTS: THE ROLE OF ALCOHOL, SMOKING, AND THE PSYCHOLOGICAL IMPACT OF THE PANDEMIC

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ABSTRACT

This cross-sectional study explores the impact of behavioural factors on perceived stress and anxiety in COVID-19 positive and negative patients in Romania (N=1362). While focusing on identifying the main anxiety and stress predictors, data were gathered based on demographic criteria, alcohol consumption, tobacco use, and anxiety scores measured with Hamilton Anxiety Rating Scale (HAM-A) among two groups of inpatients: both with positive and negative COVID-19 tests. The relationship to the Perceived Stress Scale (PSS) scores was assessed through regression analysis. Study results suggest that in the COVID-19 positive group, alcohol consumption was associated with higher perceived stress, while smoking was associated with lower stress scores. In both groups anxiety levels predicted a high perceived stress, suggesting that high levels of anxiety were pervasive during the pandemic. However, demographic factors such as age, gender, income level were significant predictors of stress in COVID-19 negative group, whereas in the positive group the demographics showed no significant impact. Our study findings suggest that maladaptive behaviours should be addressed, and public health interventions should be considered globally to mitigate post-pandemic stress effectively.

Key words: alcohol; smoking; stress; anxiety; COVID-19

INTRODUCTION

The COVID-19 pandemic has not only challenged the healthcare global system but also has had a significant impact in overall population mental health worldwide [1–3]. In Romania, similarly to many countries, stress, anxiety, and related mental health issues have been present along to physical illness [4,5].

Studies suggest that in times of psychological burden, people employ maladaptive coping behaviours, such as alcohol consumption [3,6,7] or smoking [8–10]. Also, alcohol and tobacco are used as coping mechanism specifically for individuals trying to mitigate the stress and anxiety in pandemic and post-pandemic context [11].

The relation between stress and anxiety and use of alcohol and tobacco during periods of crisis [8] especially as the worry over economic stability was heightened, studies show that smoking strongly corelates with the economic and health concerns all together.

The present study aims to contextualize these maladaptive behaviours in Romanian sample group as we look at recent literature. Research findings suggest that individuals experiencing higher levels of stress are more likely to prefer smoking and alcohol use as

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coping mechanisms, and this connection is particularly evident in low- and middle-income countries (LMICs) [10,12,13].

The impact of alcohol has been noted especially in the individuals who already had mental health issues related to stress and anxiety [6]. Studies have been conducted globally suggesting that alcohol not only enhances depressive symptoms, but also plays a role as a maladaptive coping mechanism for stress [13–15]. A Canadian study results suggest that the increase in depression in adults is linked to increased alcohol consumption during COVID-19 pandemic [6].

Although our study suggests that smoking provides a short-term relief to perceived stress and anxiety, the long-term effects of tobacco use are associated with depression and anxiety [16,17] whereas a systematic review emphasizes that quitting smoking may improve mental health [18]. The interplay of perceived stress, anxiety, and substance use during the COVID-19 epidemic illustrates the worldwide mental health crisis that accompanied physical health issues.

MATHERIALS AND METHODS

This cross-sectional study aimed at exploring the impact of behavioural factors, specifically alcohol and tobacco consumption on self-reported perceived stress and anxiety among a group of Romanian patients. The study involved inpatients from several hospitals in Romania, with different health issues, who also tested positive or negative for COVID-19. The study group (N=1362) was divided into two groups of patients – the patients who tested COVID-19 positive (n=210) and the group of patients with negative COVID-19 test (n=1152). Participants demographic data, alcohol, smoking habits, and anxiety scores measured with HAM-A questionnaire were included in regression analysis to examine the correlations between these variables and PSS scores. The inclusion criteria for the study group were female and male adults over 18 years of age, during study period from January to June 2023. The study was conducted according to the guidelines of the Declaration of Helsinki and approved by the Ethics Committee of Grigore T. Popa University of Medicine and Pharmacy (137/25.01.2022).

We performed data collection through structured questionnaire applied online, and the informed consent was obtained simultaneously with the data collection. The questionnaire was designed to gather information on demographic data and patients were administered The Hamilton Anxiety Rating Scale (HAM-A) and Perceived Stress Scale (PSS).

