ORIGINAL RESEARCH

Assessing the Saudi Population Knowledge, Acceptance, and Perception on the Effectiveness of Following the Safety Precautions During COVID-19 Pandemic

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Background: Coronavirus disease 2019 (COVID-19) has become an alarming issue worldwide. Kingdom of Saudi Arabia was fast in adopting the safety precaution measures and is considered one of the major countries that place preventive precautions measures to control the spread of the disease. The current study aims to assess the knowledge, effectiveness, and acceptance of the public regarding COVID-19 safety precautions measures: face masks, physical distance, wash hands/use hand sanitizer, and the use of Tawakkalna application as a preventive measure in the Kingdom of Saudi Arabia.
Methods: The study design was quantitative cross-sectional using a self-administered questionnaire.
Results: Of the 400 received responses, the data analysis showed that there was a significant association between knowledge about the safety precaution measures score with nationality and gender with P value less than 0.05.
Conclusion: The awareness of Saudi citizens of the importance of implementing preventive precautions and their compliance greatly contributed in limiting the virus spread.
Keywords: COVID-19, public perceptions, knowledge, acceptance

Introduction

The ongoing outbreak of coronavirus disease 2019 (COVID-19) has become an alarming issue all over the world and has significant effects in different aspects.[1,2] COVID-19 spread in Wuhan city, China, initially in December 2019. Then, in March 2020, the World Health Organization (WHO) classified COVID-19 as a pandemic that threats the population globally.[2] The first case in Saudi Arabia was announced in March 2020 as well.[3] The WHO declared that COVID-19 is a highly communicable disease that can be spread through close contact of the infected person with any person nearby by respiratory droplets and nasopharyngeal secretion. Also, it can spread by touching objects and surfaces contaminated with the virus.[4] COVID-19 has many changing symptoms, but the most common symptoms are fever, dry cough, fatigue, and shortness of breath.[1,2]

Presently, viruses are constantly changing through genetic mutations and this is what exactly happened with the COVID-19 when it changed to a delta variant, which is more dangerous than previous strains, as it caused severe illness and spread faster than it was in the previous COVID-19 generations.[5]

Globally, this pandemic showed that each health-care system has to place some protective measures, policies, and strategies to protect and control public health.[6] To minimize the spread of COVID-19, the main precaution strategies are achievable and available in settings with limited resources.[7] Wearing a face mask, keeping physical distance, staying home and washing hands were the primary safety precaution measures suggested to stop the spread of COVID-19.

The Kingdom of Saudi Arabia was fast in adopting the safety precaution measures and is considered one of the major countries that place preventive precautions measures to limit and control the spread of the disease.[8]

Moreover, making some political reforms and governance structures helped the countries to control the spread of the COVID-19 virus.[9] In March 2021, the Ministry of Health in Saudi Arabia, in collaboration with the Saudi Authority for Data and Artificial Intelligence (SDAIA), has achieved a significant drop in the number of infected cases, especially in Madinah, by making use of mobile technology to control this pandemic.[10] "Tawakkalna" is one of the applications that was published and approved by the Saudi Ministry of Health during the COVID-19 pandemic. The purposes of this application are to detect the infection, trace it, and avoid it.[10] Also, it shows the health status of people if they have a current or past infection and send a warning if the people come into direct contact with the infected person or not.[10] Furthermore, the application was developed to serve advanced features, involving Umrah, Hajj, and gatherings permits.[10]

The awareness of the disease is an important parameter for the acceptance of COVID-19 protective methods that reduce the exposure to risk.[3] One of the key factors that successfully affect and manage the spread of COVID-19 is people's commitment to follow the safety precaution measures that the Ministry of Health and the Ministry of Interior have assigned. This commitment highly depends on the people's knowledge and attitude to COVID-19, which helps in dealing with pandemics. Measuring public knowledge assists in detecting gaps and supports the prevention of hard work that is accomplished in regard.[11]

Therefore, the present study aims to assess the public knowledge, acceptance, and perception on the effectiveness of COVID-19 safety precaution measures: face masks, physical distance, wash hands/use hand sanitizer, and the use of Tawakkalna application as a preventive measure in the Kingdom of Saudi Arabia. Knowing this information will expand the benefit of policymakers, innovators, and users who anticipate the adoption of the technology of health application that may affect providing the optimum service for the appliance user and improving the health of individuals and performance of providers.

