ORIGINAL ARTICLE

Measures undertaken to avoid COVID-19 Infection: Internet-based, Cross-Sectional Survey Study

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Abstract

Introduction: In Saudi Arabia, over 154,000 people were infected with coronavirus disease (COVID-19). Unfortunately, until now, there are no vaccinations or effective drugs available, so only public health interventions such as physical distancing and hygiene measures in addition to targeted testing followed by isolation and quarantine measures are available. **Objective:** This study aims to describe the measures that are undertaken by Saudi population to avoid COVID-19 infection in Saudi Arabia. **Methodology:** This is a cross-sectional using internet-based survey. The survey was adapted from the previous study and from the WHO recommendations for COVID-19 prevention and control. The data included sociodemographic characteristics, level of attention, preventive measures taken by participants, and practice toward curbing the COVID-19 epidemic. **Results:** The majority of participants' responded that their attention to the COVID-19 epidemics was very high to high (81.08%) while no one rated their attention at very low. To protect their families or friends, the respondents were mainly persuaded them to stay at home as much as possible (86%) and told them to avoid large gatherings (72.73%). Regarding the participants' confidence in curbing the COVID-19 epidemic, about 73.47% of the participants were confident (strongly confident or confident). **Conclusion:** The public followed the hygiene recommendations of health authorities very well but still more education is still needed on some measures to prevent the spreading of the infection specially using the online education to enhance the public awareness about COVID-19.

Key words: Coronavirus, COVID-19, epidemic, interventions, measures, prevention

INTRODUCTION

Coronavirus disease 2019 (COVID-19) is the novel coronavirus disease that appeared in the Chinese city, Wuhan in December 2019 in the form of acute pneumonia.[1] On January 30, 2020, the outbreak of COVID-19 has been recognized as a public health emergency of international concern by the World Health Organization.[2] As of June 20, 2020, the total number of confirmed cases from the virus has increased to 8,946,238 cases. In Saudi Arabia, over 154,000 people were infected with COVID-19 and over of 1230 people have died in <4 months, as reported by Saudi Ministry of Health.[3] Therefore, COVID-19 is a highly transmissible disease. As for other respiratory viruses, it primarily spreads from person to person through respiratory droplets. It can also be transmitted through the contact with infected individuals' secretions.[4] In addition, people can also be infected from and touching contaminated surfaces and touching their eyes, nose, or mouth. COVID-19 virus may survive on surfaces for numerous hours; nevertheless, simple disinfectants can kill it.[5] The disease developed to a mild course in 80% of the cases and to severe course in 20%.[6]

Unfortunately, until now, there are no vaccinations or effective drugs available, so only public health interventions such

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as physical distancing and hygiene measures in addition to targeted testing followed by isolation and quarantine measures are available.[6] It is well known that public compliance with current preventive measures and recommendation is a fundamental part of effective for COVID-19 prevention. Huang *et al*. reported that it is important to provide the public with sufficient information about the risks of the disease outbreak and the interventions that should be implemented to control it such as the appropriate use of masks, regular handwashing, and the avoidance of large gatherings to control the outbreak.[7]

Ministry of Health in Saudi Arabia recommended a key actions for COVID-19 prevention such as personal hygiene, practice safe sneezing and coughing etiquette, avoid close contact with anyone who has common cold or flu symptoms, and avoid unsafe handling animals, whether they are wild or on the farm. In addition, Ministry of Health recommended sneezing etiquette to prevent infection and tips for travelers to prevent disease spreading.[1]

Although the KSA government has taken all necessary prevention and control measures to contain the spread of COVID-19,[8] there is a need to assess the efforts that have been made in the community, which would assist the health-care management to identify any knowledge gaps and supports efforts to fill those gaps and to ensure the adequate preparedness of the public in facing new epidemic of influenza or any other new emerging disease. Therefore, this study aimed to describe the measures that are undertaken by Saudi population to avoid COVID-19 infection in Saudi Arabia.