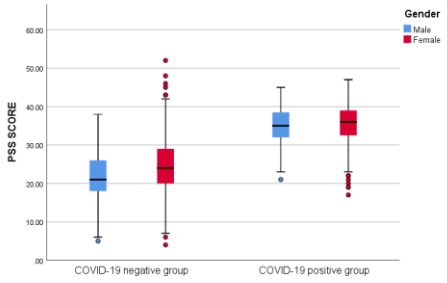

Figure 1. PSS scores by gender in the COVID-19 positive and negative groups

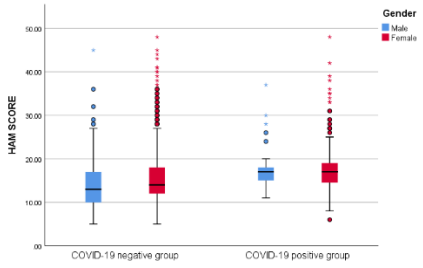

Figure 2. HAM-A scores by gender in COVID-19 positive and negative groups

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RESULTS AND DISCUSSIONS

Demographic variables

In our study group (N=1362) women represent a significant majority (83.3% in the COVID-19 positive group and 85.3% in the COVID-19 negative group), while the overall percentage of females included in the study was 85% (Table 1). As far as the age variable, the COVID-19 positive group displays a younger mean age (43.6 years) compared to COVID-19 negative group displaying a mean age of 45.8 years.

Most of our study participants, both with positive and negative tests, lived in urban areas, with an overall percentage of 86.6%. Also, married participants represent the majority in both groups (73.3% positive and 67.2% negative tests). Most of the participants were employed (96.2% in the positive group and 92.6% in the negative group), whereas the largest proportion of the participants in both groups benefited from college education (46%), followed by participants holding a master's degree (31.6%). Most participants reported an income over 700 euros per month (82.4% in the positive group and 74.9% in the negative group), whereas a smaller percentage reported income below 500 euros per month.

Concerning the smoking and drinking alcohol habits, the smoking rates suggest a similarity between both groups (23.3% in the positive group and 23.5% in the negative group); however, the alcohol use was slightly higher in the COVID-19 negative group (39.6%) compared to the COVID-19 positive group (34.3%).

COVID-19 positive study group

We explored through a regression analysis how the demographic factors included in the model play a role in the PSS scores in the COVID-19 positive study group (Table 4). Our data suggest that none of the demographic variables (age, gender, marital status, employment status, urban or rural location, education level or income) play a significant role in predicting perceived stress levels in our sample group. Age variable presents a small positive β coefficient of 0.066, that may indicate a small impact of age in PSS scores, but with no statistical significance. Also, the gender β coefficient is rather small 0.020, with a negligeable impact on perceived stress levels, marital and employment status have also little to no impact on the PSS scores in the COVID-19 positive sample group. The education variable indicates a small negative effect on PSS scores, as higher level of education is associated with lower levels of stress, but with no statistical significance; and the income variable also indicates a small and with no statistical significance effect on stress levels.

We performed a regression analysis with PSS score as dependent variable (Table 5) to emphasize the complex relationship between substance use, anxiety, and stress in the COVID-19 positive individuals. The alcohol use plays a significant role suggesting is responsible for higher levels of anxiety, with an unstandardized coefficient B of 5.611, suggesting that individuals who consume more alcohol will report higher levels of anxiety; also, the standardized coefficient β of 0.452 suggest a strong positive correlation with the perceived stress. The t-value (2.806) and p-value (0.005) suggest that alcohol consumption is a robust predictor of stress in COVID-19 positive individuals. As for the smoking, for COVID-19 positive individuals there is a decrease in PSS scores associated with tobacco use and has a moderate negative effect on stress (β = - 0.396) suggesting that smoking may have a stress reductive effect on individual teste positive for COVID-19. Also, the same indication is provided by the t-value (-2.457) with a p-value of 0.015, which is statistically significant, that smoking is a predictor of lower stress in the group. While our results indicate that lower PSS scores are associated with smoking in the COVID-19

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positive group (B= - 2.776; p=0.015), studies suggest that the stress alleviation effect is short-term, as the long-term smoking is associated with in-creases anxiety and stress [16,19]. Our data also suggest that isolation variable has no significant impact on stress (B= –0.057, β = -0.005, p=0.945). However, the HAM-A scores have a significant positive relationship with PSS scores (B = 0.213, β = 0.227, p = 0.001), suggesting that higher level of anxiety is a strong predictor of high perceived stress. The education level variable indicates a small negative effect on PSS scores, suggesting that higher level of education is associated with lower levels of stress, but with no statistical significance. The income variable also indicates a small and with no statistical significance effect on stress levels.

