

Coronavirus Anxiety Scale: A Validation Study in an Indian Population

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ABSTRACT

Background and Objective: Coronavirus is spreading across the globe since December 2019. As India's first case was reported on January 30, 2020, the spread of this virus is experiencing by our population. As a result, there are extensive emotional distress and anxiety among populations due to this pandemic. Screening mental health is important for psychological well-being of any individual during this pandemic. The objective of this study was to validate the Coronavirus Anxiety Scale (CAS) in an Indian population. **Materials and Methods:** The research proposal was laid out before an ethical clearance committee, which approved the conduct of the research and consequent publication of the paper. Data were collected from 246 respondents through online. CAS, developed by Lee (2020), was adopted for the study. Informed consent was given by all the respondents, and their participation was voluntary. AMOS and SPSS were used to calculate confirmatory factor analysis and other statistical analyses. Bartlett's test of sphericity and Kaiser–Meyer–Olkin (KMO) test, and Cronbach's alpha, were also calculated. Convergent validity was calculated through average variance extracted (AVE) and composite reliability (CR) in Microsoft Excel. **Results, and Conclusions:** Bartlett's test of sphericity was highly significant measuring Chi-square = 494.004, df = 10, and $P < 0.001$. The KMO was acceptable at 0.805. Fit indices ($P < 0.001$, Chi-square/df = 3.24, goodness of fit index = 0.976, Tucker–Lewis index = 0.954, and comparative fit index = 0.977) are statistically significant. Cronbach's alpha coefficient (0.822), AVE (0.526), and CR (0.745) were adequate. The overall findings of the analyses demonstrate that the CAS is a reliable and valid scale that evaluates the severity levels of dysfunctional anxiety linked to COVID-19 in an Indian sample. CAS is applicable to measure the level of dysfunctional coronavirus anxiety in the Indian population.

KEYWORDS: Anxiety, Coronavirus Anxiety Scale, coronavirus, COVID-19, mental health, Wuhan

INTRODUCTION

On the day of December 31, 2019, the World Health Organization (WHO), China Country Office, was informed of pneumonia cases with unknown causes identified in Wuhan, China.^[1] In a short time period, coronavirus spread across the globe. As of 01:30 Greenwich Mean Time on July 6, 2020, 11,555,414 people were infected and 536,720 of them died from the disease.^[2] On July 5, 2020, as of 08:00 India Standard Time, India reported 673,165 confirmed cases and 244,814 of them were active cases, with 19,268 deaths, and 1 migrated case.^[3] India's first case was confirmed

on January 30, 2020, to a person in Kerala's Thrissur district, who returned from Wuhan University in China.^[4] On March 11, 2020, the WHO announced COVID-19 as a pandemic.^[5] As a result of this pandemic, the global economy, not sparing any single nation, has been affected.^[6] The International Labor Organization^[7]

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estimated that around 38% of the global workforce, accounting for 1.25 billion workers, are at a high risk of workforce displacement. Widespread emotional distress and social disorder have occurred among populations due to the pandemic, and these people vary widely in their reactions to anxiety or fear. Pandemic fear or anxiety at moderate levels encourages people to manage the disease, but severe distress may lead to devastation.^[8]

Minimal discussion has occurred on the mental health challenges caused by the pandemic,^[9] and the mental health-care needs of COVID-19-impacted people have not been identified and addressed.^[10] A psychological crisis intervention model is needed to deal with the secondary mental health problems of the people due to this pandemic.^[11] An assessment tool to evaluate coronavirus anxiety is needed,^[12] and this tool may help researchers, policymakers, and medical professionals to identify and understand the clinical signs of coronavirus anxiety.^[12-14] Lee^[12] developed a scale to screen for COVID-19-related anxiety, which is known as Coronavirus Anxiety Scale (CAS), and he claimed that the scale is the first published, scientific measure of COVID-19-related anxiety. Considering the importance of screening the mental health during this pandemic, the current study was an attempt to validate the CAS^[12] in an Indian population.

MATERIALS AND METHODS

Participants and procedure

The research proposal was laid out before an ethical clearance committee, which approved the conduct of the research and consequent publication of the paper. Data were collected from 246 respondents during 11–16 June 2020 through an online Google Forms link distributed across WhatsApp groups, social media, and personal E-mail ids. Informed consent was given by all the respondents, and their participation was voluntary. Of the 246 respondents, 238 responses were valid. Because the study on anxiety occurred during the COVID-19 pandemic, it was necessary for the study to select respondents who had been exposed at least 1 h per day to coronavirus-related matters such as social media, television, and radio to think about the pandemic for the past 2 weeks at the time of filling out the e-questionnaire.

