

## **Depression, anxiety, and stress during the sanitary emergency of COVID-19 in southeastern México**

## **Depresión, ansiedad y estrés durante la emergencia sanitaria por COVID-19 en el sureste mexicano**

## **Depressão, ansiedade e estresse durante a emergência sanitária da COVID-19 no sudeste do México**

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## ABSTRACT

**Aim:** Evaluate the level of depression, anxiety, and stress; and identify the factors associated with these psychological responses during the third phase of the COVID-19 health emergency in a sample of Mexican population. **Methods:** An online cross-sectional survey was conducted. We performed bivariate and multivariate analyses to identify factors associated with depression, anxiety, and stress. **Results:** We included 997 individuals with a mean age of  $35.3 \pm 12.9$  years; 18.9% of the participants presented symptoms of depression, 21.7% symptoms of anxiety and 14.1% symptoms of stress. Respondents were more likely to present depression if they were <40 years old (OR 1.73), not

having a religion (OR 1.71), if they were currently unemployed (OR 1.54). Factors associated with anxiety were age <40 years old (OR 1.73) and having recent contact with suspected or diagnosed patients with COVID-19 (OR 1.54). Self-perception of insufficient knowledge about COVID-19 disease was associated with stress (OR 1.55). Declaring not feeling safe of COVID-19 infection was associated with depression (OR 2.03), anxiety (OR 1.90), and stress (OR 1.75). **Conclusions:** The damage to mental health caused by the COVID-19 pandemic is evident; health personnel must pay attention to their psychological state and well-being to take appropriate measures.

**Keywords:** COVID-19; depression; anxiety; stress.

## RESUMEN

**Objetivo:** Evaluar el nivel de depresión, ansiedad y estrés; e identificar los factores asociados a estas respuestas psicológicas durante la tercera fase de la emergencia sanitaria COVID-19 en una muestra de población mexicana. **Métodos:** Se realizó un estudio transversal en línea. Mediante análisis bivariado y multivariado identificamos factores asociados con depresión, ansiedad y estrés. **Resultados:** Participaron 997 individuos con una edad media de  $35,3 \pm 12,9$  años; el 18,9% de los participantes presentó síntomas de depresión; 21,7%, ansiedad; y 14,1%, estrés. Los encuestados tenían más probabilidades

de presentar depresión si tenían <40 años (OR 1,73), si no tenían religión (OR 1,71) y no tenían empleo (OR 1,54). Los factores asociados con la ansiedad fueron edad <40 años (OR 1,73) y contacto reciente con pacientes sospechosos o diagnosticados de COVID-19 (OR 1,54). La autopercepción de conocimiento insuficiente sobre la enfermedad se asoció a estrés (OR 1,55). Declarar no sentirse seguro ante el contagio se asoció con depresión (OR 2,03); ansiedad (OR 1,90); y estrés (OR 1,75). **Conclusiones:** El daño a la salud mental causado por la pandemia COVID-19 es evidente; el personal de

salud debe prestar atención a su estado psicológico y bienestar para

tomar las medidas adecuadas.

**Palabras clave:** COVID-19; depresión; ansiedad; estrés.

## RESUMO

**Objetivo:** Avaliar o nível de depressão, ansiedade e estresse; e identificar os fatores associados a essas respostas psicológicas durante a terceira fase da emergência sanitária da COVID-19 em uma amostra da população mexicana. **Métodos:** Foi realizado um estudo transversal on-line. Através da análise bivariada e multivariada identificamos fatores associados à depressão, ansiedade e estresse. **Resultados:** 997 indivíduos com idade média de 35,3 ± 12,9 anos participaram; 18,9% dos participantes apresentaram sintomas de depressão; 21,7%, ansiedade; e 14,1%, estresse. Os respondentes tinham maior probabilidade de depressão se tivessem <40 anos (OR 1,73), não tivessem religião (OR 1,71)

e estivessem desempregados (OR 1,54). Os fatores associados à ansiedade foram idade <40 anos (OR 1,73) e contato recente com pacientes suspeitos ou diagnosticados com COVID-19 (OR 1,54). O conhecimento insuficiente autopercebido sobre a doença estava associado ao estresse (OR 1,55). O relato de não se sentir seguro contra infecção estava associado à depressão (OR 2,03); ansiedade (OR 1,90); e estresse (OR 1,75). **Conclusões:** Os danos à saúde mental causados pela pandemia da COVID-19 são evidentes; os profissionais da saúde devem prestar atenção ao seu estado psicológico e bem-estar a fim de tomar as medidas apropriadas.