Materials and Methods
Study Design
This is a descriptive quantitative cross-sectional study design.

Participants and Recruitments
The target population of this study is the public aged 18 years and above and living in the Kingdom of Saudi Arabia. Convenience and snowball sampling techniques were used to recruit the study participants through distributing the survey online using social media channels, including Whatsapp and Twitter.

Variables
The independent variables of this study were users' demographic characteristics including the nationality, gender, age, marital status, number of children, educational level, and health status. The dependent variables were knowledge, effectiveness, acceptance of public to the safety precautions of COVID19 and the use of Tawakkalna application as a safety precaution measure.

Data Sources/Measurement
A self-administered questionnaire was adapted from five previous studies.[3,7,11–13] After the questionnaire items were developed, the questionnaire was translated into the Arabic language, in order to be suitable for the Saudi context, where the majority of the population are Arab. The questionnaire consisted of six parts with 34 items. The first part consisted of seven questions about participant demographic information, mentioned in the previous section. The second part was general questions about the awareness of the safety precaution measures and consisted of five questions. The third part contained questions related to the knowledge about the safety precaution measures and consisted of six questions. The fourth part contained questions about the effectiveness of the safety precaution measures and consisted of five questions. The fifth part contained questions about the acceptance of following the precaution measures and consisted of six

questions. The sixth and final part contained questions about the Tawakkalna application as a safety precaution measure and consisted of five questions. The participants answered each item using either 5-point Likert agreement scale or Yes, No, and sometimes and was distributed online through social media application.

In order to ensure the validity of the questionnaire, linguistic, content, and face validity were conducted. First, content validity was established by using expert panel review technique. As suggested by the literature, the authors targeted experts who have several publications or work experience in the same field of the study.[14] Academic experts were recruited purposively from the Public Health Department at Imam Abdulrahman Bin Faisal University (IAU) and health-care professionals were recruited from King Fahad Teaching Hospital. An invitation email was sent to 10 experts to participate in a content validity evaluation of the scale. Seven out of 10 experts, with a 70% response rate, responded to the invitation. Most of the participants were female (60%), with long experience in the field (10 years or above). The content validity of the questionnaire was then assessed using content validity index (CVI) techniques.[15]

Secondly, backward–forward translation was established to assess the instrument's linguistic validity. Finally, face validity was done by recruiting 25 participants from the public. In face validity, the items of both the Arabic and English versions were assessed by lay participants according to three criteria, *Clarity*, ie. whether they are clear enough, *Easiness*, ie. whether lay participants are able to answer the questionnaire easily, and the *Appropriateness* of layout and style. Each item was assessed against these criteria and was given a rate out of 4.

Bias
Recall bias could have been introduced, as the data rely solely on the participants' knowledge, acceptance, and their perception on the effectiveness of the effectiveness of following the safety precautions during COVID-19 pandemic.

Study Size
The rule of thumb supported by Comey and Lee was used in this study, where 100 participants = fair, 200 participants = good, 500 participants = very good, and >1000 participants = excellent. A total number of 856 people reviewed the link to the online survey from 1 to 31 October 2021, of which 403 participants completed the survey. Three responses were under 18 years old so it was removed from the analysis.

Statistical Test
All numerical data were entered and analyzed by using the IBM Statistical Package for Social Sciences (SPSS) software version 28.0.1.0. The summary statistics are presented as counts and percentages of categorical variables and as measures of central tendency for continuous variables. The continuous variables were not normally distributed. The skewness was 0.122 and the kurtosis was 0.243. Therefore, non-parametric tests were used. Mann–Whitney U-test and the Kruskal–Wallis test were used to conduct the bivariate analysis, where P value less than 0.05 means significant association.

Results
Scale Validity Test Findings
The content validity assessment indicated that all of the items received a high score as a result of the I-CVI between 0.80 and 1. Following the advice of the expert panel, a few modifications to the questionnaire have been made.

