Construction and Preliminary Validation of the COVID-19 Pandemic Anxiety Scale

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ABSTRACT

Background: The current pandemic (COVID-19) has created an unprecedented challenge for the scientific community and ordinary people alike. The pandemic apart from being life-threatening has also created a lot of anxiety among the people. This anxiety can have long term consequences for the individual. The purpose of the present investigation was to develop a short scale to assess COVID-19 pandemic anxiety.

Materials and Method: The data were collected in two phases through online surveys. A total of 318 adult Indian participants formed the sample. In the first phase, data collected from 107 participants on the initial 34 items scale were analyzed through exploratory factor analysis (EFA). For extraction, principal component analysis with oblique rotation was employed. The resulting model was tested in the second phase using confirmatory factor analysis (CFA) with the maximum likelihood method. The resulting COVID-19 pandemic anxiety scale (COVID-19 PAS) was also correlated with an existing scale based on DSM-5, Coronavirus Anxiety Scale.

Results: EFA involving Principal component analysis with oblique rotation identified two factors of COVID-19 pandemic anxiety. The obtained two factors; fear and somatic concerns explained 57.36 percent of the variance. The resulting model was tested using CFA with the maximum likelihood method. The resulting final model indicated an excellent model fit The Cronbach alpha of the short 10 items COVID-19 pandemic scale was 0.80. The correlation between COVID-19 PAS and CAS by Lee was significant (r=0.56, p < 0.01), indicating significant convergent validity of the scale.

Conclusion: The COVID-19 PAS illustrated significant internal consistency and validity. The scale can be a useful instrument to study COVID-19 pandemic anxiety.

INTRODUCTION

The recent outbreak of COVID-19 caused by the SARS-CoV-2 virus has created an unprecedented challenge in front of humanity as a whole. Since the SARS-CoV-2 virus started spreading to different parts of the world, it has changed the way people used to live. In these times of uncertainty, being anxious is obvious. Anxiety is often described as a feeling of worry, nervousness, or unease about something with an uncertain outcome. A certain amount of anxiety has always provoked human species to adapt to the challenges in their environment. This, in turn, has increased the survival capacity of humans. However, over-anxiety and long-term anxiety can be catastrophic for an individual.

The psychological harm caused by the pandemics is huge but difficult to fully assess and understand. Many diseases apart from being life-threatening have also created mental health challenges in the last two decades. Psychological and psychiatric complications like delirium, persistent depression, anxiety, psychomotor excitement, psychotic symptoms, panic attacks, and even suicidal ideation in individuals have been reported in the 2003 phase of SARS[1]. Further, individuals who had scarce resources, with very little means along with students and health professionals were the most affected and have a higher risk of psychological ill health.[2] Social media also

plays a significant role in the modern age. Individuals are bombarded by information on social media platforms. Many times, a near-constant stream of news breaks on the outbreak and unauthentic messages, and rumors create fear, anxiety, and stress among people.[3] There is already an urgent need for substantial mental health services in the country, indicated by the number of suicides for which the common causative factor was the fear of contacting the COVID-19, a financial setback, and societal pressure. [4] Along with that, due to the societal pressure, the fear of isolation, and social stigma, a large number of people are refusing to come forward for testing as well.[5] Similarly, during lockdowns, due to less exposure of the sunlight, noticeable changes in circadian rhythms adversely affecting the physical and mental health has been observed.[6] Current social distancing guidelines, lockdowns, continuous coverage of pandemic news (about coronavirus), social media rumors, the stigma associated with infection, maintaining everyday hygiene, wearing masks and sanitizing things frequently, monitoring contact tracking, excessive worry about being contaminated coupled with the fear of death can produce severe anxiety.

Breaking the socio-economic boundaries, the impact of the SARS-CoV-2 virus on every stratum of society has been profound. It has changed the way one used to travel,

eat, communicate, work, and socialize. Thus, the mental health problems arising due to the pandemic (COVID-19) anxiety needs to be understood and investigated. However, no such tool for assessment exists in the Indian context. Thus, the objective of the current study was to develop a short scale to assess COVID-19 pandemic anxiety by understanding the psychological factors of COVID-19 pandemic anxiety.