We performed a regression analysis with PSS score as dependent variable (Table 3) The alcohol plays a significant role as responsible for higher levels of anxiety, with an unstandardized coefficient B of 5.611; also, the standardized coefficient β of 0.452 suggest a strong positive correlation with the perceived stress. The t-value (2.806) and p-value (0.005) suggest that alcohol consumption is a robust predictor of stress in COVID-19 positive individuals. As for the smoking, for COVID-19 positive individuals there is a decrease in PSS scores associated with tobacco use and has a moderate negative effect on stress (β = -0.396) suggesting that smoking may have a stress reductive effect on individual teste positive for COVID-19. Also, the same indication is provided by the t-value (-2.457) with a p-value of 0.015, which is statistically significant, that smoking is a predictor of lower stress in the group. While our results indicate that lower PSS scores are associated with smoking in the COVID-19 positive group (B= –2.776; p=0.015), studies suggest that the stress alleviation effect is short-term, as the long-term smoking is associated with increases anxiety and stress [16,19]. Our data also suggest that isolation variable has no significant impact on stress (B= –0.057, β = -0.005, p=0.945). However, the HAM-A scores have a significant positive relationship with PSS scores (B = 0.213, β = 0.227, p = 0.001), suggesting that higher level of anxiety is a strong predictor of high perceived stress.

COVID-19 negative study group

The regression analysis for the individuals that tested negative for COVID-19 show the relations with demographic characteristics within the group (Table 4). Data suggest that income is a significant predictor of perceived stress, as higher income is associated with lower stress scores (p-value = 0.002) and β-coefficient of β = -0.137 indicates a moderate negative effect on stress. Gender is also a strong predictor, whereas females report significant higher stress levels than males, with a p-value < 0.001 statistically significant and a β coefficient of 0.139, suggesting a small to moderate positive effect, as females tend to report higher levels of perceived stress. The marital status values indicate a borderline significant relationship with stress (p = 0.055), with an unstandardized coefficient (B = 0.671) and a small β coefficient (β = 0.056). The employment status, urban/rural location variables hold no statistical significance to PSS scores with p-values of 0.419 and 0.764. However, education is statistically significant with p= 0.028, but with small effect (β = -0.070), with higher levels of education associated with lower stress levels (β = -0.070, p = 0.028). Finally, the age variable suggests that older individuals report lower stress levels. The un-standardized coefficient (B = –0.056) and standardized β coefficient (β = –0.091) indicate a small but significant negative effect of age on stress (p = 0.002).

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Table 1. Demographic characteristics of included participants

Characteristics	Group study (N=1362)	COVID-19	
		Positive n=210	Negative n=1152
Age, years, mean ± SD	45.45 ± 10.88	43.60 ± 10.18	45.79 ± 10.97
Women, n(%)	1158 (85.0)	175 (83.3)	983 (85.3)
Urban, n(%)	1179 (86.6)	182 (86.7)	997 (86.5)
Marital status, n(%)			
Married	928 (68.1)	154 (73.3)	774 (67.2)
Unmarried	381 (28.0)	50 (23.8)	331 (28.7)
I prefer not to answer	53 (3.9)	6 (2.9)	47 (4.1)
Occupation, n(%)			
Student	21 (1.5)	2 (1.0)	19 (1.6)
employee	1269 (93.2)	202 (96.2)	1067 (92.6)
retired	72 (5.3)	6 (2.9)	66 (5.7)
Level of education, n(%)			
High school	200 (14.7)	20 (9.5)	180 (15.6)
Post-secondary school	105 (7.7)	18 (8.6)	87 (7.6)
College	627 (46.0)	97 (46.2)	530 (46.0)
Master	430 (31.6)	75 (35.7)	355 (30.8)
Income, n(%)			
>700€	1036 (76.1)	173 (82.4)	863 (74.9)
500 - 700€	230 (16.9)	25 (11.9)	205 (17.8)
< 500€	96 (7.0%)	12 (5.7)	84 (7.3)
Behaviors, n(%)			
Smoking	320 (23.5)	49 (23.3)	271 (23.5)
Alcohol consumption	528 (38.8)	72 (34.3)	456 (39.6)
Chronic illness[1]	390 (28.6)	59 (28.1)	331 (28.7)

[1] History of hypertension, diabetes mellitus, autoimmune disease, or cancers.

