

Anxiety, depression, and stress in response to the coronavirus disease-19 pandemic

Ansiedad, depresión y estrés como respuesta a la pandemia de COVID-19

Héctor J. Pérez-Cano¹, Madeleine B. Moreno-Murguía², Oscar Morales-López¹, Olliever Crow-Buchanan³, Jane A. English³, Jaime Lozano-Alcázar⁴, and Selma A. Somilleda-Ventura^{1*}

¹Centro de Investigación Biomédica, Fundación Hospital Nuestra Señora de la Luz, Mexico City, Mexico; ²Private Practice, Mexico City, Mexico; ³Women's Research Center, University of Central Oklahoma, Oklahoma, USA; ⁴Medical Direction, Fundación Hospital Nuestra Señora de la Luz, Mexico City, Mexico

Abstract

Objective: The objective of the study was to determine the state of anxiety, depression, and stress present in the society during the development of the 2019 coronavirus pandemic. **Methods:** Mixed methods study; a three-section questionnaire was developed which included sociodemographic, perceptions, emotions, and behaviors related to the 2019 coronavirus pandemic, and two emotional assessment psychometric tests. The proportions and confidence intervals of the variables were calculated and compared using the Chi-square test. **Results:** More than 40% of the subjects presented some degree of anxiety and 41.3% depression; the proportion of stress was < 30%. Of the subjects who experienced anxiety, 18.6% also had moderate-to-very severe depression or stress. **Conclusion:** There are emotional indicators derived from the 2019 coronavirus pandemic in almost half of the study population. The identification and timely treatment of these states could lessen the psychological impact due to 2019 coronavirus.

Key words: Anxiety. Coronavirus disease-19. Depression. Pandemic. Psychological effects.

Resumen

Objetivo: Determinar el estado de ansiedad, depresión y estrés en la sociedad durante el desarrollo de la pandemia de COVID-19. **Método:** Estudio de métodos mixtos. Se desarrolló un cuestionario de tres secciones que incluía aspectos sociodemográficos, percepciones, emociones y comportamientos relacionados con la pandemia de COVID-19, y dos pruebas psicométricas de evaluación emocional. Las proporciones y los intervalos de confianza de las variables se calcularon y compararon mediante la prueba de ji al cuadrado. **Resultados:** Más del 40% de los sujetos presentaron algún grado de ansiedad y el 41,3% de depresión; la proporción de estrés fue inferior al 30%. De los sujetos que experimentaron ansiedad, el 18,6% también tenía depresión o estrés moderado a muy intenso. **Conclusión:** Existen indicadores emocionales derivados de la pandemia de COVID-19 en casi la mitad de la población del estudio. La identificación y el tratamiento oportuno de estos estados podrían disminuir el impacto psicológico debido al COVID-19.

Palabras clave: Ansiedad. COVID-19. Depresión. Efectos psicológicos. Pandemia.

Correspondence:

*Selma A. Somilleda-Ventura

Ezequiel Montes, 135

Col. Tabacalera, Del. Cuauhtémoc

C.P. 06030, Ciudad de México, México

E-mail: som.ven10@outlook.com

Date of reception: 27-05-2020

Date of acceptance: 11-06-2020

DOI: 10.24875/CIRU.20000561

Cir Cir. 2020;88(5):562-568

Contents available at PubMed

www.cirugiaycirujanos.com

0009-7411/© 2020 Academia Mexicana de Cirugía. Publicado por Permayer. Éste es un artículo open access bajo la licencia CC BY-NC-ND (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Introduction

The emergence of a pandemic can cause psychosocial disruption in response to a threat. The World Health Organization (WHO) warns that at least a third of the population exposed to a pandemic may suffer a psychopathological manifestation, according to the magnitude of the event and the degree of vulnerability¹. The first reaction is panic, a sudden and extraordinary fear that can influence behavior and decision-making². There is a psychosocial impact that has been observed in the history of infectious diseases: for example, that produced by the AIDS pandemic in the 1980s. The fear of being infected by the human immunodeficiency virus (HIV) brought discrimination and isolation as a social problem³.

