**The Arab COVID-19 Anxiety Syndrome Scale (C-19ASS): COVID-19 anxiety syndrome and psychological symptoms in the Saudi Arabian population**

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**Abstract**

**Introduction:** The COVID-19 Anxiety Syndrome Scale (C-19ASS) is a reliable scale assessing dysfunctional coping strategies activated in response to COVID-19 fear and threat. The present study aimed to provide a validation of the Arabic version of the C-19ASS and to explore the association between the C-19ASS and psychological symptoms syndrome.

**Method:** In Study 1, a community sample of 404 participants completed the Arabic version of the C-19ASS and results were subjected to an Exploratory Factor Analysis. In study 2, a community sample of 903 participants completed the Arabic version of the C-19ASS and a series of measures assessing depressed mood and anhedonia, generalized anxiety and health anxiety. Internal consistency, construct validity, and incremental validity were assessed. Associations between C-19ASS and psychological symptoms were assessed.

**Results:** Factor analysis identified a two-factor solution (i.e., C-19ASS Perseveration and C-19ASS Avoidance) and confirmatory factor analysis suggested a two-factor model best fits the data. The Arabic version of the C-19ASS showed good internal consistency, good construct, and incremental validity. COVID-19 anxiety syndrome was associated with more severe anxiety symptoms, depressive symptoms, and health anxiety. Females had higher levels of COVID-19 anxiety syndrome than males. Participants diagnosed with COVID-19, and those who had experienced loss as a consequence of COVID-19, had higher levels of COVID-19 anxiety syndrome (Perseveration).

**Conclusions:** The Arabic version of the C-19ASS appears to be a reliable and valid measure of the COVID-19 anxiety syndrome. The COVID-19 anxiety syndrome could be a suitable therapeutic target to improve psychological recovery during the COVID-19 pandemic among Arabs.

**Keywords:** COVID-19 anxiety; COVID-19 anxiety syndrome; depression; generalized anxiety; health anxiety.

**Key Practitioner Message**

* The Arabic version of the C-19ASS may allow clinicians and practitioners to identify COVID-19-specific dysfunctional coping strategies which may aggravate health outcomes among Arabs.
* Females had higher levels of COVID-19 anxiety syndrome compared to males.
* Participants diagnosed with COVID-19, and those who had experienced loss as a consequence of COVID-19, had higher levels of COVID-19 anxiety syndrome (Perseveration).
* The COVID-19 anxiety syndrome could be a suitable therapeutic target to reduce psychological symptoms linked to pandemic events among Arabs.

**Introduction**

**COVID-19 in Saudi Arabia (KSA)**

The COVID-19 pandemic spread across the world, including Saudi Arabia (KSA), leading to a health emergency (Salam, Al-Khraif, & Elsegaey, 2021; Zhou et al., 2020). Over 827,365 confirmed COVID-19 infections and nearly 10,000 deaths due to COVI-19 have been reported in Saudi Arabia (KSA) (World Health Organization, 2023). In response to the pandemic, Saudi Arabia (KSA) adapted the World Health Organization (WHO)’s guidelines to control the spread of the virus. Many strict public health measures were implemented by Arabic authorities such as closure of educational institutions, and suspension of religious and recreational events. Furthermore, health campaigns were established to increase awareness about COVID-19 symptoms and preventive measures like social distancing, mask wearing and hands washing, together with vaccination programmes, were adopted (Khan et al., 2021).

The COVID-19 pandemic and the measures adopted to contain the emergency have changed people's daily life (Alzueta et al., 2021; Brailovskaia et al., 2021; Busch, Moretti, Mazzi, Wu, & Rimondini, 2021; Emmelkamp, 2021; Mansueto, Lopes, Grassi, & Cosci, 2021). The rapid spread of COVID-19 in Saudi Arabia (KSA) created panic responses from people to adjust to strategies and control measures, including welfare and relief measures (Patnaik & Maji, 2020; Salam et al., 2021). Moreover, the rapid spread of COVID-19 in Saudi Arabia (KSA) has been found to be associated with an increase in psychological symptoms of stress, affective symptoms, insomnia and obsessive-compulsive symptoms in the general population (Alateeq et al., 2021a; AlAteeq, Aljhani, Alsubaie, Althiyabi, & Majzoub, 2021b; AlHadi, Alarabi, & AlMansoor, 2021; AlHadi & Alhuwaydi, 2021; Alkhamees, Alrashed, Alzunaydi, Almohimeed, & Aljohani, 2020), healthcare providers (Alateeq et al., 2021c; AlAteeq, Aljhani, Althiyabi, & Majzoub, 2020a) and students (AlAteeq, Aljhani, & AlEesa, 2020b; AlHadi & Alhuwaydi, 2021).

Psychological symptoms related to COVID-19 pandemic stressors may have been worsened by dysfunctional coping strategies activated in response to the fear or threat of the COVID-19 pandemic itself, such as avoidant behaviours, checking, worrying and threat monitoring (Akbari, Seydavi, Zamani, Nikčević, & Spada, 2022; Mansueto et al., 2022; Nikčevic, Marino, Kolubinski, Leach, & Spada, 2021; Nikčevic & Spada, 2020). These dysfunctional coping strategies ‘lock’ individuals in a state of fear and threat of COVID-19, impeding the return to daily functioning (Lee, 2020; Nikčevic & Spada, 2020), an possibly maintaining psychological distress beyond the COVID-19 pandemic (Duffy & Allington, 2020; Lee, 2020; Nikčevic & Spada, 2020). Considering that dysfunctional coping strategies may lead to worse clinical conditions (Akbari, et al., 2022; Mansueto et al., 2022; Nikčevic et al., 2021; Nikčevic & Spada, 2020), the development of clinical tools that may help clinicians to recognize COVID-19-specfic dysfunctional coping strategies is a clinical priority (Lee, 2020; Nikčevic & Spada, 2020; Taylor, 2019).

