

## Article

# Predictors of Anxiety in the COVID-19 Pandemic from a Global Perspective: Data from 23 Countries

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**Abstract:** Prior and ongoing COVID-19 pandemic restrictions have resulted in substantial changes to everyday life. The pandemic and measures of its control affect mental health negatively. Self-reported data from 15,375 participants from 23 countries were collected from May to August 2020 during the early phases of the COVID-19 pandemic. Two questionnaires measuring anxiety level were used in this study—the Generalized Anxiety Disorder Scale (GAD-7), and the State Anxiety Inventory (SAI). The associations between a set of social indicators on anxiety during COVID-19 (e.g., sex, age, country, live alone) were tested as well. Self-reported anxiety during the first wave of the COVID-19 pandemic varied across countries, with the maximum levels reported for Brazil, Canada, Italy, Iraq and the USA. Sex differences of anxiety levels during COVID-19 were also examined, and results showed women reported higher levels of anxiety compared to men. Overall, our results demonstrated that the self-reported symptoms of anxiety were higher compared to those reported in general before pandemic. We conclude that such cultural dimensions as individualism/collectivism, power distance and looseness/tightness may function as protective adaptive mechanisms against the development of anxiety disorders in a pandemic situation.

**Keywords:** COVID-19 pandemic; SARS-CoV-2 infection; anxiety; stress; cross-cultural; individualism; collectivism; power distance; looseness; tightness

## 1. Introduction

COVID-19 (SARS-CoV-2) was officially declared a global pandemic on 11 March 2020 by the World Health Organization [1]. Following this declaration, countries around the world started to implement public policy to reduce the spread of the virus, such as implementing social distance guidelines and restricting large gatherings. During the first

wave of the COVID-19 outbreak, countries introduced various restrictions. Some countries instituted lockdowns and banned all nonessential travel (for example, regions of Canada, Iran, Italy, some states of the USA); others announced partial quarantine and restrictions of varying degrees (Russia, Brazil, Turkey), and some countries limited themselves to advisory measures (Belarus).

COVID-19's impacts can be observed at both the individual and community level. Prior and ongoing COVID-19 restrictions are taking a toll on people's modern lifestyle. Recently published data from 2020 based on sample of adult from different countries revealed that social isolation, and resulting loneliness, are associated with both poorer mental and physical health [2,3]. There is evidence that the pandemic, and measures to control it, have negative associations with mental health and important psychosocial and economic consequences [2,4–7] that are affecting children and adults [8–11]. Regarding the contribution of age to stress levels, the data generally indicate that older people are less stressed and less affected by the psychological effects of isolation, whereas being younger predicted higher distress scores [2–4]. Additionally, a review of studies across 10 countries that experienced SARS, Ebola, the H1N1 influenza pandemic, MERS and equine influenza, reported negative psychological effects of quarantine and demonstrated that the psychological impact of quarantine is wide-ranging, substantial, and can be long-lasting [2]. Indeed, prior research on the impact of epidemics, such as SARS, MERS and Ebola, have demonstrated a significant association with symptoms of anxiety due to health threats and people's desire to protect themselves and their loved ones against contagion [2,12–17].

Furthermore, the likelihood of contracting COVID-19 can increase anxiety [18]. Considering that the COVID-19 pandemic has been ongoing, it is obvious that we are facing consequences such as long-term stress, threats to the immune system and increasing susceptibility to viral infections [19]. The increase in anxiety has resulted in an increase of both physical and psychological symptoms, such as feeling nervous, fearful, tense palpitations, hyperventilation and rapid breathing [20,21]. Outside of a global pandemic, women tend to report greater anxiety and stress compared to men [2,22–25], and recent studies on stress levels during a pandemic indicate the same trend [3,7,26,27].

Beyond the individual level, there are community-level factors to consider when examining the associations between COVID-19 and associated outcomes, such as presence (or absence) of other people during the pandemic, intimate relationships and number of children. Participants who rated high in loneliness showed high rates of hostility, depression, insomnia and anxiety before COVID-19 [3,28–30]. For example, a meta-analysis on the harmful effect of loneliness before the pandemic concluded that loneliness is a risk factor for all-cause mortality [31]. However, high-density environments, such as crowding in residential and laboratory settings and household crowding, can also be stressful [32,33], results similar to those in a recent examination on spatial activity in the COVID-19 pandemic [16]. Recent research by Kowal and colleagues (2020) suggested that the association between stress and whom people are living with during isolation is somewhat U-shaped, meaning those who live alone, and those who are overcrowded, experience the highest levels of stress [3].

Culture (e.g., social norms and moral institutions, social distancing rules and social network structure) may be an important factor affecting stress levels during the pandemic. Members of the same culture are socialized to use their culturally specific values to guide their daily survival processes, and there are significant cross-cultural differences in how people assess stressors, choose coping strategies and indicators of adaptive outcomes. Recent research has been published on the effects of COVID-19 on well-being, broadly defined, using cross-cultural samples. For instance, Limcaoco and colleagues (2020) gathered data across 41 countries from 17 March to 1 April 2020, wherein it was demonstrated that the level of anxiety increased [26]. However, a notable limitation of this study was the lack of examination between and within country differences. In another paper, Kowal and colleagues (2020) collected data from 26 countries to examine associations between COVID-19 and stress. Results from this study showed higher levels of stress were associated with

younger age, being a single woman, lower level of education, staying with more children, and living in a country that has been severely impacted by COVID-19 [3]. In particular, those from Croatia, Japan, Poland and Turkey reported the highest levels of perceived stress. However, further details on cultural differences were not reported. Lastly, Mækelæ and colleagues (2020) assessed how effective a range of restrictions were perceived, how severely they affected daily life, general distress and paranoia during the early phase of the outbreak in Brazil, Colombia, Germany, Israel, Norway and the USA [4]. These authors found a large effect of the country of residency on perceived efficacy of specific restrictions, and that participants from Brazil, Colombia and the USA reported the highest level of distress, whereas people from Israel, Norway and Germany had comparatively lower levels of distress [4]. Again, this study did not explicitly focus on cultural differences, which leaves a dearth of understanding in how culture influences perceptions of the pandemic. Culture is a useful aspect to understand the variations of coping strategies and their effects [34,35].

Many of these studies have raised questions about the impact of cultural dimensions on the course of a pandemic. One of the main focuses of research in this area is the individualism–collectivism dimension [36,37]. Collectivistic vs. individualistic societies put more emphasis on group interest over personal interests and enjoyment [38]. People from collective cultures focus on caring for others, alleviating the negative psychological effects of restrictions and lockdown. Stress levels are expected to be higher for individualistic versus collectivist cultures [3].

The dimension of cultural tightness-looseness refers to the strength of cultural norms [39]. A tight culture (e.g., Pakistan, Singapore, South Korea and China) allows little room for individual liberty and poses high censoring pressure, whereas a loose culture provides members more room for discretion [39]. In tight societies, state authorities tend to make strict behavioral guidance for the public (e.g., social distancing, wearing masks, tracking individual health conditions) and closely monitor and punish deviance [40].

These two constructions (collectivism–individualism and tightness–looseness) are related but clearly differentiated constructs, although collectivism and tightness covary moderately [38,39,41]. In the study of Kowal and colleagues (2020) there was no differences in perceived stress levels between countries with varying levels of individualism, but it stated “that people from collectivistic cultures may feel more stressed over their financial burdens than people from individualistic cultures, whereas people from individualistic cultures may treat the current situation as a threat to their need for self-expression and freedom” [3]. Cao and colleagues (2020) showed that neither the Individualism Scale nor the Tightness Index is sufficient to account for differences between countries in COVID-19 containment results [42].

In the process of evolution, humankind has been exposed to various environmental stressors and high pathogen pressure, and pandemics were among them. The ongoing COVID-19 pandemic poses a real threat to humans and demonstrates the current relevance of cultural factors. The fear of any natural threats, according to evolutionary behavioral sciences, is an adaptive defense mechanism, which is necessary for survival [43–45]. Experience from previous epidemics shows that the severity of stress depends on the duration and degree of quarantine, feelings of loneliness, fear of infection, (in)adequate information and stigma [2,45,46]. Hence, it is highly probable that anxiety responses to the threat of COVID-19 may change what has been considered normal for everyday functioning, but individuals will likely vary in their reported responses. It is highly probable to observe some visible changes in human behavior as a consequence of the current pandemic [47].

The goal of the present study was to examine possible factors that may be associated with self-reported levels of anxiety during the first wave of the COVID-19 pandemic (from May to August 2020). We hypothesized that spread of the pandemic, isolation measures, and restrictions would result in increased depression symptoms and would worsen the psychological well-being of people world-wide during COVID-19 first wave lockdown. We also hypothesized that cultural dimensions, such as individualism/collectivism, power

distance, tightness/looseness, and previous familiarity with infections would affect the level of anxiety in society.