**Palavras-chave:** COVID-19; depressão; ansiedade; estresse.

**C**oronavirus disease 2019 (COVID-19) pandemic is an underway international public health emergency currently active in 188 countries and territories (Dong, Du & Gardner, 2020). COVID-19 first imported cases in Mexico were confirmed in late February 2020, and by March 18<sup>th</sup> the first death was registered. According to Mexican General Health Council (GHC), there are three phases: a) Phase one: viral import; b) Phase two: community transmission; and c) Phase three: epidemic. On April 21<sup>st</sup> of 2020, with 8,772 confirmed cases and 712 deaths, the GHC announced that Mexico had entered phase three of the emergency plan. Mexican Health Secretary (Secretaría de Salud) then implemented several strategies to prevent and contain the contagion among the population, such as stricter health protocols, increased social distancing

measures, and temporary closure of schools and workplaces. By this time, a large part of productive and social activity declined significantly.

Large-scale health emergencies can cause emotional and psychosocial disturbances in the population, triggering psychosomatic symptoms (Huremovic, 2019). Preventive and restrictive measures can cause high levels of psychological burden (Holmes et al., 2020; Pedrosa et al., 2020) and the appearance of symptoms of anxiety, depression, and stress (Rubin & Wessely, 2020; Brooks et al., 2020). It has been identified that gender, age, employment status (Y. Wang, Di, Ye, & Wei, 2020; Mazza et al., 2020; Paulino et al., 2020), auto perceived knowledge and safety, and contact with COVID-19 patients (C. Wang et al., 2020) are associated factors of either depression, anxiety, or stress symptoms among the general population. This study aimed to estimate the level of depression, anxiety, and stress; and identify the associated factors of these psychological responses during the third phase of the COVID-19 health emergency in a sample of the Guerrero State population in Mexico.

## Methods

### Design of the study

We conducted a cross-sectional online survey with a snowball sampling strategy. The survey was disseminated between May 11<sup>th</sup> and 18<sup>th</sup> of 2020, during the third phase of the COVID-19 health emergency in Mexico.

### Participants

We included participants over the age of 18 that confirmed Guerrero State residency, participants that did not match these criteria were excluded. Records with more than 10% of missing or invalid data were eliminated. We reached 1006 Guerrero state Mexican residents between 18 and 81 years old. From this number, 997 (99.1%)

accepted to participate, gave their informed consent, and completed the online survey. The final sample consisted of 666 females (66.8%) and 331 males (33.2%).

### **Measurements**

We generated an online questionnaire designed to gather participant's sociodemographic data. Disease concern-related variables include following social distance recommendations, being part of risk population, perceived level of information about COVID-19, auto perceived safety to disease, recent contact with suspected or diagnosed COVID-19 patients, and heavy alcohol intake within the last seven days were also inquired.

#### *Depression, Anxiety, and Stress Scales (DASS-21):*

As in other mental health studies about COVID-19 psychological responses (Cortés-Álvarez, Piñeiro-Lamas, & Vuelvas-Olmos, 2020; Mazza et al., 2020; Paulino et al., 2020; C. Wang et al., 2020) we used the 21 item Depression, Anxiety and Stress Scales. This instrument is a self-report questionnaire consisting of three subscales, each composed of 7 items. Respondents score the items on a scale from 0 "did not apply to me at all" to 3 "applied to me very much." We used the original cut-off points (Lovibond & Lovibond, 1996) because standard scores are not available for the general Mexican population. A score of  $\geq 10$  points was considered positive to depression, being its severity classified as mild (10-13); moderate (14-20); severe (21-27); and extremely severe ( $\geq 28$ ). Anxiety was identified from  $\geq 8$  points and its severity classified as mild (8-9), moderate (10-14), severe (15-19), and extremely severe at  $\geq 20$ . Finally, a score of  $\geq 15$  points was considered positive to stress. The severity of stress was classified as mild (15-18), moderate (19-25), severe (26-33), and extremely severe ( $\geq 37$ ).