**The COVID-19 Anxiety Syndrome Scale (C-19ASS)**

At the beginning of 2020, Nikčevic and Spada created the COVID-19 Anxiety Syndrome Scale (C-19ASS) to assess COVID-19-specfic dysfunctional cognitive-behavioural coping strategies. The C-19ASS includes two factors: perseveration (i.e., checking, worrying and monitoring because of the fear or threat of COVID-19), and avoidance (i.e., avoidance of public spaces, transport and contact with objects because of the fear or threat of COVID- 19) (Nikčevic & Spada, 2020). The psychometric proprieties of the C-19ASS and the clinical correlates of the COVID-19 anxiety syndrome have been widely explored (Akbari, et al., 2022; Albery, Spada, & Nikčevic, 2021; Hoseinzadeh, Ebadi, Nia, Froelicher, & Rahmatpour, 2022; Mansueto et al., 2022; Muthiah et al., 2022; Nikčevic & Spada, 2020). The C-19ASS was initially validated in a USA community sample (Nikčevic & Spada, 2020) with further validations in other community samples in the UK (Albery et al., 2021), Iran (Akbari, al., 2022; Hoseinzadeh et al, 2022), Indonesia (Muthiah et al., 2022), and Italy (Mansueto et al., 2022) showing good internal consistency, concurrent, divergent, construct and incremental validity.

The COVID-19 anxiety syndrome may contribute to the persistence of psychological symptoms related to the exposure to COVID-19 stressful events (Akbari, et al., 2022; Mansueto et al., 2022; Nikčevic & Spada, 2020). Literature has shown that the perseveration component of the COVID-19 anxiety syndrome predicts COVID-19 anxiety, (Akbari, et al., 2022; Nikčevic & Spada, 2020), generalized anxiety, (Albery et al., 2021; Mansueto et al., 2022), health anxiety (Mansueto et al., 2022), depression (Albery et al., 2021; Mansueto et al., 2022), as well as functional impairments (Akbari, et al., 2022; Albery et al., 2021; Mansueto et al., 2022; Nikčevic & Spada, 2020). In the USA and Iranian samples it has been found that the total COVID-19 anxiety syndrome score mediates the association between Big Five personality traits and generalized anxiety, health anxiety, depressive symptoms and COVID-19 anxiety (Akbari, et al., 2022; Nikčevic et al., 2021). In a recent study in the Italian population, Mansueto and colleagues (2022), exploring the mediating role of the two components of C-19ASS in the association between Big Five personality traits and psychological outcomes, observed that C-19ASS Perseveration mediates the relationship between emotional stability and psychological symptoms (i.e., depression, generalized anxiety and health anxiety), while no significant associations were found between C-19ASS Avoidance and psychological outcomes.

Recent findings have suggested that specific demographic, psychological, and COVID-19 environmental and clinical features may be associated with more severe COVID-19 anxiety syndrome (Akbari, 2022; Mansueto et al., 2022). Females (those who perceive themselves to be vulnerable to COVID-19) and those with lower emotional stability have been found to report more severe COVID-19 anxiety syndrome compared with males, those that did not perceive themselves to be vulnerable to COVID-19, and those with higher emotional stability (Akbari, 2022; Mansueto et al., 2022).

**Aims of the present study**

The present study is aimed at: (1) providing a validation of the Arabic version of the C-19ASS by exploring the factor structure, construct validity, internal reliability, and incremental validity of the Arabic version of the C-19ASS; (2) investigating the association between the COVID-19 anxiety syndrome and psychological symptoms in an Arab population; (3) exploring demographic, clinical, and COVID-19 features that may be associated with more severe COVID-19 anxiety syndrome among Arabs, by investigating differences on C-19ASS on the basis sex, COVID-19 related variables (e.g., been tested for COVID-19, have been vaccinated for COVID-19, having experienced loss as a consequence of COVID-19), and the presence of chronic illness.

**Study 1**

We conducted a first study aimed at providing a preliminary translation and validation of the Arabic version of the C-19ASS by evaluating its factor structure.

**Methods**

***Participants***

A convenience sample was recruited from the general population during March 2021. Participants were eligible for inclusion in the study if they: (1) were 18 years of age or above; (2) resided in Saudi Arabia (KSA); (3) understood written Arabic; and (4) consented to participate. Eligibility criteria were minimal to attract a sample that represented a broad range of individuals.

A total of 404 individuals completed the C-19ASS, 284 (70.3%) of whom were females and 120 (29.7%) of whom were males. The majority of participants (143, 35.4%) were 18-29 years old, 105 participants (26%) were 30-39 years old, 94 (23.3%) were 40-49 years old, 58 (14.4%) were 50-59, and 4(1%) were above 60 years of age. With regards to nationality, 372 (92.1%) were Arabic and the remaining participants stated ‘other’. With regards to education level, 259 (64.1%) were graduates, 42 (10.4%) achieved post-graduate degrees, 35 (8.7%) achieved a diploma degree, and 68 (16.8%) completed high school or less. With regards to civil status, 256 (63.4%) were married, 136 (33.7%) were unmarried, and 12 (3%) were a widower. With regards to working status, 39 (9.7%) were unemployed or retired, 198 (49%) were employed, 95 (23.5%) were housewives, 72 (17.8%) were students.

***Procedure and measures***

This study was approved by the Princess Noura University Institutional Ethics Review Board, reference H-01-R-059 and in accordance with the principles of the Declaration of Helsinki as revised in 2013.