## 2. Methodology of the Study

### 2.1. Ethics Statement

The study was conducted according to the principles expressed in the Declaration of Helsinki. The Scientific Council of the Institute of Ethnology and Anthropology of the Russian Academy of Sciences (protocol No 01, dated 9 April 2020) approved the protocols used to recruit participants and to collect data before conducting this study. All participants provided informed consent via a Google form before completing the survey.

### 2.2. Participants

Self-reported data from 15,375 participants were collected from May to August 2020 (see Table 1 for details of sample). The sample comprised of people from 23 countries (seven from Europe: Belarus, Bulgaria, Croatia, Hungary, Italy, Romania, Russia; 11 from West, South and Southeast Asian: Armenia, India, Indonesia, Iran, Iraq, Jordan, Malaysia, Pakistan, Saudi Arabia, Thailand, Turkey; two African: Nigeria and Tanzania; and three from North, South, and Central America: Brazil, Canada, USA).

The mean age of total sample was 29 years old and mean scores of ages in each country are described in Table 1. The minimal age of respondents was 18-years-old, and the maximum, 89 years old.

**Table 1.** Distribution of sample by country, sex <sup>1</sup> and age.

COUNTRY	Survey Language	Total N	SEX		Mean Age (±SD)
			Men	Women	
ARMENIA	Armenian	33	27	6	20.45 (±2.37)
BELARUS	Russian	338	143	195	19.20 (±2.85)
BRAZIL	Portuguese	515	82	430	38.80 (±13.78)
BULGARIA	Bulgarian	322	129	193	28.34 (±8.75)
CANADA	English	692	446	246	30.33 (±8.74)
CROATIA	English	275	71	204	24.10 (±8.40)
HUNGARY	Hungarian	235	35	198	31.95 (±11.84)
INDIA	English	383	213	170	29.95 (±9.85)
INDONESIA	Indonesian	930	504	424	32.05 (±12.09)
IRAN	Persian	306	88	217	33.68 (±7.34)
IRAQ	Arabic	173	88	85	35.03 (±10.63)
ITALY	Italian	253	44	208	23.50 (±4.15)
JORDAN	Arabic	449	121	328	33.68 (±10.52)
MALAYSIA	Malay	1087	478	609	33.19 (±11.12)
NIGERIA	English	316	214	102	34.09 (±11.24)
PAKISTAN	English	484	212	272	27.06 (±11.11)
ROMANIA	Romanian	269	42	226	36.22 (±10.94)
RUSSIA	Russian	1903	486	1417	20.99 (±4.72)
SAUDI ARABIA	Arabic	414	98	316	26.76 (±9.72)
TANZANIA	English	341	185	156	23.95 (±4.25)
TURKEY	Turkish	4717	1609	3093	27.57 (±10.84)
THAILAND	Thai	300	49	250	32.82 (±13.00)
USA	English	666	189	477	45.16 (±17.15)
TOTAL		15,375	5553	9822	29.15 (±11.80)

<sup>1</sup> Data on biological sex (not their gender identity) of respondents are presented.

### 2.3. Procedure

All coauthors collected data in their home countries for this study. The questionnaire was generated on the Google Forms service hosted by the principal investigator. The original questionnaire was developed in Russian and English. In all nonEnglish speaking

countries (except Russia), colleagues translated the measures into their native languages using a back-translation procedure [48,49].

Participants in each country were recruited from various university listservs and social networking sites. We had one exclusion criteria—participants who responded yes to having a chronic disease and/or predisposition for depression and received treatment were excluded. All participants provided informed consent. If eligible, participants were directed to complete the self-report survey on Google forms to provide informed consent, and were asked to take a survey, described below, which took approximately 20 min to complete. Participants were not compensated for their participation.

The survey was conducted during the first wave of COVID-19 from May to August 2020 (Median 5 June 2020) (see Table 2). We measured the degree of restrictions by asking participants the following yes/no question: Is a self-isolation (quarantine) regime introduced in your country? (yes, no).

**Table 2.** Dates of Data Collection.

COUNTRY	Start Date	End Date	Median
ARMENIA	8 June 2020	21 June 2020	11 June 2020
BELARUS	29 April 2020	21 June 2020	7 May 2020
BRAZIL	15 May 2020	27 July 2020	10 June 2020
BULGARIA	18 May 2020	30 June 2020	23 June 2020
CANADA	13 May 2020	24 May 2020	16 May 2020
CROATIA	18 May 2020	27 August 2020	17 July 2020
HUNGARY	30 June 2020	08 August 2020	22 May 2020
INDIA	16 May 2020	31 August 2020	16 May 2020
INDONESIA	3 June 2020	14 August 2020	23 June 2020
IRAN	21 May 2020	17 July 2020	28 May 2020
IRAQ	7 June 2020	14 July 2020	8 June 2020
ITALY	4 June 2020	29 November 2020	12 June 2020
JORDAN	1 June 2020	13 June 2020	1 June 2020
MALAYSIA	12 May 2020	22 July 2020	10 June 2020
NIGERIA	4 May 2020	9 August 2020	31 May 2020
PAKISTAN	13 May 2020	3 August 2020	21 May 2020
ROMANIA	18 May 2020	31 August 2020	5 June 2020
RUSSIA	2 May 2020	8 August 2020	5 May 2020
SAUDI ARABIA	22 May 2020	20 June 2020	30 May 2020
TANZANIA	1 May 2020	1 July 2020	26 June 2020
TURKEY	23 May 2020	16.07.2020	6 June 2020
THAILAND	12 May 2020	30 May 2020	14 May2020
USA	19 May 2020	30 August 2020	10 June 2020
TOTAL			5 June 2020

#### 2.4. Instruments

Participants completed a standard demographic survey along with the measures listed below. We also asked the following question “Do you live alone or with somebody?” with answers 0 = no, with somebody, 1 = yes, alone.

##### 2.4.1. Measure of Anxiety

Two questionnaires for measurement of anxiety level were used in this study, the Generalized Anxiety Disorder Scale (GAD-7) [50] and the first part of The State-Trait Anxiety Inventory (STAI)—State Anxiety Inventory (SAI) [51]. We chose two scales of anxiety, as each targets different aspects of this phenomenon. GAD-7 screens for the presence of anxiety and related disorders, while SAI evaluates anxiety as a reaction to stress

(in our case reaction to COVID-19). Validated measures of the GAD-7 and SAI were used when available [50–61].

#### Generalized Anxiety Disorder Scale (GAD-7)

Level of anxiety was measured using the seven-item Generalized Anxiety Disorder Scale (GAD-7) [50], a widely used instrument to screen for the presence of anxiety and related disorders [62]. The GAD-7 consists of seven items and asks participants to rate their symptoms of anxiety using a four-point Likert scale (0 (not at all) to 3 (almost every day) over the past two weeks). Total scores across the seven items were calculated, and anxiety symptoms classified as norm (0–4), mild (5–9), moderate (10–14) and severe (15–21) [50]. The alpha reliability coefficient in the present study for GAD-7 was 0.90.

#### State Trait Anxiety Inventory (STAI)

Anxiety as an emotional state was measured using the first part of questionnaire The State-Trait Anxiety Inventory (STAI)—State Anxiety Inventory (SAI) [51]. It was developed to provide reliable, relatively brief self-report scales for assessing state and trait anxiety in research and clinical practice [51]. SAI consists of a 20-item scale for measuring the intensity of anxiety as an emotional state. Participants reported the intensity of their feelings of anxiety in that moment by rating themselves on the following four-point Likert scale from 1 (not at all) to 4 (very much so). Total scores of anxiety symptoms were classified as norm/low (0–30), moderate (31–45) and high (46 and above) [51]. The alpha reliability coefficient in the present study for SAI was 0.77.

#### 2.5. Global Indices

**Individualism versus Collectivism.** Global indices were examined in this study, as represented by the Hofstede model (the Individualism versus Collectivism scale, related to the integration of individuals into primary groups and the Power Distance scale, related to the different solutions to the basic problem of human inequality) [36]. Each country was positioned relative to other countries through a score on each dimension. Individualism stands for a society in which the ties between individuals are loose and everyone is expected to look after her/his immediate family only. Collectivism stands for a society in which people from birth onwards are integrated into strong, cohesive in-groups, which throughout people's lifetime continue to protect them in exchange for unquestioning loyalty [36] (p. 225). Power Distance has been defined as the extent to which the less powerful members of organizations and institutions (like the family) accept and expect that power is distributed unequally. This represents inequality (more versus less), but defined from below, not from above. It suggests that a society's level of inequality is endorsed by the followers as much as by the leaders [37] (p. 9). Information about this indicator in each country was obtained from <https://www.hofstede-insights.com> (accessed date 5 June 2020).