METHODOLOGY

Study design and participants

An internet-based, descriptive, cross-sectional survey was administered to convenience sampling across a 2-week period in May 2020 for 2 weeks. Participants were included if they were adult at least 18 years of age and reside in Saudi Arabia.

Data collection

The survey was adapted from the previous study conducted by Huang *et al*.[7] in addition to recommendations from the WHO key messages and actions for COVID-19 prevention and control in schools.[5] Survey was translated to Arabic and back to English to check translation validity. Survey concepts were clearly defined and questions unambiguously phrased. Question wording was carefully examined for special sensitivity or bias.

Survey items were pretested one-on-one with 10 participants (including middle-aged and elderly participants) through a printout of the proposed survey instrument. Modifications were made based on feedback to improve ease of understanding, and the survey instrument was uploaded to an online platform. A second round of pretesting with the online instrument was done among four participants to ensure readability on both personal computer and mobile platforms.

The questionnaire was distributed using social media to the public, the participation is voluntary and the privacy is maintained through anonymity and confidentiality. The incomplete surveys were excluded.

Survey measures

The questionnaire included several sections. The first section contained the demographic data of the participants and included five questions. The second section identified participants' level of attention paid to the epidemic using 5-point Likert scale (1 = very low to 5 = very high) and included one question. The third section identified people sources of COVID-19 information which was identified by directly asking participant to select their source of COVID-19 information and included one question. The third part included one multiple-choice question to determine participants visited place during the COVID-19 epidemic period before the survey. Next section included 16 questions (15 questions answered by Yes or No and one multiple-choice question) to measure people preventive measures taken to avoid infections. The fifth section included one question answered by 5-point Likert scale (1 = strongly lack of confidents and 5 = strongly confident) to measure participants' confidence in the curbing of the outbreak in Saudi Arabia. Finally, the last section includes items to identified participants' sociodemographic characteristics and background information.

Ethical statement

The involvement in the study is voluntary and all of the information included were totally confidential. Ethical approval was not required for this study because there was no any identifier or group of identifiers which would allow attribution of private information to an individual.

Sample size estimation

The sample size is determined using Raosoft sample size calculator with margin of error = 5%, confidence level of 95%, and a response distribution = 50% (if the sample is skewed highly one way or the other, the population probably is, too. If you do not know, use 50%, which gives the largest sample size).

Statistical analysis

Data were exported from Google Forms to Microsoft Excel and after that the descriptive data were represented as

frequencies and percentages. After that, the data were added to SPSS and the one-way ANOVA and a Chi-square analysis were used to examine variation in public attention and public confidence by sociodemographic characteristics.

RESULTS

In the present survey, 407 participants completed the survey (the minimum recommended size of the survey as determined by Raosoft sample size calculator was 385). The majority of participant were female (51.3%), age ranged from 20 to 29 years (40.5%), had university degree or still studying in the university (75.92%), unemployed (39.80%), and married (58.23%). Sociodemographic characteristics are shown in Table 1.

Regarding to the attention to the COVID-19 epidemics, the majority of participants' responses were very high to high (81.08%) while no one rated their attention at very low. Furthermore, participants revealed that they received information for the COVID-19 mainly from news and information applications (61.67%) or from Facebook or Twitter (51.35%). Public level of attention and the main sources of information are shown in Table 2.

To protect their families or friends, the respondents were mainly persuaded them to stay at home as much as possible (86%) and told them to avoid large gatherings (72.73%). Most of the participants reported that they implement the preventive measures taken to avoid the infection appropriately. For example, about 96.81% of them reported that they wash their hands after touching public goods. Moreover, 98.03% of them reported that they wash their hands after returning home. Preventive measures taken by participants to avoid being infected with coronavirus disease are shown in Table 3.

Table 4 shows the places that participants had been to during COVID-19 epidemic period before taking the survey. A high percentage of the public said that they mainly went to supermarket or shopping mall (70.02%).

About 73.47% of the participants were confident (strongly confident or confident) in curbing the COVID-19 epidemic. Table 5 shows the participants' confidence in curbing the COVID-19 epidemic.