The original C-19ASS (Nikčević & Spada, 2020) was translated into Arabic utilizing the forward and backward-translation method (Sousa & Rojjanasrirat, 2011). First, the C-19ASS was translated into Arabic by two bilingual independent translators. Second, the Arabic version was back translated into English by another two bilingual independent translators. A comparison was made between both the forward and backward translations of the measure to evaluate for any discrepancy of sentence structure and ensure the translation's accuracy. Discrepancies were examined with the collaboration of the authors of the C-19ASS. Third, an expert panel of one methodologist, two associate professors, and four assistant professors reviewed the Arabic version translation individually. After approval by the expert committee for the clarity and content equivalence of the instrument, a prefinal version was piloted with 20 people. Participants were asked about the clarity and understandability of the measure. There were no apparent issues regarding the clarity of the measure, and no changes were required. The final version of the Arabic C-19ASS is found in the Appendix.

Participants were recruited via social media platforms. Those who agreed to participate provided a digital informed consent of privacy protection disclaimer and completed the online questionnaires. Participants were asked to provide also socio-demographic details. The original C-19ASS (C-19ASS; Nikčević & Spada, 2020) is a self-report measure comprising of nine items split into two factors: (1) Perseveration (six items), with items concerning checking (e.g., "I have checked myself for symptoms of coronavirus"), worrying (e.g., "I have imagined what could happen to my family members if they contracted coronavirus"), and threat monitoring (e.g., "I have been paying close attention to others displaying possible symptoms of coronavirus"); and (2) Avoidance (three items) (e.g., "I have avoided touching things in public spaces because of the fear of contracting coronavirus"). Items are rated on a 5-point Likert scale from 0 (“Not at all”) to 4 (“Nearly every day over the last two weeks”) with a total score ranging from 0 to 36. Higher scores indicate higher levels of COVID-19 anxiety syndrome. The C-19ASS has been shown to possess good psychometric proprieties (Nikčević & Spada, 2020).

***Statistical analyses***

To begin, the Kaiser-Meyer-Olkin (KMO) test (Kaiser, 1970) and Bartlett’s test of sphericity (Bartlett, 1937) were performed. Exploratory Factor Analyses using the EFA dimensions package (version 0.1.7.7; O'Connor, 2023) were then run using the polychoric correlation matrix. Considering previous studies reporting a medium to high correlation between factors (e.g., Mansueto et al., 2022) we used Oblimin as the rotation criterion which allows correlation among factors (Osborn, 2015). After examining the variance explained by the model, to ensure that it reached a satisfactory level (i.e., at least 40%), and in line with suggested values in the current literature (Marci et al., 2021), we closely inspected the items’ factor loadings, and we compared the emerged factorial structure with previous literature results.

**Results**

The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was .86, and the Barlett’s test of sphericity was significant (<.001) suggesting that data was suitable for factor analysis. The subsequent EFA was performed on the polychoric correlation matrix showing that – except for item 6 – items loaded clearly on one of the two factors with a primary loading >.40 and a secondary loading < .20. The model explained a satisfactory proportion of variance (i.e., 50%), with the first and the second factor explaining 27% and 23% of the variance respectively. The estimated correlation between the two factors was .57. The factor 1 was labelled “Perseveration” (C-19ASS-P; 5 items) and factor 2 was labelled “Avoidance” (C-19ASS-A; 4 items). The “Avoidance” factor comprised four items, including item No. 4 which in the original scale belongs to the perseveration factor. A summary of the EFA is displayed in Table 1.

**Study 2**

We conducted a second study aimed at evaluating: (1) the construct validity, internal reliability, and incremental validity of the Arabic version of the C-19ASS; (2) the association between COVID-19 anxiety syndrome and psychological symptoms in an Arab population; and (3) the demographic, clinical, and COVID-19 features that may be associated with more severe COVID-19 anxiety syndrome among Arabs.

**Methods**

***Participants***

A convenience sample was recruited from the general population form July 2021 to August 2021. Participants were eligible for inclusion in the study if they: (1) were 18 years of age; (2) resided in Saudi Arabia (KSA); (3) understood written Arabic; and (4) consented to participate. Eligibility criteria were minimal to attract a sample that represented a broad range of individuals.

A total of903 individuals participated in the study, 770 (85.3%) of whom were females and 133 (14.7%) whom were males with a mean age of 32.21±13.06 years. With regards to nationality, 830 (91.9%) were Arabic and the remaining participants stated ‘other’. With regards to civil status, 401 (44.4%) were married, 463 (51.3%) were unmarried, and 39 (4.3%) were divorced or widowers. With regards to education level, 546 (60.5%) were graduates, 78 (8.6%) achieved post-graduate degrees, 63 (7%) achieved diploma degree, and 216 (23.9%) completed high school or less. With regards to working status, 99 (10.9.%) were unemployed or retired, 326 (36.1%) were employed, 173 (19.2%) were housewives, and 306 (33.9%) were students. With regards to chronic diseases, 738 (81.7%) did not report any chronic illness whereas 165 (18.3%) reported at least one chronic illness.

With regards to COVID-19 clinical features, 198 (21.9%) had been diagnosed with COVID-19, 321 (35.5%) had experienced a loss of person (e.g., family members, friends) as a consequence of COVID-19, and 799 (88.5%) had been vaccinated for COVID-19.

***Procedure and measures***

This study was approved by the Princess Noura University Institutional Ethics Review Board, reference H-01-R-059 and in accordance with the principles of the Declaration of Helsinki as revised in 2013. Participants were recruited via social media. Those who agreed to participate clicked a digital informed consent and completed a set of questionnaires via a secure link. Participants were informed that the data was anonymised – no personal identifiers such as name or DOB were collected and neither was it possible for the investigators to trace or contact those who responded. Participants provided some socio-demographic details (e.g., age, gender, district) and information related to COVID-19, i.e., whether they had been diagnosed with COVID-19, whether they had experienced loss as a consequence of COVID-19, and whether they had been vaccinated for COVID-19. They then completed the following batch of self-report measures.

*COVID-19 Anxiety Syndrome Scale* (C-19ASS; Nikčević & Spada, 2020)

The Arabic translated version of the C-19ASS administered in Study 1 was used also in Study 2.