**Tightness-looseness index.** The Tightness-Looseness Index (Tightness score) was assessed if available for our study samples, with data acquired from the paper of Gelfand and coauthors [39]. This score demonstrates the differences between cultures that are *tight* (i.e., those that have strong norms and a low tolerance of deviant behavior) compared to those that are *loose* (i.e., those that have weak social norms and a high tolerance of deviant behavior) [39]. Due to the fact that not all the countries were represented in Gelfand's work (i.e., Jordan, Indonesia, Iran, Iraq, Nigeria, Russia, Tanzania), we applied the Index of Cultural Tightness and Looseness (CTL) from the study of Uz as well [63].

**Vulnerability to disease.** We used the Infectious Disease Vulnerability Index (IDVI) as a country-level index of potential vulnerability to infectious disease outbreaks [64]. IDVI is a country-level index of vulnerability. This index was selected because it represents a robust measure of infectious disease vulnerability in four ways: a more comprehensive evidence base, a more robust set of factors potentially contributing to outbreak vulnerability and associated proxy measures, the use of adjustable weights for these parameters, and an

examination of all countries world-wide. Information about this indicator in each country was obtained from [https://www.rand.org/pubs/research\\_reports/RR1605.html](https://www.rand.org/pubs/research_reports/RR1605.html).

## 2.6. Data Analysis

SPSS (Version 27.0) was employed for data evaluation. Data were evaluated for missingness, but we chose to retain all. An analysis of descriptive statistics was conducted to illustrate the demographic and selected characteristics of the respondents. T tests were conducted to examine potential sex differences in ratings on the GAD-7 and SAI scales. Linear regression was used to test the associations between the GAD-7, SAI scales and global indexes, denoted above. Lastly, a GLM ANOVA was used for analysis of the GAD-7 and SAI to estimate the association between sex and country on levels of anxiety.

## 3. Results

### 3.1. Sex and Country Differences of Anxiety Scales

Mean and standard deviations across countries are represented in Table 3. Country-specific sex differences revealed significant sex differences of GAD-7 for individuals from Belarus, Bulgaria, Canada, Croatia, India, Indonesia, Italy, Jordan, Malaysia, Nigeria, Pakistan, Romania, Russia, Tanzania, and Turkey. For the SAI, women from Belarus, Brazil, Bulgaria, Canada, Croatia, India, Indonesia, Italy, Jordan, Malaysia, Pakistan, Russia and Turkey reported higher ratings of anxiety across both scales. The Pearson's correlation analysis, controlling for country and sex, revealed a strong positive correlation between the GAD-7 and SAI total scores ( $r = 0.49$ ,  $p = 0.0001$ ).

The results of GLM ANOVAs with GAD-7 as the dependent variable, sex and country as fixed factors and significant main effects of sex ( $F_{(1,15340)} = 298.885$ ,  $p < 0.001$ ,  $\eta^2 = 0.019$ ) and country ( $F_{(22,15345)} = 53.758$ ,  $p < 0.001$ ,  $\eta^2 = 0.072$ ), showed small and medium effect sizes accordingly. In the case of SAI as the dependent variable we found main effects of sex ( $F_{(1,15268)} = 157.504$ ,  $p < 0.001$ ,  $\eta^2 = 0.010$ ) and country ( $F_{(22,15273)} = 67.872$ ,  $p < 0.001$ ,  $\eta^2 = 0.089$ ), both with medium effect sizes.

**Table 3.** Sex differences in Generalized Anxiety Disorder Scale (GAD-7) and the State Anxiety Inventory (SAI) across countries.

COUNTRY	Scales	Sex	N	meanM	t	df	P	95% CI		Effect Size (Hedges' Correction) *
								Lower	Upper	
ARMENIA	GAD-7	men	27	5.81	0.808	31	0.425	−2.767	6.397	0.356
		women	6	4.00						
ARMENIA	SAI	men	27	30.93	0.847	31	0.403	−6.701	16.219	0.373
		women	6	26.17						
BELARUS	GAD-7	men	143	5.10	−2.702	336	<b>0.007</b>	−2.344	−0.369	−0.297
		women	195	6.46						
BELARUS	SAI	men	143	29.01	−3.055	336	<b>0.002</b>	−5.617	−1.217	−0.336
		women	195	32.43						
BRAZIL	GAD-7	men	82	7.99	−0.800	126	0.425	−1.738	0.737	−0.087
		women	430	8.49						
BRAZIL	SAI	men	82	36.27	−2.513	510	<b>0.012</b>	−6.541	−0.801	−0.302
		women	430	39.94						
BULGARIA	GAD-7	men	129	5.87	−2.821	308	<b>0.005</b>	−2.467	−0.440	−0.307
		women	193	7.32						
BULGARIA	SAI	men	129	26.18	−3.325	314	<b>0.001</b>	−6.842	−1.755	−0.358
		women	193	30.48						
CANADA	GAD-7	men	420	7.75	−2.209	657	<b>0.028</b>	−1.812	−0.107	−0.179
		women	239	8.71						
CANADA	SAI	men	382	31.03	−2.403	607	<b>0.017</b>	−3.902	−0.393	−0.201
		women	227	33.18						



Table 3. Cont.

COUNTRY	Scales	Sex	N	meanM	t	df	P	95% CI		Effect Size (Hedges' Correction) *
								Lower	Upper	
CROATIA	GAD-7	men women	71 204	6.44 7.77	-2.056	273	<b>0.041</b>	-2.610	-0.056	-0.282
	SAI	men women	71 204	24.61 29.61	-3.049	273	<b>0.003</b>	-8.249	-1.774	-0.419
HUNGARY	GAD-7	men women	35 198	3.69 5.16	-1.784	231	0.076	-3.096	0.154	-0.326
	SAI	men women	35 198	24.83 28.73	-1.750	231	0.081	-8.299	0.491	-0.320
INDIA	GAD-7	men women	213 170	5.37 6.79	-2.822	381	<b>0.005</b>	-2.413	-0.431	-0.290
	SAI	men women	213 170	30.23 33.54	-3.553	381	<b>0.0004</b>	-5.151	-1.481	-0.365
INDONESIA	GAD-7	men women	504 424	3.27 5.59	-7.797	828	<b>&lt;0.001</b>	-2.912	-1.741	-0.521
	SAI	men women	504 424	26.48 30.47	-5.617	926	<b>&lt;0.001</b>	-5.380	-2.594	-0.370
IRAN	GAD-7	men women	88 217	5.57 5.77	-0.373	303	0.710	-1.294	0.882	-0.047
	SAI	men women	88 217	34.75 35.00	-0.656	303	0.513	-1.019	0.510	-0.083
IRAQ	GAD-7	men women	88 85	8.81 9.52	-0.944	171	0.347	-2.197	0.776	-0.143
	SAI	men women	88 85	31.16 33.74	-1.726	171	0.086	-5.535	0.371	-0.261
ITALY	GAD-7	men women	44 208	6.09 7.96	-2.712	250	<b>0.007</b>	-3.229	-0.512	-0.449
	SAI	men women	44 208	35.20 39.05	-2.152	250	<b>0.032</b>	-7.371	-0.326	-0.356
JORDAN	GAD-7	men women	121 328	4.94 7.13	-4.326	447	<b>&lt;0.001</b>	-3.174	-1.191	-0.459
	SAI	men women	121 328	26.43 29.06	-2.305	447	<b>0.022</b>	-4.875	-0.388	-0.245
MALAYSIA	GAD-7	men women	478 609	2.68 3.54	-3.484	1072	<b>0.001</b>	-1.337	-0.374	-0.329
	SAI	men women	477 609	28.98 27.57	2.267	1064	<b>0.024</b>	0.189	2.627	0.137
NIGERIA	GAD-7	men women	214 102	3.98 5.26	-2.003	158	<b>0.047</b>	-2.549	-0.018	-0.265
	SAI	men women	214 102	24.77 25.51	-0.572	314	0.567	-3.278	1.801	-0.069
PAKISTAN	GAD-7	men women	212 272	5.20 6.90	-3.624	482	<b>&lt;0.001</b>	-2.631	-0.781	-0.331
	SAI	men women	212 272	28.20 32.72	-4.282	482	<b>&lt;0.001</b>	-6.592	-2.445	-0.392
ROMANIA	GAD-7	men women	42 226	4.12 5.79	-2.138	266	<b>0.033</b>	-3.205	-0.132	-0.358
	SAI	men women	42 226	21.45 24.19	-1.395	266	0.164	-6.612	1.127	-0.234
RUSSIA	GAD-7	men women	486 1417	3.80 5.71	-7.951	938	<b>&lt;0.001</b>	-2.381	-1.438	-0.394
	SAI	men women	486 1417	25.34 29.47	-6.761	1901	<b>&lt;0.001</b>	-5.335	-2.936	-0.355

Table 3. Cont.