Table 2. Multivariate linear regression. The relationship between demographic characteristics and PSS score in COVID-19 positive group

	Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B	
Model	B	Std. Error	B	t	*p*-value	Lower Bound	Upper Bound
Age	.038	.043	.066	.890	.375	-.047	.123
Gender	.315	1.127	.020	.279	.780	-1.908	2.538
Marital Status	-.189	.827	-.017	-.229	.819	-1.820	1.442
Employment status	-.140	1.671	-.006	-.084	.933	-3.436	3.156
Urban/Rural	-.716	1.231	-.041	-.582	.561	-3.142	1.711
Education	-.510	.486	-.078	-1.050	.295	-1.468	.447
Income	.349	.823	.032	.424	.672	-1.274	1.971

Table 3. Multivariate linear regression. The relationship between demographic characteristics and PSS score in COVID-19 positive group

	Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B	
Model	B	Std. Error	B	t	*p*-value	Lower Bound	Upper Bound
Alcohol use	5.611	1.999	.452	2.806	.005	1.669	9.553
Tobacco use	-2.776	1.130	-.396	-2.457	.015	-5.004	-.548
Isolation	-.057	.821	-.005	-.069	.945	-1.675	1.562
HAM-A scores	.213	.063	.227	3.381	.001	.089	.338

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Table 4. Multivariate linear regression. The relationship between demographic characteristics and PSS score in COVID-19 negative group

	Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B	
Model	B	Std. Error	B	t	*p*-value	Lower Bound	Upper Bound
Age	-.056	.018	-.091	-3.104	.002	-.091	-.021
Gender	2.635	.545	.139	4.836	.000	1.566	3.703
Marital Status	.671	.349	.056	1.924	.055	-.013	1.355
Employment status	-.477	.590	-.024	-.808	.419	-1.635	.681
Urban/Rural	-.173	.575	-.009	-.301	.764	-1.301	.955
Education	-.470	.214	-.070	-2.198	.028	-.890	-.051
Income	-1.520	.365	-.137	-4.170	.000	-2.236	-.805

Table 5. Multivariate linear regression. The relationship between behavioural characteristics and PSS score in COVID-19 negative group

	Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B	
Model	B	Std. Error	B	t	*p*-value	Lower Bound	Upper Bound
Alcohol use	.713	.735	.052	.969	.333	-.730	2.155
Tobacco use	-.333	.431	-.041	-.773	.440	-1.180	.513
Isolation	-.443	.471	-.021	-.941	.347	-1.368	.481
HAM-A score	.640	.023	.640	28.076	.000	.596	.685

The behavioural characteristics of the COVID-19 negative group are shown below (Table 7) where alcohol and tobacco use as well as the isolation due to quarantine regulation or COVID-19 positive tests of family member are not statistically significant in relation to PSS scores. However, alcohol consumption has a weak positive effect on stress levels with β coefficient of 0.052, but with no statistical significance. Also, smoking has a weak negative effect with a β coefficient of – 0.041, but with no statistical significance in relation to perceived stress. The results are like in the COVID-19 positive group results, but with less effect and no statistical significance, suggesting a role with minimal impact of alcohol and smoking in the COVID-19 negative group. However, anxiety may play a role in higher levels of perceived stress, as the unstandardized coefficient of 0.640 indicates a strong positive relationship between HAM-A scores and PSS scores, indicating that the higher the anxiety, the higher the perceived stress levels reported. Also, the β coefficient 0.640 suggests that HAM-A scores have a strong positive effect on PSS scores. Therefore, anxiety is the key driver to this model, whereas alcohol and smoking play a minimal role on the PS levels in COVID-19 negative individuals.

Gender variable in both groups

We performed a descriptive analysis in a box plot for PSS scores within both sample groups of COVID-19 positive and negative individuals (Figure 1). The PSS scores across both groups suggest gender differences, whereas females report higher PSS scores than males, and the variability of stress in females is also higher in both groups. As far as the illness impact, the median PSS score for males in the COVID-19 positive group is lower than the median score for female COVID-19 positive patients. Also, the presence of extreme values in IQR in the females, in both groups, but specifically in the COVID-19 negative group, suggest that women experience extreme stress which could be investigated further.

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Similarly, we performed a gender distribution box plot analysis regarding the HAM-A scores displayed within both study groups (Figure 2). The data suggest that the median male HAM-A scores in both groups are lower than female HAM-A scores, and the interquartile range shows a moderate variability in male levels of anxiety. Also, male participants display in both groups some outlier values, suggesting that males experience some extreme levels of anxiety exceptionally. As far as the female study group is concerned, the median value of HAM-A scores is higher compared to the male group, and the interquartile range is wider, suggesting that female participants tend to have a higher variability of reported HAM-A scores. Also, the numerous outlier values in the female group suggest that a significant number of female participants report extreme high levels of anxiety, in both sample groups.