### *Alcohol Use Disorders Identification Test – Consumption (AUDIT-C):*

Heavy alcohol intake was measured with the AUDIT-C, a shortened version of the WHO's AUDIT-10 instrument (Barbor, Higgins-Biddle, Saunders & Monteiro, 2001). The AUDIT-C is a brief alcohol screening instrument that identifies hazardous drinkers and heavy episodic drinking. A sum score of 3 or 4 for women and men is considered positive to heavy episodic drinking (Cortés-Tomás, Giménez-Costa, Motos-Sellés & Sancerni-Beitia, 2016).

### **Ethical considerations**

The Research Committee approved this study of Guerrero State's Health Services (CISSG-08-20). The first page of the survey included a digital informed consent describing the study's objectives and the use that retrieved information would be subject. Such digital informed consent had two option boxes to either consent or decline to participate. It was explicitly mentioned the confidentiality of the participation and the liberty of the participants to stop answering at any time without any restrictions.

### **Procedure**

As Mexican National Health Council recommended social distancing, we used Google's online survey application Google Forms. A short text message containing information about the title, the study's aim, the selection criteria, and the benefits of the participation was redacted, and a blank form of the survey was attached to it. The questionnaire was first disseminated via social media and instant messaging services to collaborators, fellowship holders, and students who were asked to share the survey within their family, social and academic networks to be distributed and replicated among their contacts.

## Statistical Analysis

The raw answers database was downloaded from the Google Forms platform as a comma-separated values file. All answers were recodified to either numerical or categorical variables in a dBase file. We performed the data analysis using CIETmap, open-source software that provides a graphical user interface of the R statistical programming language (Anderson & Mitchell, 2002). We obtained simple frequencies and conducted a bivariate analysis to explore factors potentially associated with depression, anxiety, and stress. The significance of bivariate associations was expressed using Odds Ratio (OR), and the statistical significance of this estimation was assessed with Mantel-Haenszel chi-square ( $\chi^{2mh}$ ) (Mantel & Haenszel, 1959). We also calculated the 95% Confidence Intervals (95% CI) and statistical significance ( $p < 0.05$ ). Finally, we conducted three multivariate analyses using a general linear mixed model for each psychological distress outcome. The initial saturated model included all statistically significant variables associated with the outcomes in bivariate analysis. Then we used a step-wise deletion of the least significant association until only significant associations remained. Finally, we tested for effect modification with the Woolf chi-square test for heterogeneity ( $\chi^{2het}$ ) (Woolf, 1955).

## Results

A total of 1006 Guerrero State residents were reached and invited to participate in the study; 9 declined to participate, 997 gave their informed consent and finished the survey. The mean age of the sample was 35.3 years (SD 12.9). Table 1 shows that most participants were female (66.8%), follows COVID-19 preventive measures such as keep social distancing, and stay home recommendations (80.2%), have children (46.7%), and were healthcare workers (40.5). 22.4% declared to be part of the population at risk. We identified that 45.8% of the sample had at least one psychological affectation.