In face validity, the participant's ratings of the items ranged from 3 to 4. Based on the face validity results, some of the questionnaire items were modified to improve their clarity.

Descriptive Data
Descriptive statistics of the demographic variables of the study participants are provided in Table 1. Of the 400 received responses, the majority of the participants were Saudis (96.3%), while the non-Saudis were (3.8%). Around 66% were female and about 34% were male. Most of the responses (21.0%) were aged between 36 and 40 years, followed by (19.3%) aged above 50 years; (17.3%) aged 31–35 years; (16.8%) aged 41–45 years; (14.8%) were aged 46–50 years; (7.0%) aged 18–25 years and (4.0%) aged 26–30 years. Most participants (83.8%) were married, and (1.5%) were widowed. Regarding the number of children

Table 1 The Demographic Information of Study Participants

Variables	Frequency (n=400)	(%)
Nationality		
Saudi	385	96.3
Non-Saudi	15	3.8
Age		
18–25	28	7.0
26–30	16	4.0
31–35	69	17.3
36–40	84	21.0
41–45	67	16.8
46–50	59	14.8
+50	77	19.3
Gender		
Male	135	33.8
Female	265	66.3
Marital Status		
Single	51	12.8
Married	335	83.8
Divorce/Separated	8	2.0
Widowed	6	1.5
Number of Children		
0	65	16.3
1–2	116	29.0
3–4	144	36.0
5–6	62	15.5
>7	13	3.3
Level of Education		
Less than high school	4	1.0
High school	51	12.8
Diploma/Certificate	61	15.3
Bachelor's degree	225	56.3
Master's/PhD degree	59	14.8
Chronic Diseases		
Yes	79	19.8
No	321	80.3

Abbreviations: n, sample size; %, percentage.

(36.0%) were having 3–4 children; and (3.3%) having more than 7 children. More than half of the participants (56.3%) with Bachelor's degree; while the less than high school with (1.0%). Most of the participants with no chronic diseases (80.3%) while (19.8%) who have chronic diseases.

Table 2 provides the frequency and percentage of the general questions regarding the safety precaution measures. About 93% of the participants know about the safety precaution measures. Around 55% of the participants heard about safety precaution measures through social media. The highest safety precaution measures that more that 90% of the participants reported they use were washing hands or using hand sanitizer, wearing a face mask, and keeping distance. Following the use of the Tawakkalna application with (80.5%). Nearly half of the responses stay home and use the Tabaud application. Around 71% of the participants believed that the safety precaution measures prevent the transmission of COVID-19, while (82.8%) follow these safety precaution measures recommended by the Saudi Ministry of Health.

Table 2 The Frequency/Percentage of the General Questions

Variables	Frequency (n=400)	(%)
Do you know there is a safety precaution measures?		
Yes	371	92.8
No	5	1.3
Sometimes	24	6.0
How did you hear about the safety precaution measures?		
Family or friends	38	9.5
Social media	222	55.5
TV	38	9.5
SMS	14	3.5
Others	88	22.0
What precaution have you been taking to protect yourself against COVID-19? (Tick all that apply)		
Washing hands or using hand sanitizer	387	96.8
Wearing mask	384	96.0
Keeping distance	362	90.5
Stay home	189	47.3
I use Tabaud app	186	46.5
I use Tawakkalna app	322	80.5
Do you believe that the safety precaution measures prevent the transmission of COVID-19?		
Yes	285	71.3
No	9	2.3
Sometimes	106	26.5
Do you follow all the safety precaution measures recommended by the MOH?		
Yes	331	82.8
No	6	1.5
Sometimes	63	15.8

Abbreviations: n, sample size; %, percentage; MOH, Ministry of Health.

Main Results

The knowledge score was calculated by computing the results of knowledge about the safety precaution measures (six questions). The acceptance score was calculated by computing the results of acceptance of following the precaution measures (six questions); The perception on the effectiveness of Tawakkalna application score was calculated by computing the results of Tawakkalna application as a safety precaution (five questions). The perception on the effectiveness of the safety precaution measures score was calculated by computing the results of effectiveness of the safety precaution measures (five questions); The higher scores indicating better knowledge, acceptance, and perceived effectiveness of Tawakkalna application as well as the safety precaution measures.