Humanity has faced infectious diseases that have caused millions of deaths, such as the 1346 black plague⁴; smallpox that arrived in Mexico along with the Spanish in the 16th century, which became the most devastating pandemic in America⁵; the H1N1 influenza of 1918 (Spanish influenza)⁶; AH1N1 influenza in Mexico that started in 2009, until it was declared a pandemic⁷ and now the 2019 coronavirus disease (COVID-19).

In December 2019, the first case of pneumonia of unknown origin was reported in the city of Wuhan (Hubei, China), which spread rapidly^{8,9}. The identified pathogen was an RNA-wrapped beta-coronavirus that was initially named as COVID-19, and later as coronavirus-2 of the acute respiratory syndrome (SARS-CoV-2)¹⁰, because it shares phylogenetic characteristics with the severe acute respiratory syndrome coronavirus (SARS-CoV) responsible for the epidemic in China and later in Hong Kong in 2002. On January 30, 2020, the WHO declared an international public health emergency, and on March 11, 2020, due to alarming levels of spread, the coronavirus was characterized as a pandemic¹¹.

In 2003, Peng et al.¹² conducted a study evaluating the post-crisis psychological distress of the SARS outbreak in Taiwan, correlating psychological distress with the perception of the epidemic. On the other hand, Goulia et al.¹³ evaluated the psychological distress of health care workers during the 2009 AH1N1 influenza pandemic, in which a moderate degree of anxiety and concern was found that correlated with their psychological distress.

To identify these emotional states, a psychological evaluation is of utmost importance and in some cases allows planning of the intervention. Psychometry is a

field of psychology that allows us to explore and analyze the behavior of a person or a group of people, using psychometric tools such as tests¹⁴. The Depression Anxiety Stress Scale (DASS-21) is a 21-item questionnaire that has been validated for the Hispanic population (Cronbach's alpha = 0.96)¹⁵ and has been applied in diverse groups such as health care workers and university students^{16,17}. Furthermore, the State-Trait Anxiety Inventory (STAI), consists of two self-assessment scales that are used to measure two different dimensions of anxiety (anxiety as a trait and anxiety as a state)¹⁸, also validated for the Mexican population (Cronbach's alpha = 0.87)¹⁹. The emotional state generated by the COVID-19 pandemic in society should not be ignored. That is why the objective of this work was to assess the state of anxiety, depression, and stress that permeated society during the development of the COVID-19 pandemic.

Methods

The mixed methods study was carried out from March 22 to 30, 2020. We included, by non-probability sampling determined by time, Mexican subjects of legal age, any gender, who had access to an electronic device that allowed them to answer a survey, and who previously agreed to participate in the study through a digital informed consent; this adult population sample was recruited using social media platforms. All personal data were treated confidentially.

A digital questionnaire divided into three sections was developed (Google Forms, Google LLC, USA) to determine the perceptions, emotions, and behaviors related to the COVID-19 pandemic. The recruited subjects were asked to answer a series of questions structured specifically for this study, seven of demographic characteristics (age, gender, academic degree, and socioeconomic status), and 11 multiple-choice questions grouped as follows: (a) general perceptions of COVID-19, (b) general perceptions of the 2009 AH1N1 influenza epidemic in Mexico, (c) concerns and emotions related to the current situation, (d) perception of information about the pandemic, and (e) care of children during the contingency.

The second section consisted of the 21-item Depression, Anxiety, and Stress Scale (DASS-21) developed by Lovibond and Lovibond²⁰, which proved to be reliable and consistent when compared to other similar scales^{21,22}. This instrument made with the Likert technique, measures the states of depression, anxiety, and stress through three scales of 7 items each, and four

possible responses classified as follows: (a) did not apply to me at all, (b) apply to me to some degree or some of the time, (c) apply to me to a considerable degree a good part of the time, and (d) apply to me very much or most of the time.