MATERIALS AND METHODS

Item construction and selection: The COVID-19 Pandemic anxiety scale (COVID-19 PAS) was constructed after reviewing the relevant literature regarding health anxiety and pandemics. Initially, a pool of 94 items was prepared in English. These items broadly represented the cognitive, behavioral, and physical aspects of anxiety arising due to the pandemic. The items included 1) fear due to the pandemic disease (e.g. COVID-19) 2) work anxiety 3) sleep deprivation 4) effect on social relations 5) fear due to social media coverage of the pandemic 6) pandemic consequences on performance 7) bodily symptoms of anxiety 8) Xenophobia (fear of strangers). The initial pool of 94 items was reduced to 34 items based on the ratings of five health anxiety experts. Two experts were practicing clinical psychologists, one was a defense psychologist and the other two were mental health researchers. The average experience was 15 years. For checking the language and understanding of the items by the participants, the 34 items were administered to 16 individuals as part of the pilot study. Thus, a total of 34 finalized items were included for phase I of the study. Instructions for the study were as follows "Please read the statements carefully and select the most suitable option that applies to you since the pandemic (coronavirus/COVID-19) started spreading in the country". Items were rated on a 4-point scale with 0 scores for 'Did not apply to me at all', 01 for 'Applied to me to some degree, or some of the time', 02 for 'Applied to me to a considerable degree or a good part of the time' and 03 for 'Applied to me very much or most of the time'.

Participants

The total number of participants in the study were 318 Indian adults. The study was divided into two phases. In the first phase, 107 participants with a mean age of 29.79 (SD=10.12) years in the age range of 18-52 were included. 67.3 percent of participants were females and 32.7 percent were males. In this, 46.73 percent were either in service or were self-employed, 38.32 percent were students and 14.95 percent were housewives. In the second phase, 211 participants with a mean age of 24.55 (SD=6.59) years in the age group of 18-53 formed the sample. 38.9 percent of them were males and 61.1 percent females. In this phase, 52.06 percent were either in service or were self-employed. 43.6 percent were students, 0.02 were unemployed and 0.01 percent were housewives.

Tool for validation

The five-point single-factor scale *Coronavirus Anxiety Scale: A brief screener* (CAS) developed by Lee was used for assessing convergent validity.[7] The scale consists of five items measuring dizziness, sleep disturbance, tonic immobility, appetite loss, and nausea or abdominal distress. The scaling format is based on DSM-5.[7] The Cronbach's alpha for the scale was 0.83.

Procedure

The data was collected through online google forms. The link of the forms was shared with the participants using email, WhatsApp, LinkedIn, and Facebook. A Convenience sampling technique was used. As the data was collected online, respondents had the right to not participate in the study. Further, it was mentioned in the google form that by filling the form, the participants give consent to participate in the study. The language of the survey was English. Only participants with a minimum age of 18 were included in the study. Incomplete forms were also not considered. The data collection for the two phases started in the last week of May 2020 and lasted till the last week of June 2020. Due to online data collection, it was possible to collect data from various cities of India. The collection of data was divided into two phases. In the first phase of the study, data from 107 participants on the initial 34 items were collected. Initially, an item-total correlation was calculated for all the 34 items and as all the correlations were above the generally accepted limit of 0.30, all the items were retained. The range of item-total correlation for the 34 items was between 0.36 to 0.73. Thus, the data on the 34 items were further analyzed through a sequence of exploratory factor analysis (EFA) using principal component analysis with oblique rotation. SPSS 21 was used for the analysis. The criteria for the selection of items was that all items with factor loadings of 0.50 and above were retained. However, items with factor loadings on multiple factors with 0.40 or more were dropped. The internal consistency of the scale was assessed using Cronbach's alpha coefficient.