#### *Patient Health Questionnaire (PHQ-2**;* Löwe, Kroenke, & Gräfe, 2005).

#### The PHQ-2 is a self-report measure which consists of the first two items of the PHQ-9 (investigating depressed mood and anhedonia). The items are rated on a 4-point Likert scale from 0 (“Not at all”) to 3 (“Nearly every day”). The total score ranges from 0 to 6, with higher scores indicating higher depressive symptoms. The Arabic version of the PHQ-2 was used (AlHadi et al., 2017). In the present study the PHQ-2 showed good internal consistency (α = .763).

*Generalized Anxiety Disorder 7* (GAD-7; Spitzer, Kroenke, Williams, & Löwe, 2006)

The GAD-7 is a 7-item self-report measure assessing and screening Generalized Anxiety Disorder and its severity during the past two weeks. The items are rated on a 4-point Likert scale from 0 (“Not at all”) to 3 (“Nearly every day”), with a total score ranging from 0 to 21. Higher scores indicate higher levels of generalized anxiety. Scores ranging from 10 to 14 indicate generalized anxiety of moderate severity, and scores ranging from 15 to 21 indicate severe generalized anxiety. The GAD-7 has been shown to possess good psychometric properties (Spitzer et al. 2006). The Arabic version of the GAD-7 was used (AlHadi et al., 2017). In the present study the GAD-7 showed good internal consistency (α = .931).

*Short Health Anxiety Inventory-5* (Bot et al., 2014)

The SHAI-5 is a 5-item self-report measure assessing health anxiety. The items are rated on a 4-point Likert scale from 0 to 3. Higher scores indicate higher levels of health anxiety. The SHAI-5 has been shown to possess good psychometric properties (Bot et al., 2014). The Arabic version of the SHAI-5 was used (Alshayea, 2020). In the present study the SHAI-5 showed good internal consistency (α = .561).

***Statistical analyses***

Statistical analyses followed five steps in order to: (1) test the construct validity by analysing the factor structure of the C-19ASS via CFA; (2) test the invariance between gender groups; (3) evaluate incremental validity; and (4) explore differences in C-19ASS scores between: males *vs* females. Furthermore, we evaluated potential differences in C-19ASS between participants who had been diagnosed with COVID-19 *vs* those who had not been; participants who had experienced loss as a consequence of COVID-19 *vs* those who had not; participants who had been vaccinated for COVID-19 *vs* those who had not; participants form general population with no chronic health problems *vs* participants with at least one chronic disease.

First, descriptive analyses were calculated. Skewness and kurtosis were assessed and were considered adequate for a linear model of analysis in a range of ± 2 (Gravetter & Wallnau, 2016). To evaluate the construct validity of the C-19ASS we analysed the factorial structure of the C-19ASS by performing a series of Confirmatory Factor Analyses (CFA) using the weighted least squares mean and variance (WLSMV) estimation recommended for ordinal data (Flora & Curran, 2004). We tested a unidimensional model (i.e., baseline model in which all items load in one latent factor) and a two factors model which reflect results from the EFA. To evaluate the model fit, we considered several fit indexes, including the chi-square-to-degrees-of-freedom ratio (χ²/df), comparative fit index (CFI), Tucker-Lewis Index (TLI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR). A χ²/df less than 5, CFI and TLI greater than .95, RMSEA less than .08, and SRMR less than .10 were considered cut-off values for acceptable fit (Hu & Bentler, 1999; Schermelleh-Engel, Moosbrugger, & Muller, 2003). Furthermore, the Δχ² between models was calculated.

In terms of scale reliability, we evaluated the average variance extracted (AVE) and the composite reliability (CR) from the estimated factor-model parameters. Values of .50 and .60 (or higher) were considered satisfactory thresholds for AVE and CR respectively (Hair et al., 2022). Furthermore, we evaluated internal consistency via ordinal Cronbach’s alpha on the polychoric correlation matrix.

To examine measurement invariance of the factor structure across gender, multi-group confirmatory factor analyses (MG–CFA) were performed using the WLSMV estimator. Consistent with this procedure, the first models were fit separately for male and female. Configural invariance was then tested by allowing the parameters to remain free across groups. Then, metric and scalar invariance were simultaneously tested by constraining the factor loadings and thresholds to be equal across groups (Muthén & Muthén, 2010). Several fit indices (i.e., CFI, TLI, and RMSEA) were inspected and evaluated following the guidelines reported above, and the differences in χ² and CFI (Δ CFI) were computed between the two proximal models (i.e., configural vs. metric and scalar invariance). A non-significant change in χ² and change in CFI less than .01 between models as well as acceptable model fit indices, were considered evidence of model invariance (Chen, 2007; Cheung & Rensvold, 2002). CFAs and MG–CFA were performed using the *lavaan* package (Rosseel, 2012) of software R (R Development Core Team, 2017)

Moreover, according to Nikčević and Spada’s article (2020), hierarchical linear regression analyses were run to evaluate incremental validity of Arab version of the C-19ASS by observing whether the C-19ASS would explain additional variance in SHAI-5 health anxiety (Bot et al., 2014) when controlling for age, gender, PHQ-2 depression, and GAD-7 anxiety. Statistical assumptions for using hierarchical linear regression analyses were evaluated (Barbaranelli & D’Olimpio, 2006; Field, 2013; Myers, 1990). Effect size was calculated via, Cohen’s f2 (Cohen, 1988; Coolican, 2009, Ialongo, 2016).

Finally, a series of t test for independent samples were run to explore differences on C-19ASS scores between: males *vs* females; participants who had been diagnosed with COVID-19 *vs* those who had not been; participants who had experienced loss as a consequence of COVID-19 *vs* those who had not; participants who had been vaccinated for COVID-19 *vs* those who had not; participants from general population with no chronic health problems *vs* participants with at least one chronic disease. Effect size was calculated via Cohen's d (Cohen, 1988; Coolican, 2009, Fritz et al., 2012).