Table 1

*Main characteristics of the sample*

Variable	Value	
	N (%)	
Age (years)	Mean $\pm$ SD	35.3 $\pm$ 12.9
	Range	18 - 81
Sex	Female	666 (66.8)
	Male	331 (33.2)
Follows preventive recommendations	Yes	800 (80.2)
	No	197 (19.8)
Have a partner	No	328 (32.9)
	Yes	669 (61.1)
Have a religion	No	152 (15.2)
	Yes	845 (84.4)
Lives alone	Yes	60 (6)
	No	937 (94)
Have children	Yes	466 (46.7)
	No	531 (53.3)
Takes care of older adults	Yes	381 (38.2)
	No	616 (61.8)
Healthcare worker	No	593 (59.5)
	Yes	404 (40.5)
Employment status	Unemployed	300 (30.1)
	Employed	697 (69.9)
Part of the population at risk	Yes	223 (22.4)
	No	774 (77.6)

*(Continue)*



Table 1 Main characteristics of the sample (Continuation)

Variable	Value	
		N (%)
Self-perception of knowledge about COVID-19 disease	Insufficient	227 (22.8)
	Adequate	770 (77.2)
Feels safe of COVID-19 infection	No	683 (68.5)
	Yes	314 (31.5)
Recent contact with suspected or diagnosed patients with COVID-19	Yes	507 (50.9)
	No	490 (49.1)
Heavy episodic alcohol intake within the last 7 days	Yes	348 (34.9)
	No	649 (65.1)

Table 2 shows that 18.9% (189/997) of the respondents presented symptoms of depression; 21.7% (218/997) presented symptoms of anxiety, and 14.1% (141/997) presented symptoms of stress. Table 3 shows the Odds Ratio for bivariate associations with depression, anxiety, and stress.

Table 2

*Levels of depression, anxiety and stress*

Variable	Mild	Moderate	Severe	Extremely Severe	Overall
	n (%)	n (%)	n (%)	n (%)	n (%)
Depression	77 (7.7)	75 (7.5)	22 (2.2)	15 (1.5)	189 (18.9)
Anxiety	63 (6.3)	85 (8.4)	29 (2.9)	41 (4.1)	128 v(21.7)
Stress	62 (6.2)	44 (4.4)	23 (2.3)	12 (1.2)	141 (14.1)

Table 3

*Bivariate associations with depression, anxiety and stress*

Variable	Depression		Anxiety		Stress	
	OR	95% CI	OR	95% CI	OR	95% CI
Age ≤40 years old	2.38	1.60-3.55*	1.60	1.13-2.27*	1.75	1.14-2.69*
Sex Female	1.12	0.80-1.57	1.29	0.93-1.79	1.60	1.07-2.40*
Follows COVID-19 preventive measures	1.01	0.68-1.51	1.00	0.69-1.46	1.31	0.81-2.11
Does not have a partner	1.18	0.85-1.65	0.90	0.66-1.25	0.95	0.65-1.39
Does not have a religion	1.89	1.28-2.79*	1.08	0.72-1.63	1.46	0.93-2.30
Lives alone	0.74	0.36-1.53	0.70	0.35-1.40	0.30	0.10-0.93*
Have children	0.47	0.34-0.66*	1.10	0.82-1.49	0.62	0.43-0.90*
Takes care of older adults	0.91	0.66-1.27	1.27	0.93-1.72	1.08	0.75-1.55
Healthcare worker	1.10	0.80-1.53	0.79	0.59-1.07	0.97	0.68-1.39
Currently Unemployed	1.75	1.26-2.43*	1.04	0.75-1.44	1.48	1.03-2.15*
Part of the population at risk	0.95	0.65-1.40	1.27	0.89-1.79	1.02	0.67-1.56
Self-perception of insufficient knowledge about COVID-19	1.42	0.99-2.03	1.57	1.12-2.20*	1.74	1.18-2.56*
Does not feel safe of COVID-19 infection	1.71	1.19-2.47*	1.96	1.31-2.79*	1.75	1.15-2.67*
Had recent contact with suspected or diagnosed patients with COVID-19	1.08	0.79-1.48	1.50	1.11-2.03*	1.01	0.71-1.44
Heavy episodic alcohol intake within the last 7 days	1.40	1.01-1.94*	1.32	0.97-1.80	1.15	0.79-1.66

Note: OR= Odds Ratio, CI95%= Confidence Interval 95%, \* p < 0.05

Table 4 shows the final multivariate models of the factors associated with these three primary outcomes. Respondents were more likely to have depression if they were younger than 40 years, had no religion, and if they were unemployed; having children was associated with a lower risk of depression among our sample. Factors associated with anxiety were age <40 years and have had recent contact with patients suspected or diagnosed with COVID-19. Self-perception of insufficient knowledge about COVID-19 disease was positively associated with stress; individuals that reported living alone and not having children were less likely to present stress among our sample. Finally, not feeling safe of COVID-19 infection was associated with all three primary outcomes.

