



## ORIGINAL ARTICLE

# Knowledge, attitude, and practice towards COVID-19: Research to develop a measuring instrument



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## KEYWORDS

Knowledge;  
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COVID-19;  
Turkey-scale

## Abstract

**Objective:** To evaluate the knowledge, attitudes, and behaviors of individuals about COVID-19 and to develop a valid and reliable scale that can measure these items about COVID-19 and other similar pandemic processes.

**Design:** Methodological scale study with a quantitative approach.

**Site:** Carried out at the Uludağ University Family Health Center in Bursa, Turkey.

**Participants:** 415 individuals in the first phase and 367 in the retest phase.

**Interventions:** Carried out between March 1, 2021, and April 30, 2021.

**Main measurements:** Reliability and factor analyses were performed and validity was evaluated. In factor analysis, a scale with 4 factors and 30 questions was obtained. Confirmatory factor analysis (CFA) was applied to the factor scores of the scale. Factors were named A-General Culture, B-Mask, Distance and Cleanliness, C-Mental Status, and D-Way of Information. A 3-point Likert-type scoring system was created for the responses.

**Results:** Cronbach's alpha value was 0.894. In factor modeling, 3 of the confirmatory factor analysis fit indices were good and 4 of them were acceptable, so our model was found to be appropriate. The scale was highly reliable, according to internal and external consistency coefficients. The scale was named the Turkey COVID-19 Attitude Scale. *p* values < 0.05 were considered statistically significant.

**Conclusions:** The valid and reliable Turkey COVID-19 Attitude Scale, which we developed to evaluate the knowledge, attitudes, and behaviors of individuals about COVID-19, can be used to guide research during COVID-19 and future pandemics.

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**PALABRAS CLAVE**

Conocimiento;  
Actitud;  
Práctica;  
COVID-19;  
Escala Turquía

## Conocimiento, actitud y práctica frente a la COVID-19: Investigación para desarrollar un instrumento de medición

**Resumen**

**Objetivo:** Evaluar los conocimientos, actitudes y comportamientos de los individuos sobre la COVID-19 y desarrollar una escala válida y confiable para medir estos ítems sobre la COVID-19 y otros procesos pandémicos similares.

**Diseño:** Estudio de escala metodológica con enfoque cuantitativo.

**Emplazamiento:** Centro de Salud Familiar de la Universidad de Uludağ, en Bursa, Turquía.

**Participantes:** 415 individuos en la primera fase y 367 en la fase de retest.

**Intervenciones:** Realizadas entre el 1 de marzo de 2021 y el 30 de abril de 2021.

**Mediciones principales:** Análisis de confiabilidad y factoriales para evaluar la validez. Se obtuvo una escala con cuatro factores y 30 preguntas. Se aplicó el análisis factorial confirmatorio (AFC) a las puntuaciones de la escala. Los factores se denominaron A-Cultura general, B-Máscara, distancia y limpieza, C-Estado mental y D-Vía de información. Para las respuestas se creó un sistema de puntuación tipo Likert de tres puntos.

**Resultados:** El valor alfa de Cronbach fue de 0,894. Tres de los índices de ajuste del análisis factorial confirmatorio fueron buenos y cuatro de ellos aceptables, por lo que se consideró el modelo como apropiado. La escala resultó altamente confiable, según los coeficientes de consistencia interna y externa. Se denominó Escala de Actitud de Turquía COVID-19. Los valores de  $p < 0,05$  se consideraron estadísticamente significativos.

**Conclusiones:** La Escala de Actitud de Turquía COVID-19 válida y confiable, desarrollada para evaluar el conocimiento, las actitudes y los comportamientos de las personas sobre COVID-19, se puede utilizar para guiar la investigación durante COVID-19 y futuras pandemias.