The findings of the current study showed that there is significant association between knowledge about the safety precaution measures score with nationality and gender (P value = 0.032 and 0.025). The result showed that Saudis have more knowledge about the safety precaution measures than non-Saudis. Also, the result showed that females have more knowledge about the safety precaution measures than males (see Table 3).

Discussion

The use of preventive precautions had a clear impact in limiting the spread of COVID-19 in the Kingdom of Saudi Arabia. Moreover, the awareness of Saudi citizens of the importance of implementing preventive precautions greatly contributed in limited the virus spread. The purpose of the present study is to examine the public acceptance levels for different kinds of safety preventive methods used in Saudi Arabia during the COVID-19 outbreak and the effectiveness of each one.

This study findings revealed that most study participants were knowledgeable about safety precaution measures. Consistently, several papers conducted in Saudi Arabia reported the similar finding of safety precaution measures awareness and acceptance,[2,16,17] as well as in Singapore[18] and Ethiopia.[19] One study held in Saudi Arabia stated that participants had high compliance regarding wearing gloves, face masks, and hand hygiene, especially females and high-income people.[16] Likewise, a third of the participants in Baziad et al study chose the answer of washing hands or using alcohol compared with the other preventive measures.[16] While in this study, the high rate of safety precaution measures that was used among the participants was washing hands or using hand sanitizer, wearing a face mask, keeping distance, and following the use of the Tawakkalna application. This may be due to the characteristics of the participants, as a high percentage had a diploma certificate or bachelor's degree, or above, and were over 30 years old. This finding is consistent with other studies that have shown most participants in China avoided going to crowded places and used masks when leaving their homes during the COVID-19 outbreak.[6] These findings are similar to this study's findings on the rates of knowledge about safety precaution measures. Moreover, the questionnaire was distributed among Saudi citizens after the COVID-19 outbreak and after they managed to have awareness and knowledge about the prevention and precaution measures either through television, news, or social media.

Social media played a big role in transmitting safety awareness information rapidly.[20] Two studies reported that participants hear about the safety precaution measures through social media.[2,19] On the other hand, this study supported the significant impact of social media in that matter. However, Binsaleh et al mentioned in their study that the Saudi Ministry of Health is considered as the primary resource regarding the safety precaution measures followed by WHO, while social media is a secondary resource.[17]

Furthermore, the country governments have a role toward the implementation of the prevention and control measures. In China, although the population has a positive attitude towards COVID-19, the local government placed very strict precaution and prevention by controlling going to crowded places and controlling the public gathering.[20] These findings are similar to this study's findings. For the Saudi Ministry of Health to overcome COVID-19 pandemic obstacles, it had launched many mobile health applications, such as Mawid, Tetamman, Tawakkalna, and Tabaud to contain the virus. In November 2020, the Saudi Ministry of Health has decided to oblige residents and citizens to use the Tawakkalna application in public indoor places to strict some prevention on practice that could prevent the infection of COVID-19.[21] Interestingly, this paper indicated a high rate of awareness, acceptance, and utilization of the Saudi society for this application. However, this has not been discussed in other studies.

Table 3 Significance Association Between Independent Variables and Dependent Variables

Dependent Variable	Independent Variable	Mean Rank	Test	P Value
Knowledge about the safety precaution measures score	Nationality		U = 1986.0	**0.032***
	Saudi	202.84		
	Non-Saudi	140.40		
	Gender		U = 15,534.0	**0.025***
	Male	183.07		
	Female	209.38		
	Age		H = 2.456	0.873
	18–25	198.09		
	26–30	199.19		
	31–35	186.41		
	36–40	194.68		
	41–45	210.43		
	46–50	203.68		
	+50	209.55		
	Marital Status		H = 1.199	0.753
	Single	187.90		
	Married	201.67		
	Divorce/ Separated	228.00		
	Widowed	205.33		
	Number of Children		H = 3.013	0.556
	0	201.85		
	1–2	186.15		
	3–4	207.72		
	5–6	209.85		
	>7	197.19		
	Level of Education		H = 5.767	0.217
	Less than high school	155.50		
	High school	226.16		
	Diploma/Certificate	198.66		
	Bachelor's degree	201.77		
	Master's/PhD degree	178.44		
	Chronic Disease(s)		U = 1986.0	0.710
	Yes	204.66		
	No	199.48		

(*Continued*)

Table 3 (Continued).