The sample of the study consisted of 140 male individuals and 98 female individuals. A total of 55 (23.11%) respondents held Ph. D. degrees, and 123 (51.68%), 51 (21.43%), and 9 (3.78%) respondents were postgraduates, graduates, and individuals reporting other qualifications, respectively. A total of 68 respondents were college or university teachers (28.57%), and the remaining

individuals were students (39.08%), government employees (18.91%), individuals working in a private organization (8.40%), and housewives (5.04). A majority of the respondents resided in urban areas (58.82%) and 98 respondents resided in rural areas (41.18%). A total of 125 respondents were unmarried (52.82%), 118 respondents (49.58%) were married (49.58%), 1 respondent was divorced (0.42%), and 4 respondents were classified as other groups (1.68%). The mean age of the sample was measured at 32.64 years (standard deviation = 9.38). A total of 6 respondents stayed alone (2.52%), 130 respondents with 4–5 family members (54.62%), 68 respondents with 6 or more family members (28.57%), and 34 respondents with 2 or 3 family members (14.29%). A total of 215 respondents (90.34%) reported no chronic illness, whereas 17 respondents suffered from chronic illness (7.14%), and the remaining 6 respondents did not know whether they had experienced chronic illnesses or not (2.52%). On the date that the respondents submitted e-questionnaires, 232 respondents reported no COVID-19 infection (97.48%) and the remaining 6 respondents tested for the disease and reported no COVID-19 infection (2.52%). For family income, 136 respondents reported earning more than 50,000 Indian Rupees (INRs) per month (57.14%), 40 respondents reported earnings from 40,000 to 50,000 INRs per month (10.08%), 14 respondents reported earnings from 30,000 to 40,000 INRs per month (5.88%), 22 respondents reported earning 20,000–30,000 INRs per month (9.24%), 28 respondents reported earnings from 10,000 to 20,000 INRs per month (11.76%), and 14 respondents reported earnings from 3000 to 10,000 INRs per month (5.88%).

Background information

Questions were asked relating to background information. These questions included gender, area of residence, marital status, age, total number of family members, history of chronic illness, coronavirus diagnosis, and family income.

The Coronavirus Anxiety Scale

The CAS is a mental health screener to identify the possible cases of dysfunctional anxiety associated with the COVID-19 pandemic. It is the first published measure of COVID-19-related psychopathology validated on 775 adults who had reported significant anxiety in the early periods of the pandemic.^[12] The study was conducted with 446 men and 329 women. The CAS is a 5-item and 5-point time-anchored scale. Each item was scored on a scale with the following scores: 0 (not at all), 1 (rare, less than a day or 2), 2 (several days), 3 (more than 7 days), and 4 (nearly every day over the past 2 weeks).

The total was calculated, and it ranged from 0 to 20. Lee^[12] discriminated the respondents associated with dysfunctional anxiety from respondents not associated with dysfunctional anxiety using an optimized cutoff score of ≥ 9 (90% sensitivity and 85% specificity). It is also claimed that the CAS is an effective and valid tool for clinical research and the same result was replicated in another study by Lee.^[14] The findings of this later study demonstrated that the CAS was highly reliable with an alpha value of 0.92 and is a valid measure that meets model fit conventional standards. However, the cutoff score for CAS had to be lowered to ≥ 5 . It was because the sensitivity and specificity rates were to be acceptable at 71% and 74%, respectively. Meanwhile, the diagnostic values on mental health screening were still found within the acceptable ranges. Then, the result of the study on the psychometric characteristics of the CAS showed the consistency nature with the first CAS study and supported the validity of CAS.^[14] Because the CAS was placed in the public domain by the author [Lee,^[12] note in Table 1. Brief mental health scanner], the scale was adopted for the present study.

Statistical analysis

The AMOS statistical tool was used for calculating confirmatory factor analysis (CFA), and the IBM SPSS (Statistics Version 20, developed by International Business Machines, Armonk, New York, USA) Statistics version 20 was used for other statistical analyses in the study. To ensure correct, consistent, useable data, and no missing values in the data, data were cleaned through observation before conducting any of the statistical analyses. Bartlett's test of sphericity and Kaiser–Meyer–Olkin (KMO) test for sampling adequacy, and Cronbach's alpha, which indicates internal consistency, were calculated. To measure convergent validity, average variance extracted (AVE) and composite reliability (CR) were calculated in Microsoft Excel.

RESULTS

Factor structure

To check the sampling adequacy, Bartlett's test of sphericity and KMO test were conducted. Bartlett's test of sphericity was highly significant measuring Chi-square = 494.004, df = 10, and $P < 0.001$. The KMO was acceptable at 0.805. Because the sample indicates that factor analysis may be meaningful and useful, the CAS was then measured through CFA with a maximum likelihood, assuming that the observed variables show continuous and multivariate normal distributions. Several fit indices were used to measure the quality of the CAS model. The adopted threshold and calculated values are shown in Table 1.