**Results**

***Construct validity, invariance across gender groups, internal reliability, and incremental validity of the Arab version of the C-19ASS, and association between the COVID-19 anxiety syndrome and psychological symptoms***

Table 2 presents means, standard deviations, ranges, skewness, and kurtosis, suggesting that the variables of interest were overall normally distributed. Table 3 presents the results of CFA, showing the fit indexes of the 1-factor and 2-factor model. The two-factor model (χ2 = 141.95, df =26, χ2/df =5.45, *p* = <.001, TLI = .967, RMSEA = .070 90%CI [.059-.082], SRMR = .044) had the best model fit also supported by the significant χ2 difference between models (Δχ2= 119, df =1, *p* = <.001).

In terms of reliability the AVE was satisfactory for C-19ASS-Avoidance (.50) but slightly below the recommended values for C-19ASS-Perseveration (.47). In contrast, the CR index was adequate for both dimensions (i.e., .80 and .74 on C-19ASS-Perseveration and C-19ASS-Avoidance, respectively). Furthermore, both the C-19ASS-Perseveration (5 items; α = .79) and the C-19ASS-Avoidance (4 items; α = .79) demonstrated acceptable internal consistency. Then, measurement invariance across gender groups was tested on the two dimensions of the C-19ASS (i.e., C-19ASS-Perseveration and C-19ASS-Avoidance).

The CFA performed separately across group reported overall adequate fit in males (*χ*2 = 63.490, df = 26, *p* = <. 001, CFI = .968, TLI = .956, RMSEA = .105 90%CI [.072–.137],) and good fit in females (χ2 = 111.115, df = 26, *p* = <.000, CFI = .977, TLI = .969, RMSEA =.065 90%CI[.053–.078]). Then, multi-group CFA were performed. Configural invariance (unconstrained model) demonstrated a good model fit to the data (χ2 = 173.579, df = 52, *p* = < .001, CFI =.974, TLI = . 964, RMSEA = .072 90% CI [.060–.084]), suggesting that the factor structure is similar across gender. As configural invariance was supported, we held loadings and thresholds invariant across groups (metric and scalar invariance). Again, the model yielded a good fit to the data (χ2 = 176.909, df = 84, *p* = <.001, CFI = .980, TLI= .983, RMSEA = .050 90% CI [.039–.060]). The χ2 difference was not significant (Δχ2(32) = 30.2, *p* = .56) and the CFI difference between the constrained and unconstrained models was less than 0.01 (ΔCFI = .006) and suggesting that metric and scalar invariance were supported.

Correlation analyses showed that both the C-19ASS-Avoidance and C-19ASS-Perseveration were positively correlated with the GAD-7 (C-19ASS-Avoidance r = .215, p<.001; C-19ASS-Perseveration r = .366, p<.001), SHAI-5 (C-19ASS-Avoidance r = .196, p<.001; C-19ASS-Perseveration r = .297, p<.001), and PHQ-2 (C-19ASS-Avoidance r =.259, p<.001; C-19ASS-Perseveration r = .351, p<.001) (Table 3).

Table 4 reports the hierarchical linear regression models examining the incremental validity of the Arabic version of the C-19ASS. Before analysing data, assumptions were tested. Multicollinearity statistics were within acceptable limits (Tolerance Index ranged from .48 to .99, Variance Inflation Factor [VIF] ranged from 1 to 2.09) (Barbaranelli & D’Olimpio, 2006; Bowerman & O’Connell, 1990; Field, 2013; Hair, Anderson, Tatham, & Black 1998). Histograms and normality plots suggested that regression-standardized residuals were normally distributed (Barbaranelli & D’Olimpio, 2006; Field, 2013). Furthermore, the Durbin–Watson test (2.15), seems to indicate that standardized residuals and independent variables were not correlated (Barbaranelli & D’Olimpio, 2006; Field, 2013).

Table 4 shows the hierarchical linear regression examining the incremental validity of the Arabic version of the C-19ASS in the prediction of SHAI-5. The criterion variable (i.e., dependent variable) in the hierarchical regression model was the SHAI-5. The entry order of predictor variables (i.e., independent variables) was the following: age, gender on step 1; GAD-7 on step 2; PHQ-9 on step 3; and C-19ASS-Perseveration and C-19ASS-Avoidance on step 4. Results indicated that C-19ASS-Perseveration contributed an additional 2.3% variance to that explained by all other variables. The final equation indicated that GAD-7, PHQ-2, and C-19ASS-Perseveration were significant predictors of SHAI-5 accounting for a total of 18.4% of the variation in SHAI-5 (F=34.94, df=6, p<.001).

***Differences on C-19ASS on the basis sex, COVID-19 related variables, and chronic illness***

No significant differences were found for gender on C-19ASS-Perseveration (males, mean±SD = 8.48±5.86 *vs* females, mean±SD = 9.42±5.67; t(df)=-1.76 (901), p=.078, Cohen's d = 0.163), while statistically significant differences were observed between males and females on C-19ASS-Avoidance (males, mean±SD = 4.44±3.54 *vs* females, mean±SD = 5.30±3.35; t(df)=-2.70 (901), p=.007, Cohen's d = 0.249).

When participants diagnosed with COVID-19 were compared with those who had not been diagnosed with COVID-19 significant differences were found on C-19ASS-Perseveration (mean±SD= 10.20±6.05 *vs* 9.03±5.58, t(df)=-2.56(901), p=.010, Cohen's d =0.201) but not on C19-ASS-Avoidance (mean±SD= 4.80±3.26 *vs* 5.28±3.42, t(df)=1.74(901), p=.081, Cohen's d =0.143).