Dependent Variable	Independent Variable	Mean Rank	Test	P Value
Effectiveness of the safety precaution measures	Nationality		U = 2643.5	0.558
	Saudi	201.13		
	Non-Saudi	184.23		
	Gender		U = 16,496.5	0.179
	Male	190.20		
	Female	205.75		
	Age		H = 2.768	0.837
	18–25	191.11		
	26–30	231.25		
	31–35	198.49		
	36–40	197.24		
	41–45	189.60		
	46–50	209.07		
	+50	205.80		
	Marital Status		H = 1.084	0.781
	Single	203.79		
	Married	200.62		
	Divorce/Separated	208.00		
	Widowed	155.75		
	Number of Children		H = 4.076	0.396
	0	214.51		
	1–2	193.98		
	3–4	191.90		
	5–6	218.66		
	>7	197.27		
	Level of Education		H = 5.070	0.280
	Less than high school	208.00		
	High school	218.20		
	Diploma/Certificate	214.73		
	Bachelor's degree	198.55		
	Master's/PhD degree	177.42		
	Chronic Disease(s)		U = 2643.5	0.749
	Yes	196.97		
	No	201.37		

(*Continued*)

Table 3 (Continued).

Dependent Variable	Independent Variable	Mean Rank	Test	P Value
Acceptance of the safety precaution measures	Nationality		$U = 2088.0$	0.063
	Saudi	202.58		
	Non-Saudi	147.20		
	Gender		$U = 16,321.0$	0.143
	Male	212.10		
	Female	194.59		
	Age		$H = 5.283$	0.508
	18–25	214.27		
	26–30	236.97		
	31–35	200.92		
	36–40	204.80		
	41–45	210.75		
	46–50	181.41		
	+50	188.55		
	Marital Status		$H = 1.946$	0.508
	Single	183.80		
	Married	202.61		
	Divorce/Separated	231.13		
	Widowed	183.58		
	Number of Children		$H = 1.219$	0.875
	0	208.72		
	1–2	203.12		
	3–4	198.39		
	5–6	189.29		
	>7	212.88		
	Level of Education		$H = 2.447$	0.654
	Less than high school	203.00		
	High school	205.02		
	Diploma/Certificate	214.06		
	Bachelor's degree	193.01		
	Master's/PhD degree	210.97		
	Chronic Disease(s)		$U = 2088.0$	0.070
	Yes	179.84		
	No	205.58		

(Continued)

Table 3 (Continued).

Dependent Variable	Independent Variable	Mean Rank	Test	P Value
Tawakkalna application as a safety precaution measure	Nationality		U = 2419.0	0.233
	Saudi	201.72		
	Non-Saudi	169.27		
	Gender		U = 17,541.5	0.723
	Male	203.06		
	Female	199.19		
	Age		H = 8.999	0.174
	18–25	225.38		
	26–30	208.22		
	31–35	202.61		
	36–40	186.74		
	41–45	184.19		
	46–50	192.50		
	+50	223.30		
	Marital Status		H = 1.341	0.720
	Single	214.47		
	Married	197.99		
	Divorce/Separated	201.94		
	Widowed	219.83		
	Number of Children		H = 7.521	0.111
	0	217.14		
	1–2	193.16		
	3–4	194.65		
	5–6	197.31		
	>7	262.85		
	Level of Education		H = 5.481	0.241
	Less than high school	223.63		
	High school	221.62		
	Diploma/Certificate	190.45		
	Bachelor's degree	193.60		
	Master's/PhD degree	217.37		
	Chronic Disease(s)		U = 2419.0	0.667
	Yes	204.99		
	No	199.40		

Note: *P value <0.05.
Abbreviations: *U*, Mann Whitney *U*-test; *H*, Kruskal–Wallis test.