Table 1: Adopted and calculated fit indices for confirmatory factor analysis

Fit indices	Adopted threshold	Calculated value
χ^2/df	≤ 5	16.2/5=3.24
GFI	>0.90	0.976
TLI	>0.90	0.954
CFI	>0.90	0.977

Source: Literature review and researcher's calculation.

GFI: Goodness of Fit Index, TLI: Tucker-Lewis Fit Index, CFI: Comparative Fit Index

The overall assessment of the study indicates that $P < 0.001$, Chi-square/df = 3.24, goodness of fit index = 0.976, Tucker–Lewis index = 0.954, and comparative fit index = 0.977, which are statistically significant and within the acceptable conventional thresholds [Table 1]. Therefore, the result from CFA recommended that the CAS evaluates a unidimensional construct.

Convergent validity

The AVE and CR were used for measuring the quality of the CAS model. Fornell and Larcker^[15] stressed that convergence validity is adequate when AVE ≥ 0.5 and CR ≥ 0.7 . The loadings from CFA were transported to Microsoft Excel to calculate AVE and CR. The calculated values of AVE (0.526) and CR (0.745) were adequate, and the measurement model was acceptable. The overall results of the analyses supported the validity of CAS, as the statistics were congruent with the underlying theory.

Internal consistency reliability of the Coronavirus Anxiety Scale

In the present study, the Cronbach's alpha coefficient is measured at 0.822, which confirmed good reliability for the scale.

DISCUSSION

The present study is a humble attempt to adapt the CAS^[12] to evaluate the psychometric properties of this scale in a sample drawn from an Indian population. The findings of the study demonstrate the validity of the CAS, and they support the unidimensional factor structure of Lee.^[12] This finding is aligned with the findings of Evren *et al.*^[16] Prior studies on CAS resulted adequate reliability with Cronbach's alpha coefficients of 0.92^[14] and 0.93^[12] among the participants of the United States of America and 0.80^[16] among the Turkish population, respectively. The present study on CAS in the Indian population showed a Cronbach's alpha coefficient of 0.822, which is a good reliability. Kenny^[17] argued that, in the present day, the most popular measure of model fit is the root mean square error of approximation (RMSEA). Kaiser^[18] recommended a

RMSEA value <0.05 for model fit. The claim was supported by studies by Ferguson and Cox,^[19] Lin *et al.*,^[20] and Wu *et al.*^[21] Large values of RMSEA were suggested by Browne and Cudeck^[22] who mentioned that values up to 0.08 indicate reasonable error fit of approximation. Further, MacCallum *et al.*^[23] highlighted that RMSEA values of 0.01, 0.05, and 0.08 indicate excellent, good, and mediocre fit models, respectively. In a recent publication on measuring model fit, Kenny^[17] argued that a large value of RMSEA is associated with the models showing low N and small dfs. The present study falls under this mandate with $n = 238$ and $dfs = 5$ and measuring RMSEA values of 0.97. Kenny *et al.*^[24] justified that for the models with low df, it is not even necessary to calculate RMSEA. Further, the CFA results with relatively high factor loadings support the statistical significance and demonstrate that the items of CAS were acceptable indicators of the construct. In terms of the convergent validity of the model, AVE (0.526) and CR (0.745) were adequate and the measurement model was accepted. The overall findings of the analyses demonstrate that the CAS is a reliable and valid scale that evaluates the severity levels of dysfunctional anxiety linked to COVID-19 in an Indian sample.

The current study was limited, as the sample size was 238 only. Although the sample does not represent the entire population of India, few studies could accomplish this feat. More importantly, the results of the current study can be replicated in other studies of different samples. The second limitation was the fact that the data were collected online through Google Forms, which may not represent data collected in person. Future studies can replicate the current study with participants using in-person data collection procedures. Finally, the analyses were based on self-report data, which can be biased. Future studies could replicate the results in the current study using other-report procedures.