As far as the COVID-19 impact, male participants report a slightly higher median value of anxiety score in the COVID-19 positive group compared cu COVID-19 negative. However, females within the positive COVID-19 group display a lower medial anxiety score compared to females in the negative COVID-19 group, but the numerous outlier values in both groups suggest that females display a higher vulnerability to anxiety, regardless of COVID-19 positive or negative test.

Discussion

Although the COVID-19 pandemic has passed its peak manifestation, it has precipitated a significant raise in mental health challenges, especially manifesting as elevated stress and anxiety in general population and patients.

Studies mention that a pervasive anxiety induced by the pandemic has not only been linked to health concerns, but to socio-economic disruptions as well due to the prolonged lockdowns and social distancing regulations, which is consistent to literature [9]. Also, studies suggest that lifestyle disruptions during the pandemic were associated with depressive symptoms, largely mitigated through increased alcohol consumption and smoking [14].

The European studies also suggest that there is a consistent interaction between smoking, alcohol use and stress, whereas increased perceived stress has been linked to maladaptive behaviours such as tobacco and alcohol use.

Our study results align with patterns suggested by recent literature, highlighting an increased psychological distress in relation to higher substance use during the pandemic. Our findings suggest that there are implications regarding the psychological effects of the COVID-19 Romanian patients, especially with gender differences in perceived stress and anxiety. Furthermore, our results suggest that females report higher levels of perceived stress than male patients, in both COVID-19 positive and negative sample groups. A greater variability in stress levels with female patients added to the difference in stress levels is present in the larger IQR value in plot box analysis; also, the presence of numerous outliers in female sample group adds to the suggestion that female patients present higher vulnerability to stress and anxiety during pandemic crisis. These findings are consistent with existing literature [16,20,21].

Our data also indicate that in the COVID-19 positive group males present higher median levels of anxiety (HAM-A scores) compared to the male negative group, suggesting that the diagnosis might exacerbate the levels of anxiety in males. Conversely, females in the COVID-19 positive group exhibit lower anxiety that females in the negative group; however, with the presence of numerous outlier values in both groups suggest that females are more vulnerable to extreme

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anxiety regardless of their infection status. Our results are consistent with the literature findings, indicating that with regards to anxiety and perceived stress especially among younger women, who might be particularly vulnerable to significant psychological distress, forming a population subset to be taken into consideration by future research [6,13].

The results of the regression analysis suggest that alcohol consumption and smoking have a small effect on the perceived stress in the COVID-19 negative group. These findings are consistent with literature showing that alcohol and smoking may not have a significant impact in relation to anxiety in certain groups [14,22].

Considering the differences between males and females regarding the perceived stress and anxiety levels and adding the limited impact of alcohol and tobacco consumption, mental health interventions are important to mitigate and reduce anxiety and addressing extreme stress, especially in female patients in Romania. Our data suggest that tailored interventions are required, as a homogenous approach might not be effective in populations with high variance in experiencing severe psychological distress [23–25].

Our study findings are consistent with existing literature suggesting that the pandemic has affected especially women regarding stress and anxiety levels, indicating that the mental health approach should be rather gender sensitive. Also, alcohol and smoking play a role in perceived stress, but anxiety is a significant predictor of distress in Romanian patients. The results are consistent with existing literature [1,26].

CONCLUSIONS

1. This study enhances the comprehension of the psychological distress encountered by COVID-19 patients in Romania, with alcohol and smoking as coping strategies. The results suggest that alcohol correlates with elevated stress levels in positive for COVID-19 individuals, but smoking seems to exert a short-term stress-reducing impact.
2. Anxiety acts as an important indicator of perceived stress in both COVID-19 positive and negative groups, highlighting the pandemic's substantial effect on mental health.
3. Demographic characteristics, including age, gender, and income, influence perceived stress differently between COVID-19 positive and negative groups. In the COVID-19 negative group, income and educational level were significant predictors of stress, but with no significant influence in the COVID-19 positive group.
4. Gender disparities were also visible, with females reporting higher levels of stress and anxiety in both groups.
5. The study's findings are consistent with global studies, highlighting the pandemic's long-term psychological impacts and the importance of specific mental health interventions.

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