In addition, the Spielberger STAI questionnaire was included²³⁻²⁶, which consists in two segments of 20 items each designed with the Likert technique, in which anxiety is measured as a state (A/S) operationally defined as anxiety experienced in a given moment or situation and anxiety as a trait (A/T) that refers to the level of anxiety in general. Punctuation was determined through four possible responses for each item: (a) not at all, (b) somewhat, (c) moderately so, and (d) very much so and (1) almost never, (2) sometimes, (3) often, (4) almost always, respectively. The score of each test was calculated by summarizing the points of each answer, and it was evaluated according to its standardized severity indices.

Statistic analysis

For demographic variables and questionnaires, proportions and 95% confidence intervals (C.I. 95%) were calculated. A comparison of the proportions between gender and the severity indices of the DASS and STAI A/S and A/T tests was performed using the Chi-square test. A p-value < 0.05 was considered statistically significant. The results were stored and analyzed in the SPSS software version 25 for Windows.

Results

Six-hundred and thirteen subjects with a mean age of 26.77 ± 10.30 standard deviation were included. The demographic characteristics are shown in table 1. About 77% (n = 472) had an education equal to or higher than a bachelor's degree, and < 15% (n = 92) were located in a socioeconomic status different to the mean. Of the total of surveyed subjects, only 15% (n = 92) expressed having any disease associated with a risk factor for having COVID-19.

The pandemic perception questionnaire (Table 2) showed that 82.9% (79.9-85.9) of people had the feeling of concern and chaos, but only 10.8% (8.3-13.3) considered that COVID-19 is a dangerous and serious disease. Regarding AH1N1 influenza, more than half agreed that there was a lot of misinformation during the 2009 pandemic in Mexico, but only 27.4% (23.9-30.9) could locate someone who suffered from this disease. Even though the greatest concern of the

Table 1. Demographic characteristics in the sample (n = 613)

Variables	Percentage % (n)
Gender	
Female	76 (466)
Male	24 (147)
Academic degree	
Primary	0.8 (5)
High school (junior)	1.5 (9)
High school (senior)	11.4 (70)
Technical career	4.9 (30)
Incomplete career	4.4 (27)
Bachelor's degree	60.8 (373)
Postgraduate	16.2 (99)
Socioeconomic status	
Low	13.2 (81)
Medium	85.3 (523)
High	1.5 (9)
Systemic diseases	
Hypertension	4.9 (30)
Diabetes	3.2 (20)
Autoimmune	5.4 (33)
Respiratory	1.5 (9)
Allergy	1.6 (10)
Gastritis	0.7 (4)
Others	6.2 (38)
None	76.5 (469)
Habits	
Drinking alcohol	17.1 (105)
Smoke	11.6 (71)
Drug's use	1.5 (9)
None	69.8 (428)
Residency	
Mexico city	56.5 (346)
Mexico state	15.7 (96)
Oaxaca	7.2 (44)
Puebla	5.5 (34)
Guerrero	2.6 (16)
Others	12.5 (77)
Children	
Yes	23.3 (143)
No	76.7 (470)

sample was there could exist more deaths derived from COVID-19 (37.4%, 33.6-41.2), only 17 subjects claimed to know someone infected with the coronavirus. Five-hundred and forty-four people reported having an emotion other than "indifference," which had a proportion similar to the perception that the preventive measures applied against the pandemic are exaggerated (11.3% [9.8-13.8] and 9.8% [7.4-12.2], respectively). Of the 143 people who mentioned having young children, 74.4% (70.9-77.9) recognized that a woman was in charge of caring for them during the health contingency due to COVID-19.