Table 4

*Multivariate model of factors associated with depression, anxiety and stress*

Variable	cOR	aOR	95% CI	$\chi^2_{het}$	p value
a) Depression					
Age ≤40 years old	2.20	1.73	1.14 - 2.63	6.59	0.99
Does not have a religion	1.80	1.71	1.13 - 2.58	6.50	0.99
Have children	0.47	0.58	0.41 - 0.83	8.94	1.00
Currently unemployed	1.78	1.54	1.08 - 2.21	5.58	0.98
Does not feel safe of COVID-19 infection	1.68	2.03	1.40 - 2.96	13.7	0.98
b) Anxiety					
Age ≤40 years old	1.60	1.73	1.21 - 2.48	8.96	0.48
Does not feel safe of COVID-19 infection	1.96	1.90	1.33 - 2.72	12.53	0.35
Had recent contact with suspected or diagnosed patients with COVID-19	1.50	1.54	1.13 - 2.10	7.43	0.62
c) Stress					
Lives alone	0.30	0.27	0.09 – 0.83	5.21	1.00

*(Continue)*

Table 4. Multivariate model of factors associated with depression, anxiety and stress  
(Continuation)

Variable	cOR	aOR	95% CI	X <sup>2</sup> <sub>het</sub>	p value
Have children	0.62	0.53	0.37 – 0.78	10.49	0.92
Self perception of insufficient knowledge about COVID-19	1.73	1.55	1.04 – 2.32	4.58	0.99
Does not feel safe of COVID-19 infection	1.75	1.75	1.12 – 2.72	6.08	0.89

Note: cOR= crude Odds Ratio, aOR= adjusted Odds Ratio, 95%CI= Confidence Interval 95%, X<sup>2</sup><sub>het</sub>= Woolf chi-square for heterogeneity. a: Heavy episodic alcohol did not reach significant association and was taken out from the depression saturated model. b: Self perception of insufficient knowledge about COVID-19 disease did not reach significant association and was excluded from the anxiety final model. c: Factors that did not reach significant association and were taken out of the stress final model were female gender, age ≤40 years old and currently unemployed.

## Discussion

This study aimed to identify the factors associated with depression, anxiety, and stress responses during the third phase of the COVID-19 health emergency in a sample of the Guerrero State population in Mexico.

Depression, anxiety, and stress levels found in this study were lower than reported in recent literature (Mazza et al., 2020; Paulino et al., 2020; C. Wang et al., 2020) but comparable with depression levels reported by another Mexican population-based study (Cortés-Álvarez et al., 2020) and anxiety and stress levels identified in a multicentre study (Chew et al., 2020). This result could have several explanations: first, we used a validated Mexican Spanish translation of the DASS-21 scales with a scoring approach based in the original cut-off points that could have led in to misestimation of the actual frequency of depression, anxiety or stress. Second, the immediate

emotional responses could have been diluted over time. The survey was set on May 11<sup>th</sup>, during the third phase of the pandemic, forty-two days after the emergency declaratory by the Mexican government on March 30. Within this time-lapse, subjects could have adapted to the new, social-limited interacting reality by generating coping responses that lowered their psychological burden.

Our final model reveals that not feeling safe from COVID-19 infection is a common factor associated with depression, anxiety, and stress symptoms; this is consistent with the results in other study reporting that the perceived likelihood of contracting the disease was significantly associated with the psychological response (C. Wang et al., 2020).