In the second phase of the study, data was collected from 211 participants. Confirmatory factor analysis (CFA) using the maximum likelihood method was performed to assess the fitness of the model developed in the phase I study. Amos 26 was used for the analysis. To assess whether the drawn-out model from the data provides an excellent fit, empirically derived cut-off values by Hu and Bentler's were used.[8] An excellent model fit is indicated by SRMR ≤ 0.08, RMSEA ≤ 0.06, and CFI ≥ 0.95. A Good fit is indicated by GFI ≥ 0.90. Further, the internal consistency of the scale was assessed by Cronbach's alpha. For assessing convergent validity, the obtained scale was correlated with CAS.[7]

RESULTS

Items		Factor 1	Factor 2
I become anxious after watching or hearing pandemic (Coronavirus) related news and updates.	F	**0.85**	-0.12
I am scared of suffering a painful death due to the pandemic (COVID-19).	F	**0.79**	-0.03
In recent times, I often feel scared from the thoughts of death. *	F	**0.76**	0.06

I am afraid to go to the market for buying essentials because I think I'll contact the disease (coronavirus).	F	**0.72**	-0.03
Lockdowns produce a sense of fear in me.	F	**0.70**	0.09
I have become fearful of interacting with strangers.	F	**0.70**	0.02
If I notice an abnormality in my body, I worry it might be a symptom of the pandemic disease (COVID-19).	F	**0.57**	0.19
I feel something awful might happen. *	SC	-0.01	**0.82**
In recent times, I often feel fatigued and powerless.	SC	0.04	**0.78**
I often feel a sense of breathlessness	SC	-0.03	**0.76**
Due to heightened tension, I have been making a lot of silly mistakes.	SC	-0.05	**0.75**
Often my arms and legs feel heavy.	SC	0.19	**0.65**
Eigenvalues		5.51	1.37
% of variance		45.93	11.43

Exploratory factor analysis
To analyze the factor structure of the 34 items in the scale, we ran the principal component analysis with oblique rotation using SPSS (version 21) on the data collected in the phase 1 study. The Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy for the sample collected was 0.87. This is greater than the required threshold of 0.70. Similarly, the Barlett test ($\chi2$ (66) = 563.14 p<0.001) also indicated significant sampling adequacy for performing EFA. The EFA yielded a two-factor solution (See Table 1). Factors with eigenvalues lower than 1 and items with factor loading less than 0.50 were excluded. Similarly, items with factor loadings on multiple factors with 0.40 or more were also dropped. The obtained two factors (12 items) with an Eigenvalue of more than one

explained 57.36 percent of the total variance. This indicated good construct validity for the scale. The first factor alone accounted for 45.93 percent variance. Thus, the obtained factors explained two cardinal attributes of pandemic anxiety namely 'fear' and 'somatic concerns' respectively. Overall, 12 items constituted the COVID-19 PAS. Factor 1, i.e. 'fear' constituted of seven items and Factor 2 (somatic concerns) constituted of 5 items. The results of the EFA are given in Table 1. The correlation between the two factors was 0.55. The coefficient alpha for the scale was 0.89 which indicated a good to excellent reliability. Similarly, the Cronbach alpha for Factor 1 (Fear) was 0.86, and factor 2 (Somatic concerns) was 0.83. This indicated high internal consistency of the scale.

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Bold = Salient (> .50) factor loading. F=Fear; P=Somatic concerns. * Items not included in final scale.
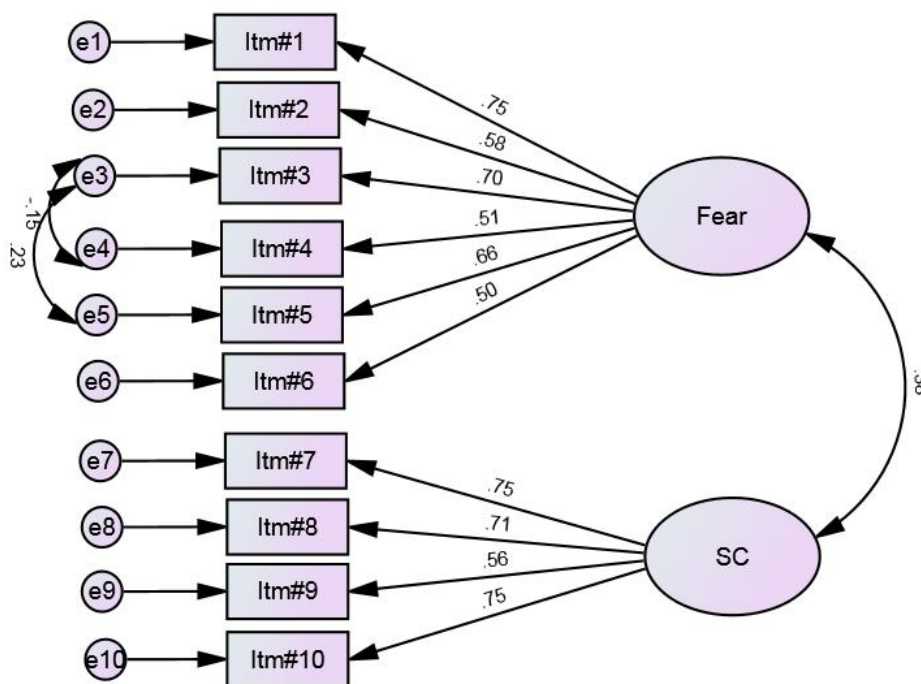
Confirmatory factor analysis