The findings of this study pronounced that the CAS is applicable to the Indian population to measure the level of dysfunctional coronavirus anxiety. The CAS could be applicable to screen the level of dysfunctional coronavirus anxiety quickly in a busy clinical environment as the scale has only 5 items. It could also enable policymakers and health practitioners to mitigate dysfunctional coronavirus anxiety.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. World Health Organization. Pneumonia of Unknown Cause-China Disease Outbreak News. World Health Organization; 2020. Available from: <https://www.who.int/csr/don/05-january-2020-pneumonia-of-unknown-cause-china/en/>. [Last accessed on 2020 Jun 27].
2. Worldometer. COVID-19 Coronavirus Pandemic, Worldometer; 2020. Available from: <https://www.worldometers.info/coronavirus/>. [Last accessed on 2020 Jul 11].
3. Ministry of Health and Family Welfare Government of India. Ministry of Health and Family Welfare; 2020. Available from: <https://www.mohfw.gov.in/>. [Last accessed on 2020 Jul 11].
4. Rawat M. Coronavirus in India: Tracking Country's First 50 COVID-19 Cases; What Numbers Tell. India Today; 2020. Available from: <https://www.indiatoday.in/india/story/coronavirus-in-india-tracking-country-s-first-50-covid-19-cases-what-numbers-tell-1654468-2020-03-12>. [Last accessed on 2020 Mar 20].
5. World Health Organization. WHO Director-General's Opening Remarks at the Media Briefing on COVID-19. World Health Organization; 2020. Available from: <https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19>. [Last accessed on 2020 Mar 11].
6. Pavlović D, Bodroža D, Vukmirović V. The economic impact of the COVID-19 on the Serbia's Labour market: Statistics and facts. *Eco Analysis* 2020;53:1-13.
7. International Labour Organisation. ILO Monitor: COVID-19 and the World of Work. Updated Estimates and Analysis. 2nd ed. Geneva, Switzerland, International Labour Organisation; 2020. Available from: https://www.ilo.org/wcmsp5/groups/public/dgreports/dcomm/documents/briefingnote/wcms_740877.pdf. [Last accessed on 2020 Apr 20].
8. Taylor S. The Psychology of Pandemics: Preparing for the Next Global Outbreak of Infectious Disease. 1st ed. Newcastle: Cambridge Scholars Publishing; 2019. p. 178.
9. Schwartz BJ. COVID-19 and mental health: A message that needs to be heard. *Psychi News* 2020;55:2-3.
10. Xiang YT, Yang Y, Li W, Zhang L, Zhang Q, Cheung T, *et al.* Timely mental health care for the 2019 novel coronavirus outbreak is urgently needed. *Lancet Psychiatry* 2020;7:228-9.
11. Rana W, Mukhtar S, Mukhtar S. Mental health of medical workers in Pakistan during the pandemic COVID-19 outbreak. *Asian J Psychi* 2020;51:102080.
12. Lee SA. Coronavirus anxiety scale: A brief mental health screener for COVID-19 related anxiety. *Death Stud* 2020;44:393-401.
13. Lee SA. How much "Thinking" about COVID-19 is clinically dysfunctional? *Brain Beha Immu* 2020;87:97-8.
14. Lee SA. Replication analysis of the coronavirus anxiety scale. *Dusunen Adam J Psychi Neuro Sc* 2020;33:203-5.
15. Fornell C, Larcker D. Evaluating structural equation models with unobservable variables and measurement error. *J Mar Res* 1981;18:39-50.
16. Evren C, Evren B, Dalbudak E, Topcu M, Kutlu N. Measuring anxiety related to COVID-19: A Turkish validation study of the Coronavirus Anxiety Scale. *Death Stud*. 2020 Jun 3:1-7. doi: 10.1080/07481187.2020.1774969. Epub ahead of print. PMID: 32490730.
17. Kenny DA. Measuring Model Fit; 2020. Available from: <http://davidakenny.net/cm/fit.htm#:~:text=The%20RMSEA%20is%20currently%20the,%2C%20and%20mediocre%20fit%2C%20>

- respectively. [Last accessed on 2020 Jun 27].
18. Kaiser HF. The application of electronic computers to factor analysis. *Edu Psycho Measu* 1960;20:141-51.
 19. Ferguson E, Cox T. Exploratory factor analysis: A users' guide. *Int J Select Assess* 1951;1:84-94.
 20. Lin CY, Luh WM, Cheng CP, Yang AL, Su CT, Ma HI. Measurement equivalence across child self-reports and parent-proxy reports in the Chinese version of the pediatric quality of life inventory version 4.0. *Child Psychiatry Hum Dev* 2013;44:583-90.
 21. Wu TH, Chang CC, Chen CY, Wang JD, Lin CY. Further psychometric evaluation of the self-stigma scale-short: Measurement invariance across mental illness and gender. *PLoS One* 2015;10:e0117592.
 22. Browne MW, Cudeck R. Alternative ways of assessing model fit. *Socio Meth Res* 1992;21:230-58.
 23. MacCallum RC, Browne MW, Sugawara HM. Power analysis and determination of sample size for covariance structure modelling. *Psycho Meth* 1996;1:130-49.
 24. Kenny DA, Kaniskan B, McCoach DB. The performance of RMSEA in models with small degrees of freedom. *Sociol Meth Res* 2014;44:486-507.