Four distinct clusters were identified based on attention (very high, high, neutral, and low), more than 81% were very high or high attention. There was no statistically significant difference in the attention to the COVID-19 epidemic between the two genders and also no significant difference between persons with different marital status. On the other hand, the difference in the attention between different age groups (P = 0.003) and the difference in the attention between different education levels (P = 0.000)

Table 1: Sociodemographic characteristics (n=407)

Variable	Category	Number	Percentage
Gender	Male	198	48.65
	Female	209	51.35
Age	<20	18	4.42
	20–29	165	40.54
	30–39	59	14.50
	40–49	83	20.39
	≥50	82	20.15
Education	Primary school	7	1.72
	Intermediate school	24	5.90
	Secondary school	67	16.46
	University degree	309	75.92
Occupation	Public	138	33.91
	Private	90	22.11
	Others*	17	4.18
	Not working	162	39.80
Marital status	Married	237	58.23
	Not married	170	41.77

*Others such as working in military institution, having own business

Table 2: Level of attention to the coronavirus disease epidemic and their main information sources

Item	Category	Number	Percentage
Your level of attention to the COVID-19 epidemic	Very high	152	37.35
	High	178	43.73
	Neutral	74	18.18
	Low	3	0.74
	Very low	0	0.00
Source of information on the epidemic	Facebook or twitter	209	51.35
	News	251	61.67
	Blogs	56	13.74
	Television or radio	170	41.77
	Family members/ friends/ colleagues	138	33.91
	Websites	202	49.63
	Short video applications	98	24.08
	SMS	128	31.45
	Community advocacy	72	17.69
	Paper media	27	6.63

Table 3: Preventive measures taken by participants to avoid being infected with coronavirus disease

Item	Category	Number	Percentage
What did you do to protect your family or friends?	Told them to avoid large gatherings	296	72.73
	Persuaded them to stay at home as much as possible	350	86.00
	Shared epidemic information with them	202	49.63
	Told them to use a mask in public	267	65.60
Did you open windows for ventilation more frequently than usual?	Yes	195	47.91
	No	212	52.09
Did you wear a mask in public?	Yes	366	89.93
	No	41	10.07
Did you avoid large crowds and stayed at home as much as possible?	Yes	401	98.53
	No	6	1.47
Did you wash your hands more often than usual?	Yes	361	88.70
	No	46	11.30
Do you wash your hands after touching public goods?	Yes	394	96.81
	No	12	3.19
Do you wash your hands after toilet use?	Yes	402	98.77
	No	5	1.23
Do you wash your hands after returning home?	Yes	399	98.03
	No	8	1.97
Do you wash your hands after coughing/ sneezing?	Yes	280	68.80
	No	127	31.20
Do you wash your hands before eating	Yes	378	92.87
	No	29	7.13
Do you wash your hands with soap and running water in most cases?	Yes	384	94.35
	No	23	5.65
Do you cover your coughs/sneezes with tissue or a bent elbow in most cases?	Yes	386	94.84
	No	21	5.16
Do you always avoid touching the eye, nose, and mouth areas in public places?	Yes	332	81.57
	No	75	18.43
If you have a fever, cough, or trouble breathing, do you hesitate to seek health care?	Yes	81	19.90
	No	326	80.10
Do you stay at home when you feel uncomfortable or have some symptoms?	Yes	370	90.91
	No	37	9.09

Table 4: Places that participants had been to during COVID-19 epidemic period before taking the survey

Places	Number	Percentage
Supermarket or shopping mall	285	70.02
Always at home	190	46.68
Gathering with friends or family members	27	6.63
Farmer's market	51	12.53
Public transport areas	3	0.74
Workplace	128	31.45

were statistically significant. Table 6 shows the demographic characteristics of respondents clustered by attention to the COVID-19 epidemic.