Figure 1: Two factor solution for Covid-19 Pandemic anxiety scale

To confirm the factor structure obtained through EFA, the data collected in the second phase of the study was analyzed using CFA with the maximum likelihood method. The sample size of 211 was around 17 times the number of items in the scale, which made it adequate (sample at least 200 or 5/10 times). The default model, which was obtained from EFA did not reveal excellent modal fit (χ^2 (53) = 216.05, p <0.001, SRMR = 0.10, RMSEA = 0.12, CFI = 0.81, GFI = 0.85) as per Hu and Bentler's criteria. [8] To improve the model, fit, one by one, two items from the respective two factors viz. Fear (F1) and Somatic concerns (F2) were dropped during CFA (see Table 2 and 3). The resulting model (SRMR = 0.06, RMSEA = 0.06, and CFI = 0.96) with two factors and 10 items indicated an excellent model fit as per Hu and Bentler's criteria. [8] The diagram of CFA is given in fig 1. The correlation between the two latent factors of the COVID-19 PAS was 0.38.

Table 2: Confirmatory factor analysis Results (N=211)

Model	χ^2	df	χ^2 /df	GFI	RMSEA	TLI	CFI	SRMR
M (10 item)	56.99**	32	1.78	0.95	0.06	0.94	0.96	0.06

**p<0.01

Table 3: Unstandardized Loadings (Standard Errors) and Standardized Loadings for 2-Factor Confirmatory Model of COVID-19 PAS (N=211)

	Items	Factor	Loadings	
			Unstandardized	Standardized
Itm#1	I become anxious after watching or hearing pandemic (Coronavirus) related news and updates.	F	1.00 (--)	0.75
Itm#2	I am scared of suffering a painful death due to the pandemic (COVID-19).	F	0.77	0.58
Itm#3	I am afraid to go to the market for buying essentials because I think I'll contact the disease (coronavirus).	F	0.91	0.70
Itm#4	Lockdowns produce a sense of fear in me.	F	0.61	0.51

Itm#5	I have become fearful of interacting with strangers.	F	0.91	0.66
Itm#6	If I notice an abnormality in my body, I worry it might be a symptom of the pandemic disease (COVID-19).	F	0.64	0.50
Itm#7	In recent times, I often feel fatigued and powerless.	SC	1.00 (--)	0.75
Itm#8	Due to heightened tension, I have been making a lot of silly mistakes.	SC	0.84	0.71
Itm#9	Often my arms and legs feel heavy.	SC	0.74	0.56
Itm#10	I often feel a sense of breathlessness	SC	0.83	0.75

F: Fear, SC: Somatic Concerns; COVID-19 PAS: COVID-19 Pandemic Anxiety Scale

Reliability analysis

The Cronbach's alpha for the overall 10 items COVID-19 PAS was 0.80, which indicated good reliability of the scale. Further, the Cronbach alpha of 0.79 and 0.78 for the two factors, namely 'fear' and 'somatic concerns' also indicated good reliability of the sub-scales.

Validity analysis

The convergent validity of the scale was established by correlating the COVID-19 PAS with the CAS.[7] There was a significant positive association between the ten items COVID-19 PAS and the CAS (r = 0.56). Similarly, there was positive association between CAS and factor 1 (fear) (r = 0.43) and factor 2 (somatic concerns) (r =0.48) of the COVID-19 PAS. This indicates the significant convergent validity of the COVID-19 PAS (Table 4). The discriminant validity of the scale was estimated by computing the Average variance extracted (AVE). The discriminant validity for factor 1 (fear) was 0.62 and factor 2 was 0.70. Both the scores were greater than the correlation between the two latent factors (r = 0.38). This indicates significant discriminant validity.