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Moreover, the results reflected that Saudi populations are committed to the safety preventive measures at the personal level. However, it is crucial to increase awareness campaigns, health education programs especially among the young and low educated people, because these findings are consistent with other studies and supported by Bazaid et al study.[16] This study findings showed the gender patterns of prevention and precaution attitude toward COVID-19, men are more likely to not follow the prevention precautions. In line with this study findings, Bazaid et al study showed a significantly high risk of some prevention measures among the men who are going to a crowded place, not wearing a face mask when leaving homes and not leaving distance.[16] As suggested by previous findings, health education interventions and education programs should be continued to the population, to significantly increase the knowledge and awareness in Saudi society and Saudi government needs to allocate a budget to provide safety precautions equipment's freely for the individual with limited income.[16]

Conclusion

The study provides the perception of the Saudi population about the importance of safety precautions during the COVID-19 pandemic. The Ministry of Health and Ministry of Interior of Saudi Arabia has mandated the safety precaution measure in public places. The current study showed that the Saudi population is knowledgeable and aware of the safety precaution measure. In addition, the study has revealed a good compliance rate among the respondents, as they are following hand hygiene either by washing hands or hand sanitizer, wearing a face mask, and keeping distance. Moreover, the study has demonstrated a good attitude towards using Tawakkalna application among the population in Saudi Arabia followed by using Tabaud application. The use of technology and artificial intelligence played a major role in obligating citizens and residents to use the Tawakkalna application, as the government's decision was a wise decision to limit the pandemic.

This study has some limitations. Firstly, the recruitment method used was convenience sampling, altering the generalisability of the target population. Secondly, the number of non-Saudis participating in the study were considered low. On the other hand, the strong point lies in the large number of responses, which are 400 participants in the study's questionnaire. Further studies should corroborate and compare this study's findings with the perception of the Saudi population about the importance of safety precautions during COVID-19 after vaccination.

Institutional Review Board Statement

The study was conducted in accordance with the Declaration of Helsinki and approved by the Institutional Review Board. Ethical approval was obtained from the Institutional Review Board (IRB) at Imam Abdulrahman bin Faisal University, on November 30, 2021, with an approval number: IRB-PGS-2021-03-442.

Data Sharing Statement

The data presented in this study are available on request from the corresponding author.

Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

Acknowledgments

We acknowledge all the participants who agreed to participate in this study.

Disclosure

The authors declare no conflicts of interest in this work.