No significant differences were found between participants who had been vaccinated from those who had not been vaccinated on C-19ASS-Perseveration (mean±SD= 9.36±5.67 *vs* 8.73±5.91, t(df)=-1.05 (901), p=.292, Cohen's d=0.108), while significant differences were observed on C-19ASS-Avoidance (mean±SD= 5.26±3.35 *vs* 4.48±3.61, t(df)=-2.22 (901), p=.027, Cohen's d =0.224).

Statistically significant differences were observed between participants who had experienced loss as a consequence of COVID-19 and those who had not on C-19ASS-Perseveration (mean±SD= 10.36±6.10 *vs* 8.69±5.39, t(df)=-4.09(901), p<.001, Cohen's d =0.290) but not on C-19ASS-Avoidance (mean±SD= 5.37±3.47 *vs* 5.07±3.34, t(df)=-1.28 (901), p=.202, Cohen's d =0.08).

Finally, no significant differences were observed between participants with at least one chronic disease and those from general population on C-19ASS-Perseveration (mean±SD= 9.75±6.18 *vs* 9.18±5.59, t(df)=-1.07 (901), p=.284, Cohen's d =0.093) and on C-19ASS-Avoidance (mean±SD= 5.31±3.71 *vs* 5.14±3.31, t(df)=-.527 (901), p=.598, Cohen's d =0.048).

**Discussion**

The aim of our work was provide a preliminary validation of the Arabic version of the C-19ASS, explore the association between COVID-19 anxiety syndrome and psychological symptoms in an Arab population, and explore which demographic, clinical, and COVID-19 features could be associated with more severe COVID-19 anxiety syndrome, among Arabs.

**Validation of the Arab version of C-19ASS and association between COVID-19 anxiety syndrome and psychological symptoms**

The EFA showed that the Arab version of the C-19ASS is composed by nine items divided in two factors corresponding to the two sub-scales of perseveration (five items) and avoidance (four items). The CFA confirmed the two factors solution where the two-factor solution model outperformed the one-factor solution model. The conclusive version of the Arab C-19ASS showed a good fit for the data and adequate levels of reliability. These results are partially consistent with the C-19ASS developed by Nikčevic and Spada (2020) and with validations of C-19ASS in community samples (Akbari, et al., 2022; Mansueto et al., 2022). Different from the original version of the C-19ASS (Nikčevic & Spada, 2020), in the Arabic version of the C-19ASS the item “I have been concerned about not having adhered strictly to social distancing guidelines for coronavirus COVID-19” is not included in the C-19ASS Perseveration factor but in the C-19ASS Avoidance factor. This result could be attributable to cultural differences as well as to some translation issues. Further studies aimed to explore cross-cultural differences on C-19ASS are needed.

Overall, the C-19ASS Perseveration and the C-19ASS Avoidance scores are similar to what has been found among Iranian participants (Akbari, al., 2022) and among Italian participants (Mansueto et al., 2022). Concerning the incremental validity, hierarchical linear regression analyses showed that C-19ASS Perseveration added significant additional variance in the prediction of health anxiety (i.e., SHAI-5, Bot et al., 2014) over and above age, gender, and depression, while generalized anxiety outperformed all model variables. On the other hand, hierarchical linear regression analyses have shown that C-19ASS Avoidance did not add a significant variance in the prediction of SHAI-5 to that explained by all other variables. Consistent to a previous study (Mansueto et al., 2022) it may be assumed that C-19ASS Perseveration may be more dysfunctional than C-19ASS Avoidance.

Correlation analyses showed that COVID-19 anxiety syndrome was associated with more severe anxiety symptoms, depressive symptoms, and health anxiety. The findings are consistent with previous studies, suggesting that COVID-19 anxiety syndrome may be associated with poor health outcomes (Akbari et al., 2022; Mansueto et al., 2022; Nikčevic et al., 2021; Nikčevic & Spada, 2020).

**Demographic, clinical, and COVID-19 features associated with more severe COVID-19 anxiety syndrome among Arabs**

Exploring gender differences related to C-19ASS, the findings of the present study showed hat females had higher levels of C-19ASS Avoidance than males. An explanation for this result may lie with previous results, which showed that females are more likely to engage in heightened avoidance than males (Graham, Weiner, & Li, 2020). This finding is consistent with previous evidence suggesting that females may show more severe COVID-19 anxiety syndrome than males (Akbari et al., 2022; Mansueto et al., 2022).

Moreover, our findings suggested that participants diagnosed with COVID-19 had higher levels of C-19ASS Perseveration than those who had not been diagnosed with COVID-19. The higher levels of C-19ASS Perseveration in participants diagnosed with COVID-19 may be related to the fact that the diagnoses of COVID-19 may increase different manifestations of worry about COVID-19, e.g., persistent worry about COVID-19 and its negative consequences, dysfunctional worry about COVID-19 infection and bodily preoccupations (Asmundson & Taylor, 2020; Busch et al., 2021; Cosci & Guidi, 2021; Labrague & De Los Santos, 2021; Sahashi et al., 2021; Wahlund et al., 2021).

As been found elsewhere (Mansueto et al., 2022), no significant differences were found between participants who had been vaccinated from those who had not been vaccinated on C-19ASS Perseveration and on C-19ASS Avoidance. Additionally, our findings suggested that participants who had experienced loss as a consequence of COVID-19 had higher levels of C-19ASS Perseveration than those who had not experienced loss as a consequence of COVID-19. A possible explanation for this finding is that bereaved individuals are more likely to engage in specific forms of preservative thinking such as worry (Eisma, Boelen, Schut, & Stroebe, 2017; Eisma, de Lang, & Boelen, 2020). This could be expected in that the death of a loved one due to COVID-19 may increase worrisome thoughts (Eisma et al., 2017; Eisma et al., 2020) about COVID-19 e.g., worry about the risk of being infected by COVID-19, worry about the risk that friend and family are infected by the COVID-19, worry about the effects of COVID-19 on one’s own physical health. Among Arabs, C-19ASS Perseveration appears to have been engaged in as a dysfunctional coping strategy following the death of a loved one due to COVID-19.