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## Introduction

The World Health Organization (WHO) declared the novel coronavirus (2019-nCoV) pandemic to be an international public health emergency in 2020.<sup>1</sup> The influenza A (H1N1) pandemic in 2009 was also an important public health issue and provided important experience for managing future pandemics. The COVID-19 pandemic has shown the importance of obtaining information about new diseases, making decisions in the face of deficiencies and difficulties, providing an attitude, and taking action.<sup>2</sup> Individual knowledge and attitude are as important as social measures in epidemic management.<sup>3,4</sup>

To increase attitudes and behaviors among the public, health officials and policymakers should promote belief in knowledge and effectiveness. Future interventions and policies should be developed in a person-centered approach to COVID-19 and targeting vulnerable subgroups.<sup>5</sup> Despite the increase in COVID-19 cases, providing adequate information with educational interventions can reduce negative attitudes. Correlations between knowledge, attitudes and practices are important in preventing infection.<sup>6–12</sup>

A systematic review of the general population showed that the components of knowledge, attitude, and practice (KAP) towards COVID-19 were at an acceptable level. Using an integrated international system can help to better evaluate these components and compare them across countries.<sup>13</sup>

The current pandemic highlights the importance of education level in the formation of adequate knowledge, attitudes, and practices, and the importance of providing

valid, effective, efficient and continuous information to the public through appropriate channels to increase understanding of COVID-19 measures.<sup>14–16</sup>

The aim of this study was to evaluate the knowledge, attitudes, and practices of individuals about COVID-19 and to develop a valid and reliable scale that can guide measurement in COVID-19 and other pandemics.

## Methods

### Study design and setting

In this study, 415 individuals who applied to Bursa Uludağ University Family Health Center completed a questionnaire between March 1, 2021, and April 30, 2021. In the retest phase, 367 participants completed the questionnaire. The opinions of 10 specialist doctors were obtained to determine the validity of the 42 items on the questionnaire, in terms of content and scope, prior to participants completing the questionnaire. Based on their feedback, 12 questions were excluded from the question pool because the content validity ratio (CVR) remained below the lower limit of 0.62. The content validity ratio of the remaining questions was 0.91. Reliability and factor analyses for the questions were performed, and their validity was evaluated. In factor analysis, a scale with 4 factors and 30 questions was obtained. Factor analysis was used to determine the factor scores of the scale. Factors were named A-General Culture, B-Mask, Distance and Cleanliness, C-Mental Status, and D-Way of Information. A 3-point Likert-type scoring system was

$$n = \frac{NPQ(z_{\alpha/2})^2}{d^2(N-1) + PQ(z_{\alpha/2})^2}$$

Figure 1 Sample calculation.

created for the responses (1-Agree, 2-No idea, 3-Disagree). Participants were asked about sociodemographic information in the questionnaire, and they were asked to mark the fit option under the attitude statements.

### Number of samples

The number of population for this study was 518382, and it was calculated as a total of 415 people, using  $P=0.5$  to maximize the number of samples to be taken, at 95% confidence level, with a sampling error of 5%, 400 people + 15 people as spares. Sample Calculation was done using the following formula.

$n$ : Number of Samples

$N$ : Number of Population

$d$ : Effect Size (calculated with a 5% margin of error)

$P$ : probability of occurrence of X event (0.5 taken for maximum number of samples)

$Q$ : Probability of not seeing event X ( $1 - P$ )

$Z_{\alpha/2}$ : Standard normal distribution value

Randomization and sample size calculation (Fig. 1).<sup>17</sup>

Sequence numbers were assigned to patients registered in our Family Health Unit who met the study criteria. Then, random numbers will be generated between 1 and  $ni$  (i. Number of people who meet the inclusion criteria registered in the family health center) by using the  $(RAND*(b-a)+a)$  function in excel. Randomization was achieved by taking the patients with row numbers opposite to these generated numbers into the study.

In terms of sample size calculation, individuals who applied to our Family Health Center during the study period, were literate, and had no cognitive adjustment or vision problems were included in the study

### Ethics

The study received approval from the Republic of Turkey Ministry of Health (Ref. 2021-02-16T16-37-09), and the Clinical Research Ethics Committee of Bursa, Uludağ University, Faculty of Medicine (Ref. 2011-KAEK-26), following the Declaration of Helsinki.