Table 2. Perceptions, emotions, and behaviors related to pandemics

Questions	Answers	Percentage (C.I. 95%)
When you hear the word "pandemic," what do you think?	Chaos Exaggeration Deaths Concern	27.4 (23.9-30.9) 5.2 (3.4-7.0) 11.9 (9.3-14.5) 55.5 (51.6-59.4)
Regarding COVID-19, do you consider	Is something that must be taken seriously It is a government invention It is just a flu It is a worldwide conspiracy It is a serious and dangerous disease	78.6 (75.4-81.8) 0.7 (0.0-1.4) 4.2 (2.8-5.8) 5.7 (3.9-7.5) 10.8 (8.3-13.3)
What do you remember of the outbreak of Influenza AH1N1?	At first it was thought to be a government invention There was fear, panic, and deaths There was a lot of misinformation from the beginning People supported each other to get ahead	13.9 (11.2-16.6) 26.9 (23.4-30.4) 50.4 (46.4-54.4) 8.8 (6.6-11.0)
Did you know someone who has suffered from AH1N1 influenza?	No Yes Maybe	65.7 (61.9-69.5) 27.4 (23.9-30.9) 6.9 (4.9-8.9)
What worries you most about the coronavirus?	Do not let me work I do not have health insurance in case I get sick That there may be more deaths Make it a very serious illness	26.4 (22.9-29.9) 7.3 (5.2-9.4) 37.4 (33.6-41.2) 28.9 (25.3-32.5)
Does any family member or acquaintance currently have coronavirus?	No Yes Maybe	93.5 (91.5-95.5) 2.8 (1.5-4.1) 3.8 (2.3-5.3)
Select which emotion best describes how you feel about the COVID-19	Distress Anger Indifference Fear Sadness	61.2 (57.3-65.1) 7.7 (5.6-9.8) 11.3 (8.8-13.8) 10.4 (8.0-12.8) 9.5 (7.2-11.8)
Do you consider preventive measures against coronavirus?	No Yes Maybe	90.2 (87.8-92.6) 3.3 (1.9-4.7) 6.5 (4.5-8.5)
Do you think you are well informed about the COVID-19?	No Yes Maybe	20.6 (17.4-23.8) 46.2 (42.3-50.1) 33.3 (29.6-37.0)
What are the sources of information you use?	Scientific articles/scientific sources Newspaper/printed sources Social media/internet TV/radio	51.7 (47.7-55.7) 2.0 (0.9-3.1) 34.3 (30.5-38.1) 12.1 (9.5-14.7)
In case of having small children, who cares for them mainly during the contingency?	Mother Father Grandparents Aunts Older brothers Kindergarten No one	71.9 (68.3-75.5) 7.0 (5.0-9.0) 12.1 (9.5-14.7) 2.5 (1.3-3.7) 3.8 (2.3-5.3) 1.3 (0.4-2.2) 1.3 (0.4-2.2)

The proportions between the different levels of depression, anxiety, and stress are shown in figure 1. The scores of the DASS-21 showed that, of the subjects with a moderate anxiety level ($n = 89$), 82% (79.0-85.0) had mild depression and 18% (15.0-21.0)

moderate. In addition, of the subjects with very severe anxiety ($n = 114$), 8.8% (6.6-11.0) also had moderate depression, 36% (32.2-39.8) severe, 55.3% (51.4-59.2) very severe depression, 40.4% (36.5-44.3) moderate stress, 28.1% (24.5-31.7) severe, and 31.6%

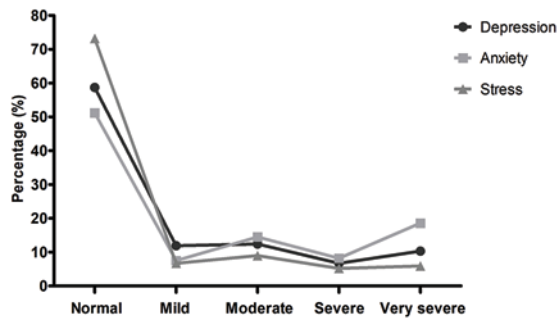


Figure 1. Proportions of levels of depression, anxiety, and stress according to the DASS-21. A higher proportion of subjects with a very severe degree of anxiety is observed compared to the states of depression and stress.