In our sample, participants were more likely to present depression and anxiety if they were 40 years old or below. Mazza et al. (2020) reported that higher age was significantly associated with less depression and stress, but no significant association was identified with anxiety. It has been suggested that the young population is more likely to present information overload, a type of excess of information that leads to negative psychological responses (Rathore & Farooq, 2020).

Some studies had shown that employment status was significantly associated with depression, anxiety, and stress (Paulino et al., 2020). Our results showed that participants were more likely to present depression if they were currently unemployed. Due to GHC recommendations, non-essential activities, including the economic and productive sector, were halted in Mexico, leading to a reduction in wages in some cases and massive temporary layoffs in others. The economic crisis generated by these conditions might lead to psychological distress among those who lost their jobs.

Additionally, we found that participants who did not have a religion were more likely to present depression symptoms. It has been previously reported a protective effect of spirituality over mental health (Braam & Koenig, 2019). Recent contact with suspected or diagnosed COVID-19 patients was positively associated with anxiety symptoms. It

has been reported that people who reported recent interaction with COVID-19 patients were more likely to present more psychological distress (C. Wang et al., 2020). Anxiety is an imprecise response of the body to the unknown with a feeling of escape or fight that increases at this time in the face of COVID-19 and as it spreads, feelings of sadness, lack of motivation, inhibition, and losing the desire to live to be able to arrive in extreme cases to the suicide risk (Pappa et al., 2020). Finally, our study found that participants having children were less likely to present depression, similar to Mazza's findings (2020). On the other hand, those living alone were less likely to present stress, similar to the results of Elbay, Kurtulmuş, Arpacioğlu, & Karadere (2020).

## Conclusion

Emotional disorders, depression, anxiety, and stress, have been conceptualized over time as an excessive or prolonged cognitive, behavioural and physiological response to a situation perceived as threatening, as is currently the case with the COVID-19 pandemic, and it is even triggered by an idea about events that have not yet occurred. That perceived threat can provoke an emotional and psychophysical response. In some individuals, this reaction can be more acute if they lack of protective factors.

## Recommendations

Given the epidemiological situation, health personnel must detect people with respiratory symptoms in the community and pay attention to their psychological state and well-being to take appropriate measures. Psychological well-being can become a fundamental key to the general health of the person. Although DASS-21 has been used in previous studies about COVID-19 psychological response, we recommend that future works take into account the original and validated translations of this instrument to elaborate scales that reflects health emergencies scenarios in Latin American and Mexican contexts.

## Limitations

We are aware that our research may have several limitations. First, we used a cross-sectional design, which limits any causal inference. Second, due to the limited resources and national healthy distance policy, we used a snowball sampling strategy, meaning that the sample was not randomly selected. The dissemination of the questionnaire was mainly through digital messaging services and was firstly responded to by students, academics, and healthcare professionals. That could lead to an oversampling of alphabetized digital users with internet access and the participant's peer, academic and social network that may lead to selection bias; for this reason, our findings cannot be generalized among the general population but may help understand the psychological distress during the current pandemic in an educated, medium to high income and urban-based populations. Third, although psychometric properties of the DASS-21 scales have been previously analyzed in the Mexican population (Gurrola-Peña, Balcázar-Nava, Bonilla-Muños & Virseda-Heras, 2006), no evidence supports the validity of the cut-off points used in our sample. Thus, our results may not reflect the actual presence of depression, anxiety, and stress in the general Mexican population.

All the participants who had mild to extremely severe symptoms were categorized as a positive case for depression, anxiety, or stress, respectively; however, psychological responses can be divergent depending on the severity of the symptoms. We identified the risk population individuals; however, searching for specific health conditions such as chronic illnesses (i.e., diabetes mellitus or cancer) would be more effective at identifying a more detailed association.

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### Authors' contribution statement

AE and AD designed the research and directed the gathering of data, EB and NB provided the statistical analysis. JA and MT provided the institutional facilities for the implementation of the research. All authors discussed the results and contributed to the final manuscript.

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