### Statistical analysis

SPSS 26.0 and AMOS 22.0 (IBM Corporation, Armonk, New York, United States) programs were used in the analysis of the variables. Spearman's rho test was used to examine the correlations of the variables with each other. In the question pool created for the validity of the research, the opinions of 10 experts for 42 questions were taken and the questions were eliminated according to the content validity indices, and content validity was performed. The smallest content validity index was 0.62 and questions below

this rate were not included in the study. 5 questions were excluded because they were below the minimum coverage validity of 0.62. The content validity index of the final questions is 0.91. Afterwards, 50 questionnaires were applied for the pilot study. According to the results of the analysis obtained, 7 questions with low reliability were removed and the study was continued with 30 questions. Re-test for reproducibility from reliability analyzes, Cronbach's Alpha coefficient for consistency and item factor correlations were calculated. Explanatory Factor analyzes were applied for factor constructions. Confirmatory factor analysis from structural equation modeling was applied to confirm the factor structures obtained, and model validity was determined by fit indices. Quantitative variables were expressed as mean (standard deviation), and Median (Minimum/Maximum) and in the tables, while categorical variables were shown as  $n$  (%). The variables were analyzed at 95% confidence level, and a p value less than 0.05 was considered significant.

### Results

In the first stage of the study, 415 people completed the questionnaire; 367 people participated in the retest stage which occurred at least 1 week later. Question 27 was the reverse question. The average scoring of the test questions varied between 2.20 and a maximum of 2.93 (Table 1).

In the factor analysis, it was determined that the sample size was sufficient and that there was a suitability in providing the relationship between the variables. After factor subtraction, the existing 4 factors explain approximately 76% of the variance (Table 2 and Fig. 2).

In the factor analysis, the correlation coefficients were determined to be suitable for the factors. Since the first break was at the fourth point in the factor loads, SPSS and scree plots, 4 factors were decided (Table 3).

The Cronbach's alpha value was determined to be 0.894. It was at a good level in terms of internal consistency and was close to perfect (Table 4).

The factor coefficient, which is one of the related questions for Factor 1, ranges from 0.150 to 0.065 (Table 5).

Correlation coefficients were high in the test and retest relationships, indicating that they were correlated. The results showed that reliability was reproducible in terms of internal and external consistency (Table 6).

In confirmatory factor analysis, Factor 1 ranged between 0.80 and 0.98, Factor 2 between 0.89 and 0.95, Factor 3 between 0.63 and 0.83, and Factor 4 between 0.75 and 0.92. In factor-equalization modeling, our model was found to be appropriate since 3 of the confirmatory fit indices were good and 4 of them were acceptable (Table 7).

### Discussion

Health education programs are recommended because of the alarmingly high levels of insufficient information, negative distorted attitudes, and malpractice related to the COVID-19 pandemic in a survey study.<sup>18</sup> One study stated that the possibility of control decreases with the increase of transmission of COVID-19 prior to symptoms beginning. It is