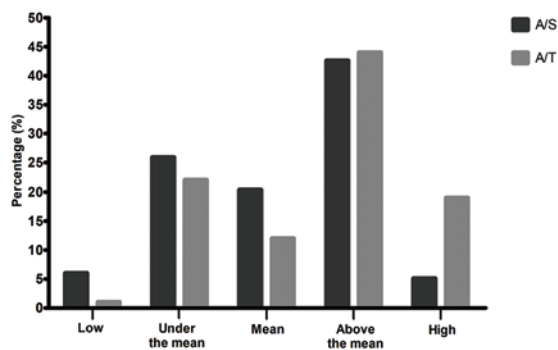


Figure 2. Proportions of the degrees of anxiety as state (A/S), and anxiety as trait (A/T) in the sample (STAI test). There is a higher proportion of high anxiety as a trait, which contrasts with anxiety as a state.

(27.9-35.3) very severe. Only 50 of those with severe anxiety showed mild (82%, 79.0-85.0) and moderate stress (18%, 15.0-21.0). The female gender had a higher proportion of depression ($p = 0.04$), anxiety ($p = 0.01$), and stress ($p = 0.02$) when compared to the male gender.

Figure 2 shows the proportions between anxiety levels as a state and as a trait. Of the total sample, 42% (38.1-45.9) had anxiety as an emotional state about the COVID-19 pandemic. Of these, 70 (26.8%, 23.3-30.3) showed high anxiety as a trait, and 132 (50.6%, 46.6-54.6) were above the mean. The proportion of subjects with A/S above the mean was higher in the male gender compared to the female (57.1% [53.2-61.0] vs. 38% [34.2-41.8], $p < 0.0001$), and this difference also existed between genders when A/S was high (9.5% [7.2-11.8] vs. 3.6% [2.1-5.1], $p = 0.004$).

Discussion

The results indicate that 48.8% of the evaluated subjects had anxiety from mild to very severe associated with the COVID-19 pandemic, and 18.6% of these also experienced depression or stress from moderate to very severe, according to the DASS-21 test. This is consistent with the results of the STAI test, in which it was found that 42% of the sample had anxiety as a state. Although only 5.1% of them presented high anxiety, 19% had it as a trait of their personality, which would mean that 13.9% of the subjects with this characteristic could experience high anxiety as a latent state. The proportion of anxiety, depression, and stress was higher in the female gender when evaluated with the DASS-21 test, but this contrasted with the results of the STAI test, where the highest proportion of subjects with anxiety was male.

Although this study was conducted during Phase 1 and the first days of phase 2 of the COVID-19 epidemic in Mexico, it has shown similar results to other investigations: Shigemura et al.²⁷ considered that anxiety and fear were increased due to the excess of sensationalist news and the rumors or misinformation regarding the pandemic. A group evaluated the positive and negative emotional indicators of 17,865 active users of a social platform in China²⁸ and reported that there was a significant increase in anxiety and depression when compared the periods from January 13 to 19 and 20 to 26 ($p < 0.001$).

Another study described a proportion of 50.4% anxiety and 71.5% stress²⁹, which corresponds to Liu et al.³⁰ who found 50.7% of participants with symptoms of depression, and 44.7% of anxiety, however, the subjects included in both studies were health-care professionals, and other scales were used to evaluate these indicators. Furthermore, Wang et al.³¹ identified proportions of depression (30.3%) and anxiety (36.4%) lower than those found in our study (41.3% and 48.8%, respectively), but the proportion of stress they found was higher (32.1% vs. 26.8%). The DASS-21 test was used in both studies, but only in our study, the proportions between gender and the scales of this test were compared.