Finally, no significant differences were observed between participants with and without chronic disease on the levels of C-19ASS Perseveration and C-19ASS Avoidance, suggesting that presence of chronic disease seems not be a clinical marker of the COVID-19 anxiety syndrome, at least in the Arab population. However, given that is not possible to compare this finding with literature because no studies have explored the association between chronic disease and COVID-19 anxiety syndrome yet, and our data do not allow for further speculation, caution should be paid when interpreting these results.

**Clinical implications**

The Arabic version of the C-19ASS may be a useful measure to assess COVID-19-specfic dysfunctional coping strategies (i.e., perseveration and avoidance) that may worsen health outcomes in the Arab population. Among Arabs, rehabilitative interventions aimed to reduce these dysfunctional coping strategies and promote alternative styles of thinking and behaviours could be considered in order to reduce the severity of COVID-19 anxiety syndrome (Nikčevic & Spada, 2020). Moreover, among Arabs diagnosed with COVID-19 and among those that have experienced loss as a consequence of COVID-19, psychological treatments aimed to reduce the severity of C-19ASS Perseveration (e.g., metacognitive therapy; Wells, 2000), may allow to improve their psychological recovery after receiving the diagnoses of COVID-19 or after experiencing the death of a loved one due to COVID-19.

**Limitations**

Results of this study must be considered taking into account design limitations. Firstly, the participants in this study may not have been representative of the general Arab population given that the sample was self-selected. Secondly, a cross-sectional design was adopted precluding the possibility to drawn conclusions on the causal relationship between COVID-19 anxiety syndrome and psychological symptoms. Thirdly, self-report biases, social desirability, context effects and poor recall may have contributed to errors in self- report measurements. Fourthly, a high proportion of females participated in the study, which, in turn, should suggest that data on invariance should be interpreted with caution. Fifthly, the data collection time-frame may have affected the study results due to the COVID-19 phase in Saudi Arabia (KSA) and preventive measures taken by the authorities (e.g. quarantine, limited social contact). The employment of a longitudinal study designs and ensuring a more diverse sample of participants are warranted.

**Conclusions**

The Arab version of the C-19ASS is a measure that could be useful in better understanding the developing concept of the COVID-19 anxiety syndrome and its effect on psychological symptoms among Arabs. The COVID-19 anxiety syndrome could be a possible therapeutic target to enhance psychological recovery during the COVID-19 pandemic among Arabs.

**Authors’ contributions**

A. Alhakami: Data curation, writing - review and editing. Victoria Salem: Writing - review and editing. Deemah Alateeq: Writing - review and editing. Ana V. Nikčević: Writing - review and editing. Tatiana Marci: Formal analysis, interpretation of data. Sara Palmieri: Writing - review and editing, formal analysis, interpretation of data. Marcantonio M. Spada: Conceptualization, writing - review and editing, interpretation of data. Giovanni Mansueto: Conceptualization, interpretation of data, writing - original draft, writing - review and editing. All authors have approved the final article.

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**Table 1**. The Arabic version of the COVID-19 Anxiety Syndrome Scale (C-19ASS Arabic) factor loadings.

|  |  |  |
| --- | --- | --- |
|  | **Factor 1 Perseveration** | **Factor 2 Avoidance** |
| 1.I have avoided using public transport because of the fear of contracting coronavirus (COVID-19). | .00 | **.61** |
| 2. I have checked myself for symptoms of coronavirus (COVID-19). | **.55** | .07 |
| 3. I have avoided going out to public places (shops, parks) because of the fear of contracting coronavirus (COVID-19). | -.09 | **.75** |
| 4. I have been concerned about not having adhered strictly to social distancing guidelines for coronavirus (COVID-19). | .21 | **.52** |
| 5. I have avoided touching things in public spaces because of the fear of contracting coronavirus (COVID-19). | .06 | **.68** |
| 6. I have read about news relating to coronavirus (COVID-19) at the cost of engaging in work (such as writing emails, working on word documents or spreadsheets) | **.37** | .29 |
| 7. I have checked my family members and loved one for the signs of coronavirus (COVID-19). | **.94** | -.07 |
| 8. I have been paying close attention to others displaying possible symptoms of coronavirus (COVID-19). | **.74** | .05 |
| 9. I have imagined what could happen to my family members if they contracted coronavirus (COVID-19). | **.50** | .34 |

Note: N= 404

**Table 2**. Means, standard deviations, ranges, and inter-correlations of the study variables.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **Mean ±SD** | **Range** | **Skewness** | **Kurtosis** | **1** | **2** | **3** | **4** | **5** | **6** |
| 1 | Age | 32.21±13.06 | 13-100 | .86 | .19 | 1 | -.085\* | -.125\*\* | -.169\*\* | -.171\*\* | -.101\*\* |
| 2 | C-19ASS-A | 5.17±3.39 | 0-12 | .271 | -.731 |  | 1 | .594\*\* | .259\*\* | .215\*\* | .196\*\* |
| 3 | C-19ASS-P | 9.28±5.71 | 0-24 | .332 | -.619 |  |  | 1 | .351\*\* | .366\*\* | .297\*\* |
| 4 | PHQ-2 | 2.20±1.88 | 0-6 | .566 | -.668 |  |  |  | 1 | .709\*\* | .353\*\* |
| 5 | GAD-7 | 7.14±6.07 | 0-21 | .715 | -.500 |  |  |  |  | 1 | .394\*\* |
| 6 | SHAI-5 | 5.29±2.71 | 0-15 | .403 | .123 |  |  |  |  |  | 1 |

Notes: n=903; \*p<0.05; \*\*p<0.001; C-19ASS-P = COVID-19 Anxiety Syndrome Scale-Perseveration; C-19ASS-A = COVID-19 Anxiety Syndrome Scale-Avoidance;PHQ-2 = Patient Health Questionnaire 2; GAD-7 = Generalized Anxiety Disorder 7; SHAI-5 = Short Health Anxiety Inventory-5