**Table 1** Test questions and scoring.

No	Questions	Disagree 1 point	No idea 2 points	Agree 3 points
1	COVID-19 stands for Coronavirus disease 2019			
2	COVID-19 is caused by the SARS-CoV-2 virus			
3	The SARS-CoV-2 virus that causes COVID-19 was first identified in 2019 in Wuhan, China			
4	SARS-CoV-2 virus is transmitted from person to person			
5	COVID-19 can occur in all age groups			
6	The main symptoms of COVID-19 are fever, cough, difficulty breathing, chills, muscle pain, headache, sore throat, loss of taste and smell			
7	COVID-19 causes pneumonia in some patients			
8	COVID-19 causes no symptoms or signs in some people			
9	Those who have COVID-19 without symptoms can also transmit the virus to other people			
10	COVID-19 may have a more severe course in people with diseases such as diabetes, obesity, asthma, heart disease, cancer			
11	Symptoms often begin after 4-5 days in a person infected with the SARS-CoV-2 virus, but can last up to 14 days			
12	SARS-CoV-2 virus may show mutation (change)			
13	People who have had COVID-19 can be tested to see if they have developed antibodies to the SARS-CoV-2 virus			
14	Social distancing, mask use, and washing hands with soap and water are very important in protection from COVID-19			
15	It is necessary to be at least 1.5-2 meters away for social (-physical) distance to provide protection from COVID-19			
16	When using a mask, the mouth and nose must be covered to protect against COVID-19			
17	To prevent COVID-19, the face, eyes, mouth and nose should not be touched without proper washing of hands			
18	If I have come into contact with a person who is positive for COVID-19, I apply to the health institution by following the mask, distance, and hygiene rules			
19	Vaccination is very important in preventing COVID-19			
20	People who have been vaccinated for protection from COVID-19 should also continue to follow the rules of social distancing, use of masks, and washing hands with soap and water			
21	I feel stressed due to COVID-19			
22	I am having trouble sleeping due to COVID-19			
23	I have been away from my family, friends and social circle due to COVID-19			
24	I obtained my information about COVID-19 from written and visual media			
25	I got my information about COVID-19 by researching it on the internet			
26	I obtained my knowledge about COVID-19 by researching scientific medical literature			
27	I have never researched COVID-19, I am informed by what I hear from my environment			
28	I follow all the rules, including mask, distance, hygiene, to protect from COVID-19			
29	I take vitamin supplements to protect myself from COVID-19			
30	I take herbal supplements to protect myself from COVID-19			

### Diagram of the study

#### Study population and interventions:

415 individuals participated in the first phase	- Ethics Committee Approval and Ministry of Health permission.
at least 1 week later	- Carried out at the Uludağ University Family Health Center in Bursa, Turkey between March 1, 2021, and April 30, 2021.
367 individuals participated in the retest phase	- A 30-question survey was created by subtracting 12 questions from the 42 questions originally designed after specialist doctors' opinions.
	- Reliability and factor analyzes were performed and validity was evaluated.
	- In factor analysis, a scale with 4 factors and 30 questions was obtained.

#### Follow-up and definitions:

Factors	- Confirmatory factor analysis was applied for the factor scores of the scale.
A-General Culture	- Factors were named as A-General Culture, B-Mask, Distance and Cleanliness, C-Mental Status and D- Way of Information
B-Mask, Distance and Cleanliness	- A 3-point Likert-type scoring was created for the answers. (1-Agree, 2-No idea, 3-Disagree).
C-Mental Status	
B-Way of Information	

#### Statistical analysis:

The scale obtained in this way was named " <b>Turkey COVID-19 Attitude Scale</b> ".	- Questionnaire forms were analyzed in SPSS 26.0 program. P values below 0.05 were considered statistically significant.
	- Cronbach's Alpha value was determined as 0.894. It was at a good level in terms of internal consistency and was close to perfect.
	- The scale was highly reliable according to the internal and external consistency coefficients.

#### Results and recommendations:

<b>The valid and reliable Turkey COVID-19 Attitude Scale, can be used to guide research during COVID-19 and future pandemics.</b>	- In the factor analysis, it was determined that the sample size was sufficient and there was appropriateness in establishing the relationship between the variables.
	- Correlation coefficients were high in the test and retest relationship and showed that they were correlated. Reliability was found to be reproducible in terms of internal and external consistency.
	- The scale was highly reliable according to the internal and external consistency coefficients.

Figure 1 Study outline: Diagram of the study.

stated that models are needed to reflect updated transmission characteristics and more specific definitions of epidemic control.<sup>19</sup> As states that in these studies, deficiencies in knowledge, education, attitude, behavior, and detecting mistakes are not sufficient in pandemics or other serious

situations. These results highlight the importance of scale development in our study. In extraordinary situations such as pandemics, in addition to identifying the situation and problem, there is a need for attitude and behavioral awareness. Our results revealed that positive guidance was provided to