In studies related to other pandemics such as AH1N1 influenza, a similar proportion of evasive behaviors such as anxiety was also found (41.2%), which was measured with the STAI test³². Williams et al.³³ identified that negative perceptions of AH1N1 influenza showed a predictive value of anxiety state of $\beta = 0.498$. In 2018, a research group found that 48.4%

of assessed subjects had at least one symptom of anxiety or depression related to their perception of the Ebola epidemic, and 76% showed at least one symptom of post-traumatic stress³⁴. High anxiety means were also found in subjects evaluated using the STAI test in Hong Kong and Singapore during the SARS epidemic³⁵.

Furthermore, it has been found that people with a low tolerance for uncertainty perceive pandemics as threatening situations³⁶. These experiences of anxiety could explain erratic behaviors among the population, such as the intensification of obsessive attitudes in handwashing or the excessive use of disinfectant products, stigmatization of health-care personnel or people with respiratory diseases regardless of the etiology, and the panic buying derived from the feeling of uncertainty about the epidemic.

Other relevant data are the proportions of evaluated subjects who consider COVID-19 a disease invented by the government or a world conspiracy. Although these proportions are low, they suggest that misinformation persists in our society. Since one of the main sources of information used is social media, it is imperative to apply strategies that lessen the impact of fake news that spreads rapidly and that can lead to anxious states.

One of the most significant findings in our study was the proportion of subjects with anxiety classified as severe or very severe in the DASS-21 test, and the consistency of these results with high A/S and A/T levels in the STAI test. Although these levels of anxiety were not expected in the sample because the study was performed during the early stages of the epidemic in Mexico, this proportion could increase as reports of infections and deaths in our country multiplies. Regarding the care of children during the health contingency, the fact that this activity is carried out by women in a higher proportion highlights that this could contribute to the development of anxiety or other negative emotional states in this population, but determining this would require a study specifically designed with a gender perspective.

The study has potential limitations. First, it was not possible to achieve a homogeneous distribution of individuals, and the fact that the most of the sample had a medium socioeconomic status or a bachelor's degree could reflect other perceptions regarding COVID-19. Second, the age mean was not representative for older adults, which would require additional studies that include them; however, our study population coincides with other reports regarding COVID-19 pandemic²⁸⁻³¹, in which age or academic

degrees have similar proportions to our results³⁷. Moreover, in this study, it was identified that anxiety had opposite proportions regarding gender in the tests used, but this could be attributable to the specific characteristics of each scale.

In summary, this study demonstrates that anxiety, depression, and stress are identifiable emotional states in the face of the COVID-19 epidemic and that they are found in almost half of our population, in different degrees of severity. This makes it necessary to consider them within the negative impact that this disease generates in the country and to establish specific measures for its prevention, diagnosis, containment, or treatment.

Conclusion

We identified that the emotional indicators (such as anxiety, depression and stress) derived from the 2019 coronavirus pandemic were presented in almost a half of the study population, which requires early treatment to improve the integral attention and to lessen the negative impact of the 2019 coronavirus disease.

Conflicts of interest

The authors declare that there are not conflicts of interest.

Funding

This research did not receive any financial or material funding.

Ethical disclosures

Protection of human and animal subjects. The authors declare that no experiments were performed on humans or animals for this study.

Confidentiality of data. The authors declare that they have followed the protocols of their work center on the publication of patient data.

Right to privacy and informed consent. The authors have obtained the written informed consent of the patients or subjects mentioned in the article. The corresponding author is in possession of this document.

References

1. World Health Organization. *Protección de la Salud Mental en Situaciones de Epidemias*. Washington, DC: World Health Organization; 2006.