COUNTRY	Scales	Sex	N	meanM	t	df	P	95% CI		Effect Size (Hedges' Correction) *
								Lower	Upper	
SAUDI ARABIA	GAD-7	men	98	5.40	−0.290	412	0.772	−1.211	0.899	−0.034
		women	316	5.55						
	SAI	men	98	26.15	−0.843	412	0.400	−3.949	1.578	−0.097
		women	316	27.34						
TANZANIA	GAD-7	men	185	4.39	−2.304	339	<b>0.022</b>	−2.332	−0.184	−0.250
		women	156	5.65						
	SAI	men	185	32.43	−1.261	339	0.208	−2.107	0.461	−0.137
		women	156	33.25						
THAILAND	GAD-7	men	49	3.33	−1.679	88	0.097	−1.898	0.159	−0.212
		women	250	4.20						
	SAI	men	49	28.59	−1.864	297	0.063	−4.967	0.134	−0.291
		women	250	31.01						
TURKEY	GAD-7	men	1609	5.76	−11.412	3473	<b>&lt;0.001</b>	−1.942	−1.372	−0.354
		women	3093	7.42						
	SAI	men	1609	32.14	−6.836	3718	<b>&lt;0.001</b>	−2.057	−1.140	−0.200
		women	3093	33.74						
USA	GAD-7	men	189	5.85	−1.447	664	0.148	−1.587	0.241	−0.124
		women	477	6.52						
	SAI	men	184	25.80	−1.620	643	0.106	−4.248	0.407	0.141
		women	461	27.72						
TOTAL SAMPLE	GAD-7	men	5527	5.10	−17.620	12,056	<b>&lt;0.001</b>	−1.614	−1.288	−0.292
		women	9815	6.55						
	SAI	men	5483	29.34	−13.133	11,997	<b>&lt;0.001</b>	−2.655	−1.965	−0.216
		women	9787	31.65						

N—number of cases, t—test statistics, df—degrees of freedom, p—statistical significance, NS—not significant, CI—Confidence Interval of the Difference. \* Hedges' g, which provides a measure of effect size weighted according to the relative size of each sample, is an alternative where there are different sample sizes.

**GAD-7.** A total of 7045 participants (45.84%) across the entire sample reported minimal (norm) symptoms of anxiety; 4830 (31.43%) reported mild symptoms, 2366 (15.40%) reported moderate symptoms and 1127 (7.33%) reported severe symptoms (see Figure 1a).

**SAI.** A total of 6589 participants (43.08%) across the entire sample reported a low level of anxiety, 7560 (49.42%) respondents reported moderate values, and 1147 (7.50%) respondents reported high values (see Figure 1b).

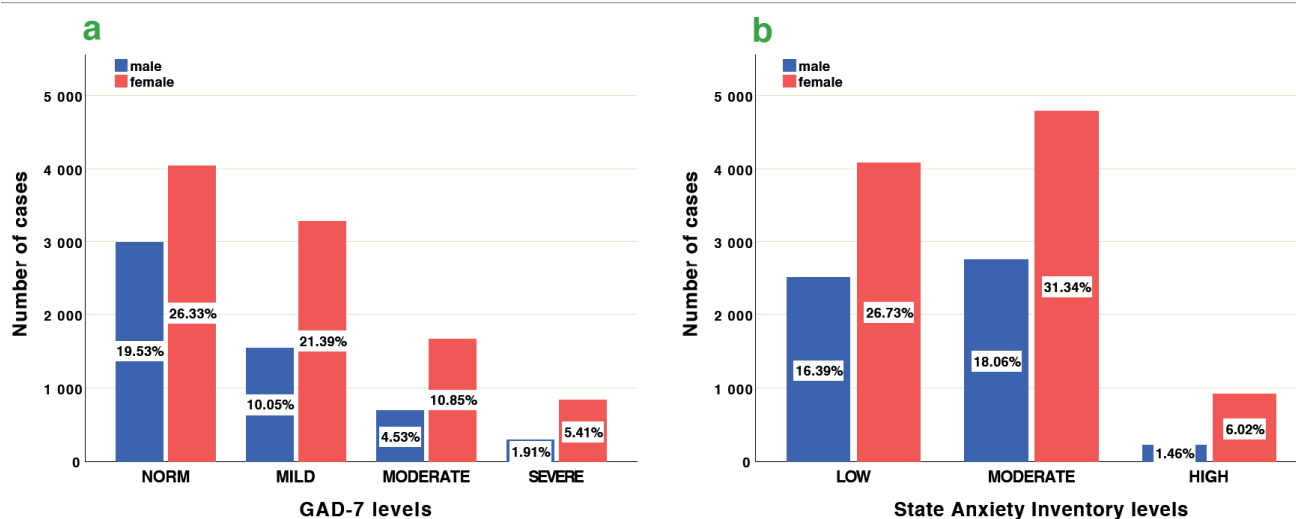


Figure 1. Sex differences of levels on GAD-7 (a) and SAI (b).

Our data revealed that the most stressed countries during restrictions and lockdown of the first wave of COVID-19 were Brazil, Iraq, Canada and the USA when looking at the GAD-7 scale (see Figure 2a). Most of the highest levels of state anxiety (SAI) were in Brazil and Italy (see Figure 2b).

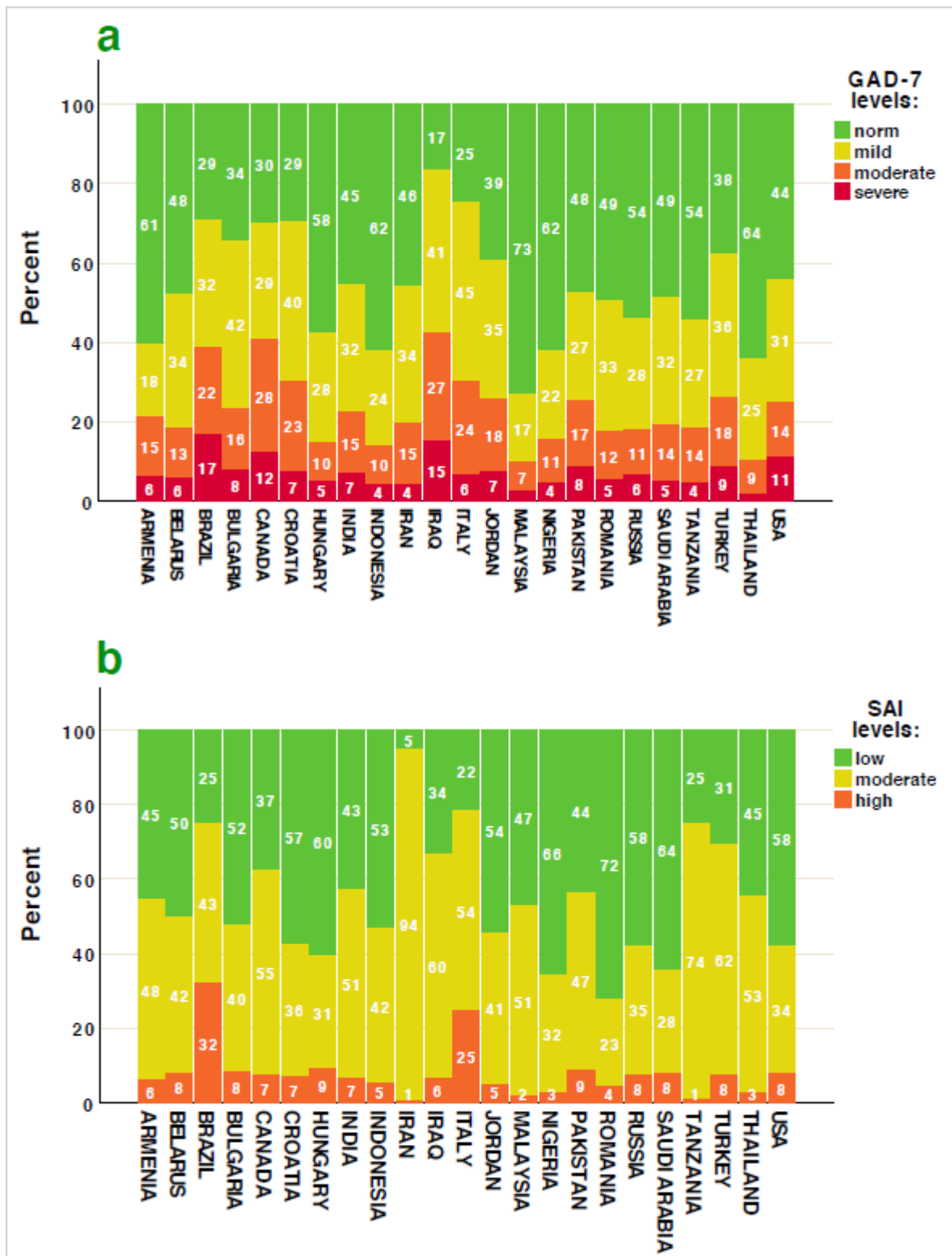


Figure 2. Levels of GAD-7 (a) and SAI (b) across 23 countries during first wave of COVID-19.

### 3.2. Global Indices

To evaluate the association between global indices and self-reported symptoms of anxiety, we used a regression analysis.