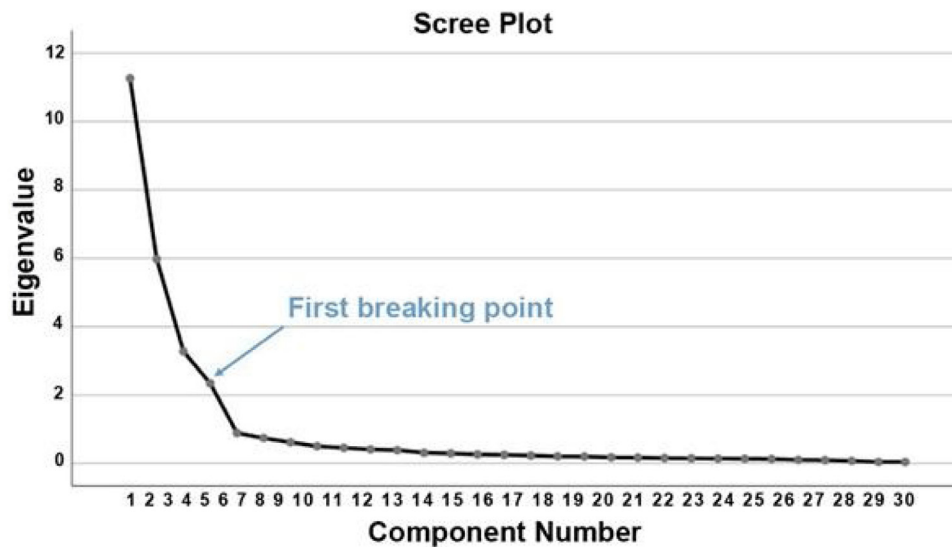
**Table 2** Explained variance and eigenvalues of factors.

Item	Initial	Extraction (variance explained when subtracted)	Components	Eigenvalues	% of explained variance	Cumulative % of total variance explained
Item 1	1	0.628	1	11.265	37.551/34.130*	37.551/34.130*
Item 2	1	0.569	2	5.971	19.902/20.639*	57.453/54.769*
Item 3	1	0.655	3	3.276	10.920/11.755*	68.373/66.525*
Item 4	1	0.709	4	2.344	7.813/9.662*	76.187/76.187*
Item 5	1	0.810	5	0.891	2.969	79.155
Item 6	1	0.840	6	0.739	2.464	81.619
Item 7	1	0.752	7	0.618	2.059	83.679
Item 8	1	0.677	8	0.500	1.668	85.346
Item 9	1	0.879	9	0.453	1.509	86.855
Item 10	1	0.817	10	0.408	1.359	88.215
Item 11	1	0.871	11	0.387	1.290	89.505
Item 12	1	0.873	12	0.310	1.035	90.540
Item 13	1	0.772	13	0.291	0.971	91.511
Item 14	1	0.852	14	0.262	0.872	92.383
Item 15	1	0.862	15	0.250	0.835	93.218
Item 16	1	0.851	16	0.228	0.761	93.979
Item 17	1	0.955	17	0.202	0.675	94.654
Item 18	1	0.911	18	0.199	0.663	95.317
Item 19	1	0.816	19	0.176	0.586	95.903
Item 20	1	0.851	20	0.168	0.560	96.464
Item 21	1	0.622	21	0.155	0.517	96.981
Item 22	1	0.720	22	0.147	0.491	97.472
Item 23	1	0.521	23	0.141	0.468	97.940
Item 24	1	0.665	24	0.135	0.451	98.392
Item 25	1	0.826	25	0.127	0.423	98.814
Item 26	1	0.443	26	0.103	0.344	99.158
Item 27	1	0.689	27	0.093	0.311	99.469
Item 28	1	0.870	28	0.073	0.244	99.713
Item 29	1	0.798	29	0.044	0.145	99.858
Item 30	1	0.753	30	0.042	0.142	100.000
KMO and Bartlett's Test:				0.933		
Bartlett's Test of Sphericity				$p < 0.001$		

Extraction method: principal component analysis.

\* After rotation.

KMO: Kaiser-Meyer-Olkin Test.