2. Ledermann DW. The man and his epidemics through the history. *Rev Chil Infect*. 2003;20:13-7.
3. Cabrera N, Cantelar N, Blanco O, Medina V. SIDA: impacto psicosocial. *Rev Cubana Psicol*. 2003;1:68-71.
4. Grácio AJ, Grácio MA. Plague: a millenary infectious disease reemerging in the XXI century. *Biomed Res Int*. 2017;2017:5696542.
5. Aguirre-Bolaños N. The phase after the eradication of smallpox in Mexico, 1952-1977. *Hist Cienc Saude Manguinhos*. 2018;25:871-7.
6. Lüthy IA, Ritacco V, Kantor IN. One hundred years after the "Spanish" flu. *Medicina (B Aires)*. 2018;78:113-8.
7. Chowell G, Echevarría-Zuno S, Viboud C, Simonsen L, Tamerius J, Miller MA, et al. Characterizing the epidemiology of the 2009 influenza A/H1N1 pandemic in Mexico. *PLoS Med*. 2011;8:e1000436.
8. Mena I, Nelson MI, Quezada-Monroy F, Dutta J, Cortes-Fernández R, Lara-Puente JH, et al. Origins of the 2009 H1N1 influenza pandemic in swine in Mexico. *Elife*. 2016;5:e16777.
9. Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet*. 2020;395:497-506.
10. Guan WJ, Ni ZY, Hu Y, Liang WH, Ou CQ, He JX, et al. China medical treatment expert group for covid-19. Clinical characteristics of coronavirus disease 2019 in China. *N Engl J Med*. 2020;382:1708-20.
11. Panamerican Health Organization. Boletín de la OPS 11 de marzo de 2020. La OMS Caracteriza a COVID-19 Como Una Pandemia. Available from: <https://www.paho.org/hq>. [Last accessed on 2020 Mar 15].
12. Peng EY, Lee MB, Tsai ST, Yang CC, Morisky DE, Tsai LT, et al. Population-based post-crisis psychological distress: an example from the SARS outbreak in Taiwan. *J Formos Med Assoc*. 2010;109:524-32.
13. Goulia P, Mantas C, Dimitroula D, Mantis D, Hyphantis T. General hospital staff worries, perceived sufficiency of information and associated psychological distress during the A/H1N1 influenza pandemic. *BMC Infect Dis*. 2010;10:322.
14. Borja LE. Fundamentos psicométricos en la evaluación psicológica. *Rev Electrón Psicol Iztacala*. 2004;7:23-43.
15. Daza P, Novy DM, Stanley MA, Averill P. The depression anxiety stress scale-21: Spanish translation and validation with a hispanic sample. *J Psychopathol Behav Assess*. 2002;24:195-205.
16. García-Rivera B, Maldonado-Radillo S, Barón MR. Estados afectivos emocionales (depresión, ansiedad y estrés) en personal de enfermería del sector salud pública de México. *Summa Psicol UST*. 2014;11:65-7.
17. González LZ, Guevara EG, Nava MG, Estala MA, García KY, Peña EG. Depresión, ansiedad y estrés en estudiantes de nuevo ingreso a la educación superior. *RESPYN*. 2018;17:40-7.
18. Carmona CR, Rojas AM, Martínez AN, Martínez EP, García UT. Ansiedad de los estudiantes de una facultad de medicina Mexicana, antes de iniciar el internado. *Invest Educ Méd*. 2017;6:42-6.
19. Carrasco KE. Validación del inventario de ansiedad rasgo-estado en padres con un hijo en terapia intensiva. *Rev Med Inst Mex Seguro Soc*. 2010;48:491-6.
20. Lovibond PF, Lovibond SH. The structure of negative emotional states: comparison of the depression anxiety stress scales (DASS) with the beck depression and anxiety inventories. *Behav Res Ther*. 1995;33:335-43.
21. Gloster AT, Rhoades HM, Novy D, Klotsche J, Senior A, Kunik M, et al. Psychometric properties of the depression anxiety and stress scale-21 in older primary care patients. *J Affect Disord*. 2008;110:248-59.