**Individualism.** The countries with high ratings of anxiety were also rated high on individualism (beta = 0.108,  $t = 13.510$ ,  $p < 0.001$ ,  $R^2 = 0.012$ ). Participants in countries with the lowest level of individualism (Indonesia, Malaysia, Nigeria, and Thailand) also reported the lowest levels of anxiety, except for Iraq (see Figure 3a). Similar trends were observed for the SAI (beta = 0.030,  $t = 3.653$ ,  $p < 0.001$ ,  $R^2 = 0.001$ ) (see Figure 3b).

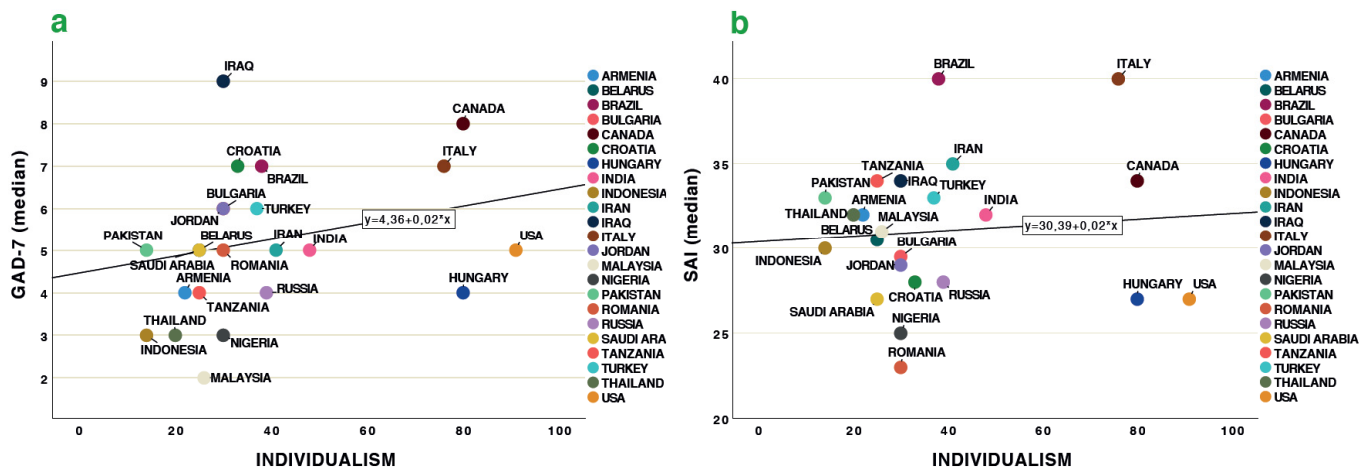


Figure 3. Association between individualism and GAD-7 (a), and SAI (b) across 23 countries.

**Power distance.** Higher GAD-7 ratings on anxiety were found for nations with low power distance (beta =  $-0.046$ ,  $t = -19.616$ ,  $p < 0.001$ ,  $R^2 = 0.024$ ), except for Iraq. See Figure 4a. Similar trends were observed for SAI (beta =  $-0.121$ ,  $t = -15.090$ ,  $p < 0.001$ ,  $R^2 = 0.015$ ). See Figure 4b.

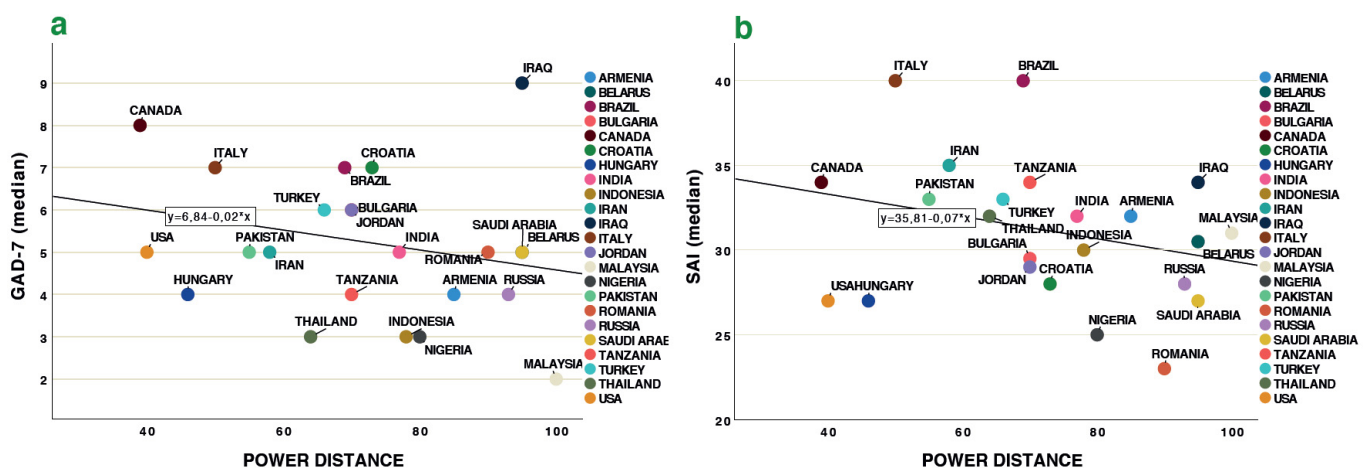


Figure 4. Association between power distance and GAD-7 (a), and SAI (b) across 23 countries.

**IDVI.** Higher GAD-7 ratings on anxiety were found for nations with low vulnerability (beta = 0.062,  $t = 7.726$ ,  $p < 0.001$ ,  $R^2 = 0.062$ ), except for Iraq (see Figure 5a). The most vulnerable to infectious diseases, but the least anxious countries were Nigeria, Tanzania, Pakistan (see Figure 5a), with the exception of Iraq. Similar trends were observed for SAI (beta = 0.014,  $t = 1.748$ ,  $p = 0.081$ ,  $R^2 = 0.000$ ) (Figure 5b).

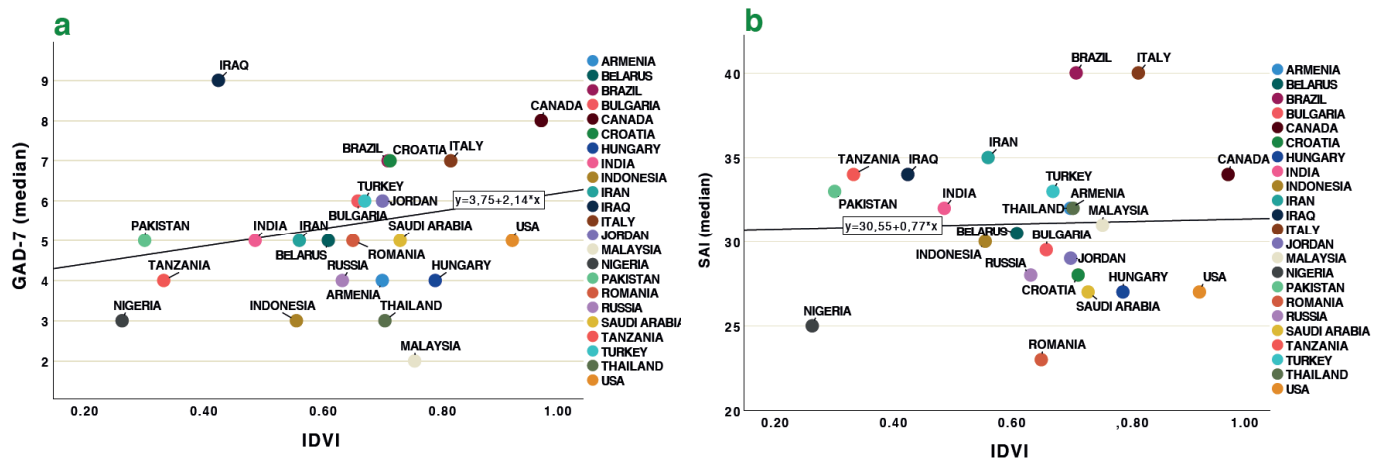


Figure 5. Association between Infectious Disease Vulnerability Index GAD-7 (a), and SAI (b) across 23 countries.

**Tightness index.** Countries who were high in measures of tightness reported the lowest ratings of anxiety on the GAD-7 (beta =  $-0.137$ ,  $t = -12.628$ ,  $p < 0.001$ ,  $R^2 = 0.019$ ) (see Figure 6a). Similar trends were observed for SAI (beta =  $-0.092$ ,  $t = -8.417$ ,  $p < 0.001$ ,  $R^2 = 0.008$ ) (see Figure 6b).