**Figure 2** The first line break.

**Table 3** Factor loadings, eigenvalues and variance explained.

Component	Component matrix <sup>a</sup>		Rotated component matrix <sup>b</sup>	
	Factor loadings	Factor loadings	Eigenvalues of factors	Variance explained by factors
<b>Factor 1</b>			<b>11.265</b>	<b>34.130</b>
Item 1	0.774	0.780		
Item 2	0.747	0.715		
Item 3	0.801	0.778		
Item 4	0.824	0.822		
Item 5	0.885	0.880		
Item 6	0.886	0.907		
Item 7	0.846	0.853		
Item 8	0.812	0.792		
Item 9	0.923	0.918		
Item 10	0.886	0.888		
Item 11	0.909	0.918		
Item 12	0.925	0.904		
Item 13	0.862	0.856		
Item 19	0.920	0.953		
<b>Factor 2</b>			<b>5.971</b>	<b>20.64</b>
Item 14	0.882	0.883		
Item 15	0.894	0.921		
Item 16	0.899	0.927		
Item 17	0.888	0.919		
Item 18	0.938	0.974		
Item 20	0.891	0.922		
Item 28	0.851	0.903		
<b>Factor 3</b>			<b>3.276</b>	<b>11.76</b>
Item 21	0.883	0.927		
Item 22	0.761	0.786		
Item 23	0.825	0.847		
Item 29	0.566	0.634		
Item 30	0.779	0.825		
<b>Factor 4</b>			<b>2.344</b>	<b>9.66</b>
Item 24	0.666	0.706		
Item 25	0.871	0.893		
Item 26	0.831	0.864		
Item 27	0.773	0.812		

Extraction method: principal component analysis.

<sup>a</sup> 4 components extracted.<sup>b</sup> Rotation converged in 4 iterations.

individuals to improve attitudes and behaviors in COVID-19 and similar pandemics.

Many adults with comorbid conditions did not have critical knowledge of COVID-19 and did not change their routines or plans despite their concerns. This inequality suggests that more public health efforts may be needed to mobilize the most vulnerable communities.<sup>20</sup> More research is needed to prevent the spread of COVID-19 and to evaluate the effectiveness of the measures taken. Responsiveness is crucial to discourage negative health-seeking behaviors and to encourage positive preventive and therapeutic practices for fear of increased mortality.<sup>21</sup> In a study in China, participants had good knowledge, positive attitude, and active practice about COVID-19, but the results recommended strengthening nationwide promotion and focus on the uneducated population.<sup>22</sup>

Situations accompanied by chronic diseases, vulnerable populations, and nationwide decisions suggest the need for a real and reliable identification of the problem, as in these studies. The need for effective scales in these studies also supports the necessity of our study.

Lack of knowledge of appropriate control methods can exacerbate racial and ethnic disparities. Additional research is needed to identify reliable sources of information and disseminate accurate prevention and treatment information.<sup>23</sup>

It is important to note that additional research is needed after this study, and that methods with a specific scope and content are recommended in research.

Today, younger and healthier populations are affected more than ever before. In the absence of any specific therapeutic agent, such as coronavirus infections, the most

**Table 4** Cronbach's alpha values of the factors.

Component	General			Split – half Cronbach's alpha
	Cronbach's alpha when items are deleted	Total item correlation	Cronbach's alpha value of factors	Part 1–Part 2
<i>Factor 1</i>			<b>0.974</b>	<b>0.936–0.964</b>
Item 1	0.762	0.974		
Item 2	0.720	0.975		
Item 3	0.782	0.973		
Item 4	0.815	0.973		
Item 5	0.879	0.972		
Item 6	0.892	0.971		
Item 7	0.840	0.972		
Item 8	0.792	0.973		
Item 9	0.920	0.971		
Item 10	0.877	0.972		
Item 11	0.913	0.971		
Item 12	0.921	0.971		
Item 13	0.858	0.972		
Item 19	0.883	0.972		
<i>Factor 2</i>			<b>0.976</b>	<b>0.960–0.946</b>
Item 14	0.895	0.974		
Item 15	0.901	0.973		
Item 16	0.893	0.974		
Item 17	0.966	0.969		
Item 18	0.936	0.971		
Item 20	0.893	0.974		
Item 28	0.906	0.973		
<i>Factor 3</i>			<b>0.881</b>	<b>0.837–0.849</b>
Item 21	0.661	0.868		
Item 22	0.751	0.848		
Item 23	0.584	0.885		
Item 29	0.824	0.828		
Item 30	0.781	0.839		
<i>Factor 4</i>			<b>0.818</b>	<b>0.820–0.774</b>
Item 24	0.606	0.843		
Item 25	0.763	0.765		
Item 26	0.476	0.838		
Item 27	0.649	0.816		
General	0.894	0.955–0.813	<b>0.894</b>	<b>0.955–0.813</b>