22. Henry JD, Crawford JR. The short-form version of the depression anxiety stress scales (DASS-21): construct validity and normative data in a large non-clinical sample. *Br J Clin Psychol*. 2005;44:227-39.
23. Spielberger CD. State-trait Anxiety Inventory. Palo Alto, CA: Consulting Psychologists Press; 1983.
24. Iluczek A, Henriques JB, Brown RL. Support for the reliability and validity of a six-item state anxiety scale derived from the state-trait anxiety inventory. *J Nurs Meas*. 2009;17:19-28.
25. Kvaal K, Ulstein I, Nordhus IH, Engedal K. The spielberger state-trait anxiety inventory (STAI): the state scale in detecting mental disorders in geriatric patients. *Int J Geriatr Psychiatry*. 2005;20:629-34.
26. Julian LJ. Measures of anxiety: state-trait anxiety inventory (STAI), beck anxiety inventory (BAI), and hospital anxiety and depression scale-anxiety (HADS-A). *Arthrit Care Res (Hoboken)*. 2011;63 Suppl 11:S467-72.
27. Shigemura J, Ursano RJ, Morganstein JC, Kurosawa M, Benedek DM. Public responses to the novel 2019 coronavirus (2019-nCoV) in Japan: mental health consequences and target populations. *Psychiatry Clin Neurosci*. 2020;74:281-2.
28. Li S, Wang Y, Xue J, Zhao N, Zhu T. The impact of COVID-19 epidemic declaration on psychological consequences: a study on active Weibo users. *Int J Environ Res Public Health*. 2020;17:2032.
29. Lai J, Ma S, Wang Y, Cai Z, Hu J, Wei N, et al. Factors associated with mental health outcomes among health care workers exposed to coronavirus disease 2019. *JAMA Netw Open*. 2020;3:e203976.
30. Liu S, Yang LL, Zhang CX, Xiang YT, Liu Z, Hu S. 2019 novel coronavirus: online mental health services. *Lancet Psychiatry*. 2020;7:611-27.
31. Wang C, Pan R, Wan X, Tan Y, Xu L, Ho CS, et al. Immediate psychological responses and associated factors during the initial stage of the 2019 coronavirus disease (COVID-19) epidemic among the general population in China. *Int J Environ Res Public Health*. 2020;17:1729.
32. Gaygisiz U, Gaygisiz E, Ozkan T, Lajunen T. Individual differences in behavioral reactions to H1N1 during a later stage of the epidemic. *J Infect Public Health*. 2012;5:9-21.
33. Williams L, Regagliolo A, Rasmussen S. Predicting psychological responses to influenza a, H1N1 (swine flu): the role of illness perceptions. *Psychol Health Med*. 2012;17:383-91.
34. Jalloh MF, Li W, Bunnell RE, Ethier KA, O'Leary A, Hageman KM, et al. Impact of Ebola experiences and risk perceptions on mental health in Sierra Leone, July 2015. *BMJ Glob Health*. 2018;3:e000471.
35. Leung GM, Quah S, Ho LM, Ho SY, Hedley AJ, Lee HP, et al. Community psycho-behavioural surveillance and related impact on outbreak control in Hong Kong and Singapore during the SARS epidemic. *Hong Kong Med J*. 2009;15 Suppl 9:30-4.
36. Taha S, Matheson K, Cronin T, Anisman H. Intolerance of uncertainty, appraisals, coping, and anxiety: the case of the 2009 H1N1 pandemic. *Br J Health Psychol*. 2014;19:592-605.
37. Kang L, Ma S, Chen M, Yang J, Wang Y, Li R, et al. Impact on mental health and perceptions of psychological care among medical and nursing staff in Wuhan during the 2019 novel coronavirus disease outbreak: a cross-sectional study. *Brain Behav Immun*. 2020;87:11-7.