Five distinct clusters were identified based on participants' confidence in curbing the COVID-19 epidemic (strongly confident, confident, neutral, lack of confidence, and strongly lack of confidence). More than 73% of the respondents were strongly confident of confident in curbing the COVID-19 epidemic. There was no statistically significant difference in the participants' confidence in curbing the COVID-19 epidemic between different genders, different education

levels, and for different marital status. On the other hand, the difference in the participants' confidence in curbing the COVID-19 epidemic between different ages was statistically significant (P = 0.024). Table 7 shows the demographic characteristics of respondents clustered by participants' confidence in curbing the COVID-19 epidemic.

DISCUSSION

This is one of the few studies that were conducted to report on the comprehensive preventive measures taken and strategies implemented to avoid COVID-19 spreading. We found that participants responded quite well to the COVID-19 epidemic, by properly following the recommendations of health authorities.

Most of the respondents said that they have a sufficient attention to the COVID-19 epidemic (very high or high). Likewise, Huang *et al*. stated that about 98.2% have a sufficient attention to the COVID-19 epidemic. In addition, a high percentage of the public said that they mainly went to supermarket or shopping mall. Huang *et al*. reported that 50.1% of people went to supermarket or shopping mall during the coronavirus disease epidemic period before taking the survey.[7]

Table 5: Participants' confidence in curbing the COVID-19 epidemic

Confidence level	Number	Percentage
Strongly confident	124	30.47
Confident	175	43.00
Neutral	76	18.67
Lack of confidence	27	6.63
Strong lack of confidence	5	1.23

The percentage of taking preventive measures by participants was high, 89.93% using a mask in public, 98.53% avoiding the large crowds and stayed at home as much as possible, 96.81% washing their hands after touching public goods, 98.77% washing their hands after toilet use, 98.03% washing their hands after returning home, 92.87% washing their hands before eating, 94.35% washing hands with soap and running water in most cases, 94.84% covering their coughs/sneezes with tissue or a bent elbow in most cases, and 90.91% staying at home when they feel uncomfortable or have some symptoms.

The present study found a high frequency of using masks (89.93%). Similar to the Kumar *et al*. who reported a high rate of using masks and a good practices and attitude toward using masks health care workers,[9] we found also a higher frequency of covering one's mouth when sneezing or coughing (94.84% vs. 70.6%) and a higher frequency washing their hands with soap and running water (94.35% vs. 85.8%).

Several previous studies showed the role of hand hygiene and face masks in preventing spreading of infections. The WHO stated that hand hygiene is the single most effective means of preventing the horizontal transmission of infections among

Table 6: The difference in the attention to the COVID-19 epidemic between patients with different demographic characteristics

Characteristics	Very high	High	Neutral	Low	*P* value
Age					0.003
<20	4	7	7	0	
20–29	55	72	37	1	
30–39	30	21	8	0	
40–49	42	32	9	0	
≥50	21	46	13	2	
Gender					0.383
Male	67	88	41	2	
Female	85	90	33	1	
Education					0.000
Primary school	4	1	1	1	
Intermediate school	11	11	2	0	
Secondary school	21	35	11	0	
University degree	116	131	60	2	
Marital status					0.122
Not married	70	62	38	0	
Married	82	116	36	3	

Table 7: Demographic characteristics of respondents clustered by participants' confidence in curbing the COVID-19 epidemic

Characteristics	Strongly confident	Confident	Neutral	Lack of confidence	Strong lack of confidence	P value
Age						0.024
<20	5	6	5	1	1	
20–29	55	57	40	11	2	
30–39	19	27	8	5	0	
40–49	32	40	7	3	1	
≥50	13	45	16	7	1	
Gender						0.371
Male	57	85	38	17	1	
Female	67	90	38	10	4	
Education						0.594
Primary school	5	1	1	0	0	
Intermediate school	8	11	3	1	1	
Secondary school	22	31	12	1	1	
University degree	89	132	60	25	3	
Marital status						0.522
Not married	58	64	35	11	2	
Married	66	111	41	16	3	

hospital patients and health-care personnel.[10] Daniels and Talbot stated that the health care workers' hands provide a potential source for transmission of infectious agents so the effective decontamination of the hands decreases the risk of transmission of these agents to other patients.[11] Moreover, Toney-Butler *et al*. reported that contaminated hands of health care workers are a main source of pathogenic spread. Therefore, proper hand hygiene reduces the microorganisms' proliferation, consequently reducing infection risk, length of stays, and overall healthcare cost.[12] Li *et al*. stated that masks can affect the formation of turbulent gas cloud and the emission of respiratory pathogen and prevent the viral transmission.[13] Furthermore, Leung *et al*. stated that surgical face masks could prevent transmission of human viruses such as influenza viruses and coronaviruses and from symptomatic individuals.[14]