Reliability test.

effective individual preventative measure is knowledge. This is a time to introspect and learn from our mistakes. Countries need to act urgently in this and similar situations.<sup>24</sup>

To our knowledge, this scale is the only scale developed regarding knowledge, attitudes and behaviors about COVID-19 in Turkey and in the world. The scale questions in our study will set an example in terms of providing a systematic approach to the problem in COVID-19 and similar pandemics by raising awareness on both physicians and individuals on a scientific basis. The scale will guide the researches during the COVID-19 process and in similar pandemics that may develop thereafter.

### Strengths and limitations

To our knowledge, this scale is the first scale developed regarding knowledge, attitudes, and behaviors regarding COVID-19 in Turkey and in the world. The scale will guide researches during the COVID-19 process and in probable future pandemics. This fact will positively contribute to the well-being and health status of people all around the World. Besides these strengths, our study has a limitation of including participants from only one country, namely Turkey. For that reason, it should be developed for other countries by taking into account the health conditions of them, before it can be used as a worldwide scale.



**Table 5** Coefficients of factor scores.*Component score coefficient matrix*

	Component			
	Factor 1	Factor 2	Factor 3	Factor 4
Item 1	<b>0.082</b>	−0.002	0.000	−0.029
Item 2	<b>0.065</b>	−0.002	0.017	0.013
Item 3	<b>0.075</b>	0.001	0.019	−0.010
Item 4	<b>0.082</b>	−0.009	−0.001	−0.004
Item 5	<b>0.089</b>	−0.003	−0.009	−0.006
Item 6	<b>0.097</b>	−0.009	−0.007	−0.034
Item 7	<b>0.088</b>	−0.005	−0.016	−0.012
Item 8	<b>0.077</b>	0.003	−0.021	0.015
Item 9	<b>0.094</b>	0.002	−0.013	−0.013
Item 10	<b>0.092</b>	−0.001	−0.012	−0.019
Item 11	<b>0.095</b>	−0.009	−0.015	−0.011
Item 12	<b>0.088</b>	0.001	0.006	−0.004
Item 13	<b>0.085</b>	−0.008	−0.001	−0.001
Item 19	<b>0.150</b>	−0.015	0.002	0.007
Item 14	−0.010	<b>0.088</b>	−0.012	0.002
Item 15	−0.009	<b>0.152</b>	−0.010	−0.005
Item 16	−0.012	<b>0.150</b>	−0.002	0.007
Item 17	−0.012	<b>0.159</b>	0.010	−0.001
Item 18	−0.009	<b>0.156</b>	0.000	−0.009
Item 20	−0.008	<b>0.152</b>	0.005	−0.019
Item 28	−0.003	<b>0.151</b>	0.003	−0.016
Item 21	−0.025	0.003	<b>0.232</b>	−0.002
Item 22	−0.028	−0.007	<b>0.253</b>	−0.013
Item 23	−0.013	0.005	<b>0.205</b>	−0.001
Item 29	−0.030	0.000	<b>0.266</b>	−0.013
Item 30	−0.024	0.002	<b>0.255</b>	−0.010
Item 24	−0.062	−0.015	0.005	<b>0.326</b>
Item 25	−0.062	−0.020	−0.002	<b>0.359</b>
Item 26	−0.030	0.003	−0.014	<b>0.242</b>
Item 27	−0.053	−0.011	−0.025	<b>0.328</b>

Extraction method: principal component analysis. Rotation method: equamax with Kaiser normalization.