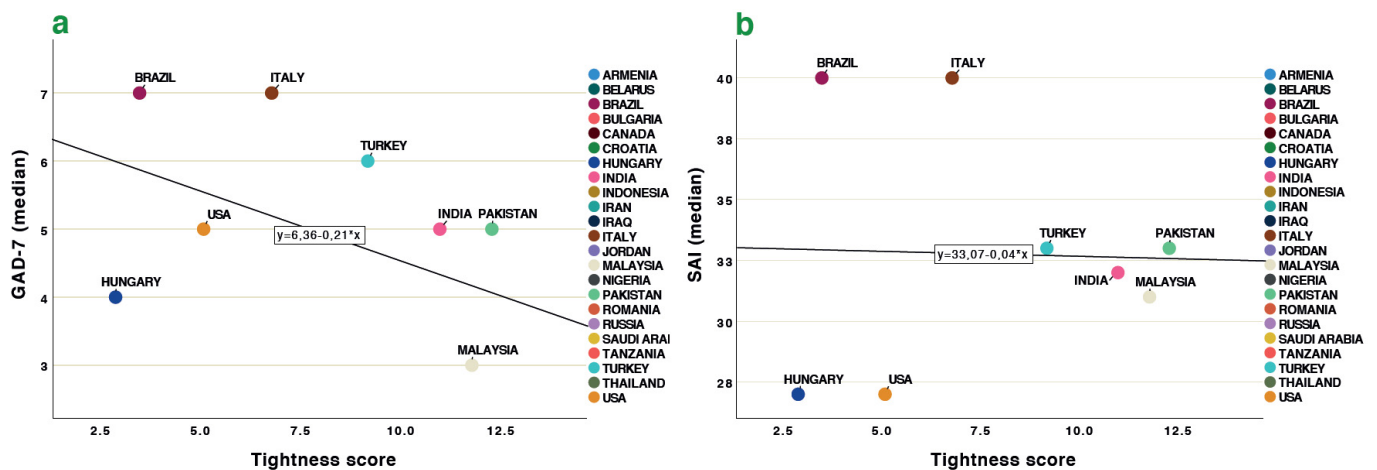
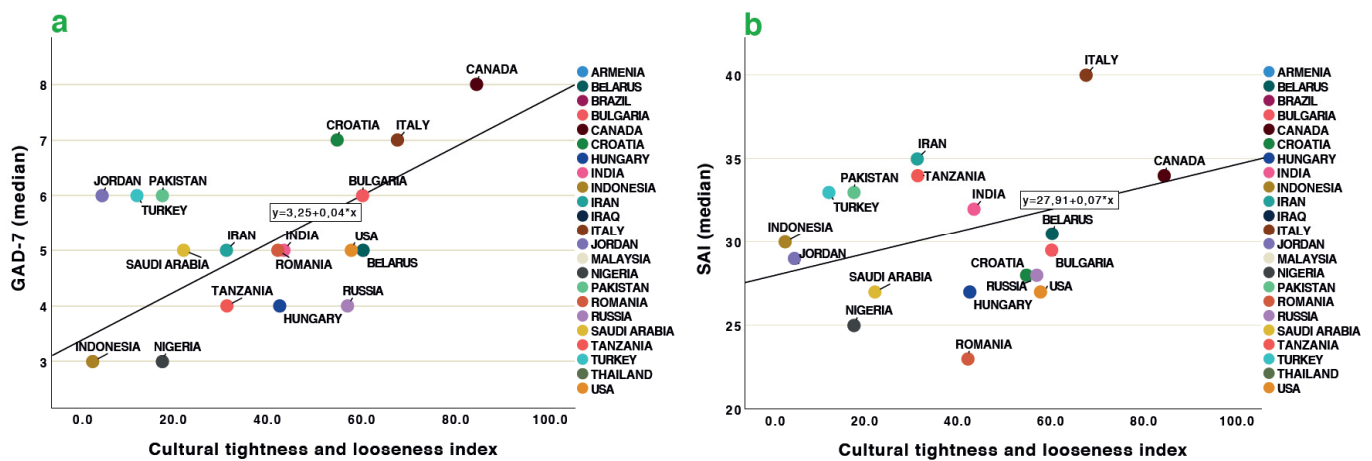


Figure 6. Association between Tightness score and GAD-7 (a), SAI, (b) across 23 countries (Figure 6 shows only those countries for which the Tightness index was available [39]).

**Index of Cultural tightness and looseness.** Similar tendencies were demonstrated in the case of Index of Cultural Tightness and Looseness (CTL) [63]. Very loose nations (such as Canada and Italy) rated higher on both the GAD-7 (beta =  $-0.137$ ,  $t = -12.628$ ,  $p < 0.001$ ,  $R^2 = 0.019$ ) and the SAI (beta =  $-0.066$ ,  $t = -7.491$ ,  $p < 0.001$ ,  $R^2 = 0.004$ ) (see Figure 7a,b, respectively). On the other side of the pole was Indonesia, Nigeria and Jordan (Figure 7a,b).



**Figure 7.** Association between CTL and GAD-7 (a), SAI (b) across 23 countries (Note that in the case of the Gelfand’s index, the tightness increases along the x axis, in Uz’s study, the direction goes to the opposite—from tight to loose countries).

3.3. Anxiety Scales, Age and Cohabitation/Loneliness

As another factor possibly influencing the level of anxiety during pandemic, we used the factor of cohabitation/loneliness (live alone or live with other). Significant differences of cohabitation/loneliness were observed in the GAD-7 scale; people who lived with someone reported the highest levels of anxiety (Table 3, Figure 8a,b). The overwhelming majority of respondents (90.8%) from our sample lived with someone, whether family members or friends (colleagues) (Table 4). In some countries we discovered a contrary tendency; that is the lonely people were more anxious. This was true for Belarus, Bulgaria, Malaysia and Pakistan, but these differences were not strong (Figure 8a).

**Table 4.** Differences in anxiety scales depending on cohabitation/loneliness across total sample.

Scales	Cohabitation/ Loneliness	N	Mean	t	df	P	95% CI		Effect Size
							Lower	Upper	
GAD-7	live with others	13,889	6.08	3.328	15295	<0.001	0.193	0.745	0.093
	live alone	1408	5.61						
SAI	live with others	13,830	30.88	1.376	15,225	NS	−0.175	1.001	0.039
	live alone	1397	30.46						

N—number of cases, t—test statistics, df—degrees of freedom, p—statistical significance, NS—not significant, CI—Confidence Interval of the Difference.

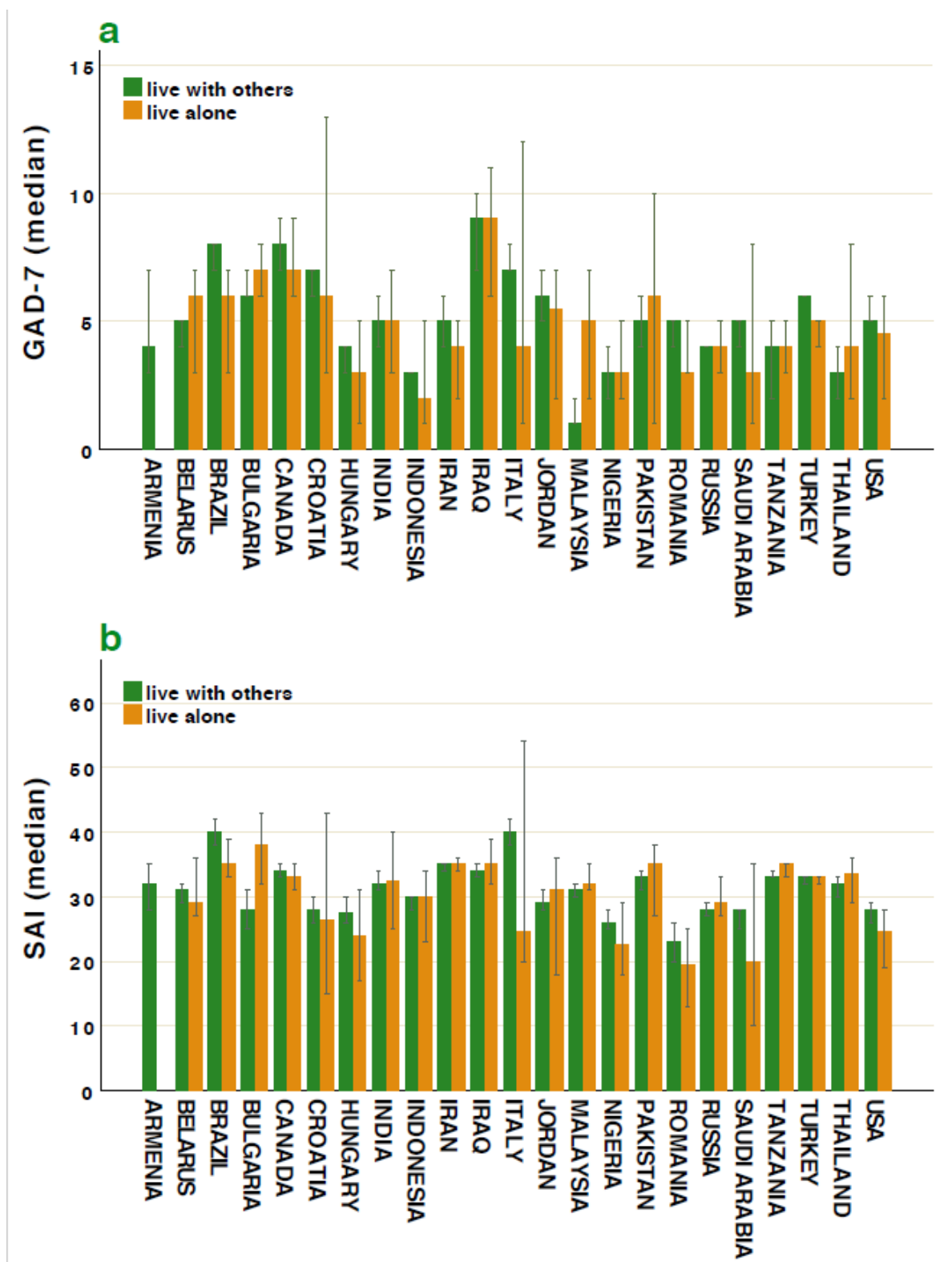


Figure 8. Differences in cohabitation/loneliness depending on GAD-7 (a) and SAI (b) across 23 countries.