Table 4: Cronbach's alpha and Test of convergent validity (CAS and COVID-19 PAS)

	CAS	COVID-19 PAS	F1	F2
Covid-19 PAS	0.56**	(0.80)		
Fear (F1)	0.43**	0.72**	(0.79)	
Somatic concerns (F2)	0.48**	0.89**	0.33**	(0.78)

*p < 0.05; **p < 0.01; N=211. COVID-19 PAS: COVID-19 Pandemic Anxiety Scale; CAS: Coronavirus Anxiety Scale; Values in parentheses indicate Cronbach's alpha for Covid-19 PAS.

DISCUSSION

The purpose of the current study was to develop a short scale for assessing COVID-19 pandemic anxiety. The EFA on the initial 34 items revealed a two-factor solution. The results of the EFA of 34 items revealed that the scale contains 12 items, 7 and 5 in each factor. The first obtained latent factor was 'Fear' and the second factor was 'Somatic concerns'. The results from the CFA confirmed the two-factor structure. However, to achieve an excellent model fit, one item each from the two factors were dropped. The resulting final scale (COVID-19 PAS) contained ten items, 6 and 4 in each factor. The Cronbach's alpha coefficient of the scale and sub-factors revealed good internal consistency of the scale. Similarly, the positive association between COVID-19 PAS and CAS[7] revealed significant convergent validity. The two latent factors namely fear, and somatic concerns also demonstrate significant discriminant validity. Anxiety is often described as a feeling of worry, nervousness, or unease about something with an uncertain outcome. During pandemic like COVID-19, anxiety arises from the fear induced by the environment created by the pandemic. The first factor identifies constant bombardment of pandemic (COVID-19) related news, death anxiety, going outside the home, lockdowns, xenophobia, and excessive concerns for bodily abnormalities as observable behavior underlying the latent construct of fear. The EFA results demonstrate that 46% variance in pandemic anxiety is explained by 'fear' alone. Pandemics also produce a sense of uncertainty and confusion in the environment. This has a direct effect on how people perceive their situation. The second-factor 'somatic concerns' in the scale assesses this aspect. 11.43% percent variance is explained by this latent factor. The items in the scale reveal that the psychological feeling of somatic concerns in an individual to control his or her life during the pandemics is manifested through fatigue, breathlessness, making silly mistakes, and bodily symptoms. The total score obtained on the 10 items COVID-19 PAS can be considered as the measure of COVID-19 pandemic anxiety. The total score on the scale can be obtained by summing all the scores obtained on the 10 items. Similarly, on each factor, separate scores can be obtained. Thus, the scale measures two important aspects of COVID-19 pandemic anxiety.

Pandemics like the Spanish flu or COVID-19 have demonstrated that the psychological impact created by these diseases on the psyche of the individual can be severe. [9, 10, 11, 12] It not only threatens human life but also harms every other aspect of human life; be it psychological, social, or economic. However, the psychological burden experienced by individuals in the form of pandemic anxiety manifested through a heightened amount of fear and somatic concerns in the face of a non-visible enemy like coronavirus is too much for the ordinary being.

The current study empirically demonstrated the reliability and validity of the two factors COVID-19 PAS. Although the scale demonstrates significant reliability and validity, there are certain limitations of the study. Like all the self-report scales, bias arising from social desirability can affect the scores of the scale. Similarly, the age range of participants for the current study was between 18 to 53 years. Due to this, the generalizability of the scale on the older population couldn't be determined. The instrument is not recommended for individual diagnostic purposes. However, the scale can be an important instrument for researchers to conduct surveys for assessing COVID-19 pandemic anxiety.

CONCLUSION

The psychological challenges that human beings face during and after the pandemic is quite demanding. Mental health care during this period should be given considerable importance. The developed COVID-19 PAS can be a useful instrument to study anxiety during the pandemic. The current study revealed two psychological variables namely fear and somatic concerns as the cardinal dimensions of COVID-19 PAS. However, this study only gives preliminary insight into the internal consistency and validity of the scale. As the pandemic situation is unfolding, more studies using the scale will provide further insight.

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