**Table 3**. Model fit indices of confirmatory factor analysis for the Arabic C19-ASS.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **χ2** | **DF** | **χ2/df** | **CFI** | **TLI** | **RMSEA** | **SRMR** |
| **One-factor solution** | 367.55 | 27 | 13.61 | 0.929 | 0.906 | 0.118 | 0.067 |
| **Two-factor solution** | 141.95 | 26 | 5.45 | 0.976 | 0.967 | 0.070 | 0.044 |

Note. All indexes are scaled. *χ*2 = chi-square index; df= degrees-of-freedom; χ²/df= chi-square-to-degrees-of-freedom ratio; CFI = comparative fit index; TLI = Tucker-Lewis Index; RMSEA = root mean square error of approximation; SRMR = standardized root mean square residual.

**Table 4.** Hierarchical regression analyses predicting Short Health Anxiety Inventory-5 (SHAI-5) scores.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Predictors** | **B** | **Std. Error** | **β** | **t** | **R** | **R2** | **Adjusted R2** | **ΔR2** | **95% Confidence interval for B** | | **Cohen’s f2** |
| **Lower Bound** | **Upper Bound** |
| Model |  |  |  |  |  |  |  |  |  | |  |
| Step 1 |  |  |  |  | .11 | .01 | .01 | .01\* |  |  |  |
| Age | -.02 | .01 | -.09\* | -2.91 |  |  |  |  | -.03 | -.01 |  |
| Gender | .36 | .25 | .05 | 1.43 |  |  |  |  | .14 | .86 |  |
| Step 2 |  |  |  |  | .40 | .16 | .15 | .14\*\* |  |  |  |
| Age | -.01 | .01 | -.03 | -1.07 |  |  |  |  | -.02 | .01 | 0.19 |
| Gender | .11 | .24 | .15 | .48 |  |  |  |  | -.35 | .58 |  |
| GAD-7 | .17 | .01 | .39 | 12.40\*\* |  |  |  |  | .14 | .20 |  |
| Step 3 |  |  |  |  | .41 | .17 | .16 | .01\*\* |  |  |  |
| Age | -.005 | .01 | -.03 | -.85 |  |  |  |  | -.02 | .01 |  |
| Gender | .10 | .23 | .01 | .41 |  |  |  |  | -.36 | .56 | 0.20 |
| GAD-7 | .13 | .02 | .29 | 6.59\*\* |  |  |  |  | .09 | .17 |  |
| PHQ-2 | .21 | .06 | .14 | 3.34\*\* |  |  |  |  | .09 | .33 |  |
| Step 4 |  |  |  |  | .43 | .19 | .18 | .02\*\* |  |  |  |
| Age | -.004 | .01 | -.02 | -.57 |  |  |  |  | -.02 | .01 |  |
| Gender | .07 | .23 | .01 | .29 |  |  |  |  | -.39 | .52 |  |
| GAD-7 | .11 | .02 | .25 | 5.74\*\* |  |  |  |  | .07 | .15 | 0.23 |
| PHQ-2 | .16 | .06 | .11 | 2.62\* |  |  |  |  | .04 | .29 |  |
| C-19ASS-Avoidance | .02 | .03 | .02 | .56 |  |  |  |  | -.04 | .08 |  |
| C-19ASS-Perseveration | .07 | .02 | .15 | 3.82\*\* |  |  |  |  | .03 | .11 |  |

Notes: N=903; \*\*p<0.001\*p<.05; Gender (0=Male, 1=Female); GAD-7 = Generalized Anxiety Disorder 7; PHQ-2 = Patient Health Questionnaire 2; C-19ASS = COVID-19 Anxiety Syndrome Scale

**Appendix: ARABIC VERSION OF THE COVID-19 ANXIETY SYNDROME SCALE (C-19ASS ARABIC)**

**مقياس متلازمة القلق الناتج عن كوفيد – 19**

فيما يلي مجموعة من العبارات تخص كيفية تعامل الأفراد مع فيروس كورونا (كوفيد – 19). يرجى تقييم إلى أي مدى تنطبق عليك كل عبارة **على مدار الأسبوعين الماضيين.**

لا تنطبق على الإطلاق = 0

نادرة الحدوث، أقل من يوم واحد أو يومين = 1

عدة أيام = 2

أكثر من سبعة أيام = 3

يوميًا تقريبًا = 4

1-تجنبت استخدام وسائل النقل العامة خوفًا من الإصابة بفيروس كورونا (كوفيد – 19).

2-تحققت من وجود أعراض فيروس كورونا (كوفيد – 19) لدَيَّ .

3-تجنبت الذهاب للأماكن العامة (المحلات التجارية والحدائق العامة) خوفًا من الإصابة بفيروس كورونا (كوفيد – 19).

4-قلقت من عدم التقيد الصارم بإجراءات التباعد الاجتماعي الخاصة بفيروس كورونا (كوفيد – 19).

5-تجنبت لمس الأشياء في الأماكن العامة خوفًا من الإصابة بفيروس كورونا (كوفيد – 19).

6-قرأت الأخبار المتعلقة بفيروس كورونا (كوفيد – 19) على حساب تأدية مهام العمل (مثل كتابة رسائل البريد الإلكتروني أو العمل على جداول البيانات وغيرها).

7-تحققت من ظهور أعراض فيروس كورونا (كوفيد-19) على أفراد أسرتي ومن يهمني أمرهم.

8- انتبهت بدقه للآخرين الذين تظهر عليهم أعراضًا محتملة لفيروس كورونا (كوفيد – 19).

9- تخيلت ما يمكن أن يحدث لأفراد أسرتي في حالة إصابتهم بفيروس كورونا (كوفيد – 19)