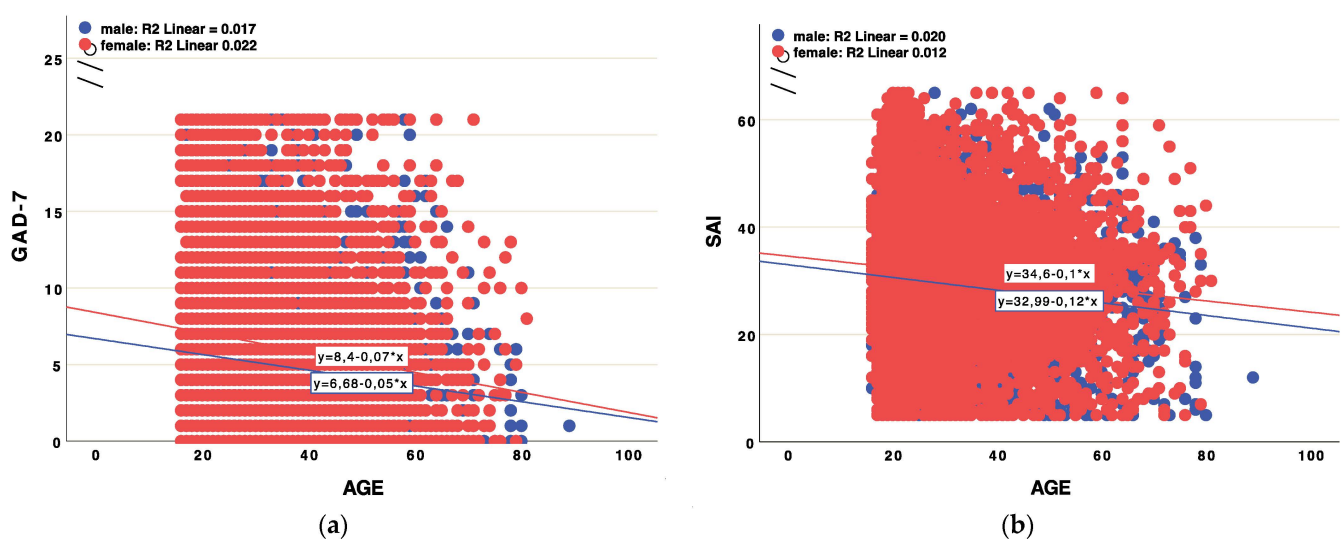
A GLM ANCOVA two-way analysis was conducted with GAD-7 and SAI as dependent variables, sex, country and cohabitation/loneliness as independent predictors and age as a covariate for the whole sample (Table 5). It was found that age was significantly associated with anxiety in each combination, but the predictor “cohabitation/loneliness” depended on country of respondent in the case of the SAI scale exclusively (Table 5).

**Table 5.** GLM ANCOVA analyses with GAD-7 and SAI as dependent variables, and sex, country and cohabitation/loneliness as independent predictors, with age as a covariate for the whole sample.

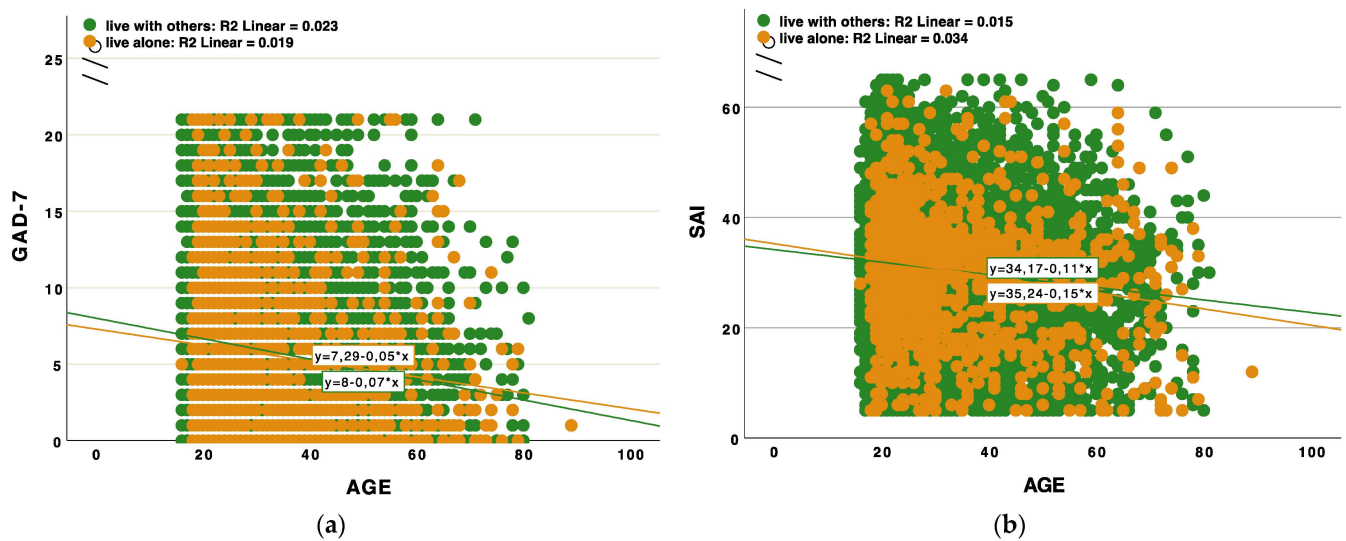
Predictors	Dependent Variable	df	F	<i>p</i>	$\eta^2$
Sex	GAD-7	1	34.961	<0.001	0.002
	SAI	1	14.199	<0.001	0.001
cohabitation/loneliness	GAD-7	1	2.808	0.094	0.000
	SAI	1	0.199	0.656	0.000
sex × cohabitation/loneliness	GAD-7	1	0.109	0.742	0.000
	SAI	1	0.946	0.331	0.000
Country	GAD-7	22	7.770	<0.001	0.011
	SAI	22	9.566	<0.001	0.014
Age	GAD-7	1	26.639	<0.001	0.002
	SAI	1	21.149	<0.001	0.001
country × age	GAD-7	22	4.921	<0.001	0.007
	SAI	22	6.245	<0.001	0.009
cohabitation/loneliness × country	GAD-7	21	1.192	0.246	0.002
	SAI	21	1.835	0.011	0.003
sex × country	GAD-7	22	1.357	0.122	0.002
	SAI	22	3.875	<0.001	0.006
cohabitation/loneliness × age	GAD-7	1	3.562	0.059	0.000
	SAI	1	0.022	0.883	0.000
sex × age	GAD-7	1	14.066	<0.001	0.001
	SAI	1	0.997	0.318	0.000

$R^2$  (GAD-7) = 0.127;  $R^2$  (SAI) = 0.131.  $R^2$ —R Squared. df—degrees of freedom. F—F test statistics. *p*—statistical significance.  $\eta^2$ —Partial Eta Squared effect size.

Across sexes, as the age of the respondents increased, the level of anxiety on both scales decreased (Figure 9a,b). There were no significant differences in the level of anxiety, decreasing with age in groups of people living alone or with someone (Figure 10a,b).

**Figure 9.** Association between age and GAD-7 (a), SAI (b) across total sample.





**Figure 10.** Association between GAD-7 (a), SAI (b) and age depending on cohabitation/loneliness across total sample.

#### 4. Discussion

Based on cross-sectional data from 15,375 participants from 23 countries collected during the early phase of the COVID-19 pandemic, the data reflect that women reported higher levels of anxiety compared to men. This result supports prior research collected before the COVID-19 pandemic [19,23–25,52,65–69]. Importantly, however, when examining between-country differences, we did not find significant sex differences in the level of anxiety between men and women in Armenia, Hungary, Iran, Iraq, Saudi Arabia, Thailand and the USA. The COVID-19 outbreak in China did not result in sex differences in stress levels either [26,27]. However, this result may be culturally related. Recent studies of existing data indicate that GAD-7 rates vary by ethnic/cultural group [70].