Our findings show that the public have a good awareness and appropriate practices regarding the measures to prevent COVID-19, but further education on some measures are needed as washing hands after coughing/sneezing and avoiding eye, nose, and mouth touching in public places.

Only 47.91% of the participants opened windows for ventilation more frequently than usual. In contrast to this result, Huang reported that about 92.4% of participants opened windows for ventilation more frequently than usual.[7] Moreover, 19.90% of the respondents said that if they have a fever, cough, or trouble breathing, they hesitate to seek health care, so further education on this measure also is needed.

Our findings showed that a high percentage of participants had tried to influence their families and friends by telling them to avoid large gatherings and stay at home as much as possible. This finding supports previous findings of Huang *et al*. and So *et al*.[7]

The respondents get their information mainly from news and information applications (61.67%) or from social media such as Facebook or Twitter (51.35%). Similarly, Huang *et al*. reported that WeChat (Chinese social media) was the participants' main source of information (92.2%) followed by news and information apps (44.4%).[7]

Both health-care providers and the public use social media commonly. In 2012, the users of Facebook exceeded 1 billion people globally, a number that represents one-seventh of the world's population.[15,16] In addition, Peck reported that 70% of the U.S. health care organizations use social media, with Facebook, Twitter, and YouTube being the most popular and that millions of active Twitter users send more than 65 million tweets daily and on YouTube, 2 billion videos are viewed each day.[15] In addition, George *et al*. stated that nearly a third of physicians have reported participating in social networks.[16] Grindrod *et al*. reported that many pharmacists use Facebook. Unlike physicians, pharmacists have been relatively slow to adopt social media.[17]

In the present study, a high percentage of respondents said that they use social media to get information but it is important to know the source of the information because most of these information are incorrect and unreliable. Moorhead

et al. reported that the main limitation of health information found on social media and other online sources are a lack of quality and reliability.[18] Furthermore, the previous studies showed that authors of medical information found on social media sites are often unknown or are identified by limited information.[18,19] In addition, the medical information may be unreferenced, incomplete, or informal.[19]

A high percentage of the participants in the present study were confident (strongly confident or confident) in curbing the COVID-19 epidemic. Huang *et al*. reported that only 57.7% were confident (in curbing the COVID-19 epidemic in China).[7] However, we can found that with the development in the medical field and increasing of public awareness, their confidence in curbing the epidemic infections is increased.

To increase the awareness about COVID-19 in a safe and efficient way, several online strategies are implementing nowadays. Internet hospitals play an important role on preventing and controlling COVID-19, they can serve different types of epidemic counselees, offer essential medical supports to the public during the COVID-19 outbreak, promote social distancing, reduce the social panic, correct improper medical seeking behaviors, enhance the public's ability of self-protection, facilitate epidemiological screening, and reduce the chance of nosocomial cross-infection.[20] Online education also has enhanced the capacity of health-care providers on the diagnosis, prevention, and treatment of COVID-19 in an efficient and safe way.[5]

CONCLUSION

Our study provided a broad description of preventive measures taken and the main strategies implemented to avoid being infected with the novel coronavirus. The public followed the hygiene recommendations of health authorities very well but still more education is still needed on some measures specially on washing hands after coughing/sneezing, avoiding eye, nose, and mouth touching in public places and to encourage persons who have a fever, cough, or trouble breathing to seek health care. Due to the spreading of the disease, the online education will enhance the public awareness and help the health workers on safe and efficient management of COVID-19 and help them in counsel patient appropriately.

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