References

1. Al-Hanawi MK, Angawi K, Alshareef N, et al. Knowledge, attitude and practice toward COVID-19 among the public in the Kingdom of Saudi Arabia: a cross-sectional study. *Front Public Heal*. 2020;8:217–227. doi:10.3389/fpubh.2020.00217
2. Manikandan N. Are social distancing, hand washing and wearing masks appropriate measures to mitigate transmission of COVID-19? *Vacunas*. 2020;21(2):136. doi:10.1016/j.vacun.2020.09.001
3. Tripathi R, Alqahtani SS, Albarraq AA, et al. Awareness and preparedness of COVID-19 outbreak among healthcare workers and other residents of South-West Saudi Arabia: a cross-sectional survey. *Front Public Heal*. 2020;8:482. doi:10.3389/fpubh.2020.00482
4. Acter T, Uddin N, Das J, Akhter A, Choudhury TR, Kim S. Evolution of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) as coronavirus disease 2019 (COVID-19) pandemic: a global health emergency. *Sci Total Environ*. 2020;730:138996. doi:10.1016/j.scitotenv.2020.138996
5. Centers for Disease Control and Prevention, Your Health. Available from: http//www.cdc.gov/coronavirus/2019-ncov/your-health/index.html. Accessed June 3, 2022.
6. Xing C, Zhang R. COVID-19 in China: responses, challenges and implications for the health system. *Healthcare*. 2022;9(1):82. doi:10.3390/healthcare9010082
7. Dires A, Gedamu S, Getachew Y. Perception of COVID-19 prevention methods efficacy and intention to use among patients with chronic disease in Dessie Town, Northeast Ethiopia: a Multicentered cross-sectional study. *J Multidiscip Healthc*. 2021;14:1325. doi:10.2147/JMDH.S313796
8. Al Jasser R, Al Sarhan M, Al Otaibi D, Al Oraini S. Awareness toward COVID-19 precautions among different levels of dental students in King Saud University, Riyadh, Saudi Arabia. *J Multidiscip Healthc*. 2020;13:1317. doi:10.2147/JMDH.S267956
9. Zhang J, Zhang R. COVID-19 in China: power, transparency and governance in public health crisis. *Healthcare*. 2020;8(3):288. doi:10.3390/healthcare8030288
10. Tawakkalna. Available from: https://ta.sdaia.gov.sa/en/index. Accessed October 9, 2021.
11. Khaled A, Siddiqua A, Makki S. The knowledge and attitude of the community from the aseer region, Saudi Arabia, toward covid-19 and their precautionary measures against the disease. *Risk Manag Healthc Policy*. 1825;2020:13.
12. Huynh G, Nguyen MQ, Tran TT, et al. Knowledge, attitude, and practices regarding COVID-19 among chronic illness patients at outpatient departments in Ho Chi Minh City, Vietnam. *Risk Manag Healthc Policy*. 2020;13:1571. doi:10.2147/RMHP.S268876
13. Padidar S, Liao S, Magagula S, Mahlaba TM, Nhlabatsi NM, Lukas S. Assessment of early COVID-19 compliance to and challenges with public health and social prevention measures in the Kingdom of Eswatini, using an online survey. *PLoS One*. 2021;16(1):e0253954. doi:10.1371/journal.pone.0253954
14. Rubio DM, Berg-Weger M, Tebb SS, Lee ES, Rauch S. Objectifying content validity: conducting a content validity study in social work research. *Soc Work Res*. 2003;27(2):94–104. doi:10.1093/swr/27.2.94
15. Rodrigues IB, Adachi JD, Beattie KA, MacDermid JC. Development and validation of a new tool to measure the facilitators, barriers and preferences to exercise in people with osteoporosis. *BMC Musculoskelet Disord*. 2017;18(1):1–9. doi:10.1186/s12891-017-1914-5
16. Bazaid AS, Aldarhami A, Binsaleh NK, Sherwani S, Althomali OW. Knowledge and practice of personal protective measures during the COVID-19 pandemic: a cross-sectional study in Saudi Arabia. *PLoS One*. 2020;15(12):e0243695. doi:10.1371/journal.pone.0243695
17. Binsaleh NK, Bazaid AS, Aldarhami A, Sherwani S, Althomali OW. Awareness and practice of covid-19 precautionary measures among healthcare professionals in Saudi Arabia. *J Multidiscip Healthc*. 2021;14:1553. doi:10.2147/JMDH.S317908
18. Koh TW, Ling AZ, Chiang CL, Lee GJ, Tay HE, Yi H. Attitudes towards COVID-19 precautionary measures and willingness to work during an outbreak among medical students in Singapore: a mixed-methods study. *BMC Med Educ*. 2021;21(1):1–11. doi:10.1186/s12909-021-02762-0
19. Girma S, Alenko A, Agenagnew L. "Knowledge and precautionary behavioral practice toward COVID-19 among health professionals working in public university hospitals in Ethiopia: a web-based survey. *Risk Manag Healthc Policy*. 2020;13::1327. doi:10.2147/RMHP.S267261
20. Zhong BL, Luo W, Li H-M, et al. Knowledge, attitudes, and practices towards COVID-19 among Chinese residents during the rapid rise period of the COVID-19 outbreak: a quick online cross-sectional survey. *Int J Biol Sci*. 2020;16(10):1745. doi:10.7150/ijbs.45221
21. Bamufleh D, Alshamari AS, Alsobhi AS, Ezzi HH, Alruhaili WS. Exploring public attitudes toward E-government health applications used during the COVID-19 pandemic: evidence from Saudi Arabia. *Comput Inf Sci*. 2021;14(3):1.