Previous studies suggest cross-cultural differences in the prevalence of anxiety disorders [71,72], but the extent of these differences remains unclear. While symptoms of anxiety have been found more common in Latin America, high income regions and regions with a history of recent conflict [66], symptoms of anxiety tend to be less common in Asian populations compared to other populations [66,71,72]. Results from the present study showed the highest GAD-7 scores in Brazil, Iraq, Canada, the USA and Italy. Overall, our samples demonstrated that GAD-7 scores were higher during COVID-19 in comparison with scores before the pandemic (for which the similar data was available) (see Table 6). In Saudi Arabia the GAD-7 scores were close to the values reported by Al-Rabiaah and colleagues during the MERS-CoV outbreak in 2014 [52].

**Table 6.** The data of studies of GAD-7 before pandemic COVID-19.

Countries	Sample: N (age)	GAD-7 *	GAD-7 Men	GAD-7 Women	Present Study	Source
Bulgaria	529 (21.00)	3.0 (median)			6.0 (median)	[53]
Brazil	4001 (18–60)	2.2% severe level	-	-	17% severe level	[54]
Canada	610 (21.35)	5.82 (mean)			8.23	[70]
Malaysia	895 (30.9 ± 10.4)	7.8% moderate and severe levels	-	-	10% moderate and severe levels	[55]
Pakistan	285 (16–80)	5.18 (mean)	-	-	6.05	[65]
Russia	132 (18–46)	3.35 (mean)	3.51	3.19	4.76 (3.80; 5.71)	[56]

Table 6. Cont.

Countries	Sample: N (age)	GAD-7 *	GAD-7 Men	GAD-7 Women	Present Study	Source
Thailand	800 (18–24)	3.78 (mean) 7.8% moderate and severe levels	3.65	3.91	3.77 (3.33; 4.20) 11% moderate and severe levels	[57]
Turkey	134 (34.67 ± 12.55)	6.11 (mean)	-	-	6.59	[58]
Saudi Arabia	200 (21.6) medical students during MERS-CoV 2014 192 (20.50 ± 1.96)	5.09 (mean) 0% severe level -	4.56 5.26	5.61 -	5.48 (5.40;5.55)	[52]
USA	2740 (47.4 ± 15.5)	4.68% severe level	-	-		
2009–2010	447 (23.43)	5.06 (mean)	-	-	11% severe level	[50]
2015	1897 (19.60 ± 1.62)	5.71 (mean)	4.84	6.57		[70]
2018–2019	426 (20.19 ± 1.82)	6.28 (mean)	5.99	8.34	6.19 (mean)	[67]
	1805 (20.44 ± 1.47)	7.45 (mean)	6.09	8.81		

\* we provide data (means, medians, percentages) that can be used to compare with our data.

Data from our study showed a positive association between age and reported symptoms of anxiety, which complements prior research [3,26,66,73,74]. At the same time, some data showed inverted U-shaped associations between age and well-being [23,69], or no association between age and stress [27]. In a study conducted earlier before the pandemic in Pakistan, age did not influence self-reported symptoms of the GAD-7 [65].

Approximately 91% of the participants in our study reported living with someone, whether family members or friends. Significant differences of cohabitation/loneliness were observed for the GAD-7 scale; particularly, people who lived with someone reported higher levels of anxiety. However, when we compared countries, we found that some countries showed the opposite association, i.e., people living alone were more anxious, for example in Belarus, Bulgaria, Malaysia, and Pakistan. Research has demonstrated that living alone may be linked to higher indices of depression and anxiety [28,75]. The same is true in the case of overcrowding [32,33,73]. Our total results are in line with the study of Kowal and colleagues (2020), who reported that people living alone were not stressed much [3]. On the other hand, the same studies suggested that married (or cohabiting) individuals experience lower levels of stress than single individuals [3,76]. The Chinese data reported no differences related to marital status on perceived stress during COVID-19 [27,77]. Such differences warrant further investigations.

**Cultural considerations.** Perhaps not surprisingly, our results showed that reported symptoms of anxiety differed across countries. Participants from countries with the highest ratings of anxiety (Canada and Italy) were also highest on individualism, whereas the least anxious countries were those with lowest levels of individualism (Thailand, Indonesia, Malaysia, Nigeria). High GAD-7 ratings on anxiety were found for nations with low power distance (Canada, Italy). Interestingly, participants in this study reported experiencing the pandemic as hypothesized by Triandis and colleagues (1990): in the individualistic cultures, people find it harder to give up their personal preferences for group needs, while collectivist countries focus on group harmony, and the emotional cost of a period of isolation is higher in individualistic cultures [38]. As expected, stress levels were higher for individualistic versus collectivist cultures in our study.

However, contrary to our results, prior research by Kowal and colleagues (2020) found the individualism–collectivism continuum not to be associated with perceived stress [3]. Mäkel and colleagues (2020) proposed another way to interpret these associations by the locus of control theory (people with a high locus or a sense of control tend to behave in a way that promotes health) [4,78]. Participants in Brazil, Colombia and the USA reported higher levels of anxiety, whereas people from Israel, Germany and Norway

had comparatively lower levels of anxiety [4]. More individualistic countries, such as Australia and Canada, tend to attribute more negative connotations to the external locus of control than more collectivistic ones [79]. As presented by Mækel et al. (2020), more individualistic countries such as Norway, Germany and the USA had relatively lower scores for the sense of control over the outbreak than the more collectivist Colombia and Brazil [4]. The tendency in associations between the level of anxiety and the individualism-collectivism dimension remains to be tested more precisely in the future studies. One of the possible directions is gene-environmental research. For example, Chiao and Blizinsky (2010) suggested that certain cultural values, such as collectivism, may protect genetically susceptible populations (e.g., East Asian populations) from the increasing prevalence of anxiety disorders [80]; a promising area for future research.

Similar results were found when examining associations with tightness and looseness as defined by Gelfand and colleagues [39]. Tight societies, such as Australia, Brazil, the Netherlands and New Zealand, restrict freedom, while loose societies such as Pakistan, Malaysia, Singapore and South Korea, allow for greater freedom [39]. Specifically, our participants from loose nations (e.g., Canada and Italy) reported higher symptoms of anxiety compared to those from tight nations (e.g., Indonesia, Jordan and Nigeria). According to Gelfand and colleagues (2014), both very permissive and very constrained nations exhibit lower happiness, higher suicide rates, lower life expectancy and greater mortality rates from cardiovascular disease and diabetes [39]. The authors suggest that these disadvantages (extremes of freedom or restrictions) may be a consequence of the inability to control oneself and one's environment [39].

Our data revealed a significant positive association between the level of anxiety during the COVID-19 first wave and countries' scores on the Infectious Disease Vulnerability Index. Countries most vulnerable in terms of infectious diseases (e.g., Nigeria, Tanzania, Pakistan) reported lower levels of anxiety compared to countries less experienced with severe infections (USA, Italy, Canada).

## 5. Limitations

The results of this study should be interpreted within the context of certain limitations. Limitations of the current study include the disproportionate representation of women to men. Relatedly, it is important to acknowledge that participants were asked their sex and not their gender identity, which limits the generalizability of the study's findings to individuals who may identify with a specific gender. Additionally, it is important to acknowledge that while the overall sample included over 15,000 participants, the representation in some countries (i.e., Armenia, Iraq) was quite low, which limits our ability to examine within-country differences. Another consideration is that participation in this study was limited to those with a stable internet connection (to complete the questionnaire), which precluded participation from those without this access.

We did not measure countries' policies relating to COVID-19 and mortality rates, which may also be an important predictor of anxiety increase. Future studies in this direction should be highly productive and may further extend our knowledge about the nature of human anxiety and its influence of individual and public wellbeing.

## 6. Conclusions

Our study revealed cross-cultural differences in the level of anxiety during the first wave of the COVID-19 pandemic (from May to August 2020). Globally, levels of anxiety were higher in women compared to men. We suggest that cultural dimensions such as individualism/collectivism, power distance, and looseness/tightness may function as protective adaptive mechanisms against the development of anxiety symptoms in the continued COVID-19 pandemic. One possible explanation is that respondents from countries with higher power distance, tightness and collectivism, were less anxious and stressed because they trusted officials, and felt more that they were being protected by

governmental services. Another possible explanation is that under such conditions, people do not feel able to influence the situation on their own.

This article presents the first results from our cross-cultural COVID-19 project. In the future we are planning to add more predictors into the analysis, including such factors as the degree of trust for the authorities, personal epidemiological experience, personal fear of COVID-19 and mortality rates for each country.

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**Data Availability Statement:** Data produced and processed in this study are included in the published article. The datasets can be acquired from the corresponding author upon appropriate purposes.

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