**Table 6** Test and retest correlation coefficients.

(n = 367)	r	p
Question 1 & Retest – Question 1	0.967	<0.001
Question 2 & Retest – Question 2	0.975	<0.001
Question 3 & Retest – Question 3	0.965	<0.001
Question 4 & Retest – Question 4	0.968	<0.001
Question 5 & Retest – Question 5	0.909	<0.001
Question 6 & Retest – Question 6	0.923	<0.001
Question 7 & Retest – Question 7	0.941	<0.001
Question 8 & Retest – Question 8	0.919	<0.001
Question 9 & Retest – Question 9	0.928	<0.001
Question 10 & Retest – Question 10	0.930	<0.001
Question 11 & Retest – Question 11	0.927	<0.001
Question 12 & Retest – Question 12	0.910	<0.001
Question 13 & Retest – Question 13	0.938	<0.001
Question 14 & Retest – Question 14	0.881	<0.001
Question 15 & Retest – Question 15	0.877	<0.001
Question 16 & Retest – Question 16	0.884	<0.001

Table 6 (Continued)

(n = 367)	r	p
Question 17 & Retest – Question 17	0.867	<0.001
Question 18 & Retest – Question 18	0.874	<0.001
Question 19 & Retest – Question 19	0.932	<0.001
Question 20 & Retest – Question 20	0.877	<0.001
Question 21 & Retest – Question 21	0.954	<0.001
Question 22 & Retest – Question 22	0.978	<0.001
Question 23 & Retest – Question 23	0.954	<0.001
Question 24 & Retest – Question 24	0.977	<0.001
Question 25 & Retest – Question 25	0.960	<0.001
Question 26 & Retest – Question 26	0.966	<0.001
Question 27 & Retest – Question 27	0.960	<0.001
Question 28 & Retest – Question 28	0.872	<0.001
Question 29 & Retest – Question 29	0.971	<0.001
Question 30 & Retest – Question 30	0.987	<0.001

Paired samples correlations.

r: correlation coefficient.

Table 7 Confirmatory factor analysis fit indices.

Index		Good fit	Acceptable	Application	Results
$\chi^2/df$	Chi-square/degrees of freedom value	<3	$3 < (\chi^2/df) < 5$	3.302	Acceptable
RMSEA	Root mean square error of approximation	<0.05	<0.08	0.057	Acceptable
CFI	Comparative fit index	>0.95	>0.90	0.998	Good fit
NFI	Fix indices	>0.95	>0.90	0.998	Good fit
NNFI (TLI)	Non-normed fix indices (Tucker-Lewis index)	>0.95	>0.90	0.789	No fit
IFI	Incremental fit index	>0.95	>0.90	0.998	Good fit
GFI	Goodness of fit index	>0.90	>0.85	0.849	Acceptable
AGFI	Adjusted goodness of fit index	>0.90	>0.85	0.854	Acceptable

## Conclusion

The valid and reliable Turkey COVID-19 Attitude Scale, which we developed to evaluate the knowledge, attitudes and behaviors of individuals about COVID-19, will guide research in the COVID-19 process and future pandemics.

### What is known on the topic

- Since the beginning of the pandemic, studies have been carried out on the information, attitudes and behaviors of individuals and societies against Covid-19. However, the pandemic is not over yet and even tends to increase due to variants.

### What this study contributes

- This scale is the only scale developed regarding knowledge, attitudes and behaviors about COVID-19 in Turkey and in the world. The scale will guide the researches during the COVID-19 process and in similar pandemics that may develop thereafter.

## Authors' contribution

OG, CE conceived, designed, and completed statistical analysis & editing of manuscript.

OG, CE completed data collection and manuscript writing.

OG completed review and final approval of manuscript.

## Disclaimer

None.

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## Conflict of interest

None.

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