ORIGINAL ARTICLE

Did Iranians respect health measures during Nowruz holidays? A study on Iranians' knowledge, attitude and practice toward COVID-19

AMIN NAKHOSTIN-ANSARI[1], FAEZEH AGHAJANI[2], MOHAMMAD SAEID KHONJI[2], REYHANEH AGHAJANI[2],
PENDAR PIRAYANDEH[3], RASHAD ALLAHBEIGI[2], HADISEH HOSAMI RUDSARI[4]

[1] Sports Medicine Research Center, Neuroscience Institute, Tehran University of Medical Sciences, Tehran, Iran; [2] School of Medicine, Tehran University of Medical Sciences, Tehran, Iran; [3] School of Medicine, Tonekabon Islamic Azad University, Mazandaran, Iran; [4] Infectious Diseases Department, Baharloo Hospital, Tehran University of Medical Sciences, Tehran, Iran

Summary

Introduction. *Since December 2019, the COVID-19 outbreak has affected almost every country in the world, including Iran. General awareness and commitment to recommendations made by health officials have important role in control of the outbreak. The aim of the current study was to assess the knowledge, attitude, and practice (KAP) of Iranians concerning COVID-19 after Nowruz (Persian New Year Holiday) in Iran and identifying its determining demographic and socioeconomic factors.*
Method. *A cross-sectional study was designed. We translated and culturally adopted Zhong's questionnaire to Persian, which is designed to assess people's knowledge, attitude, and practice toward COVID-19. We used online Google forms to send the questionnaire via social platforms throughout the country. A total of 1015 Iranians participated in the study.*

Results. *The mean knowledge score among our participants was 10.60, with an overall correct response rate of 88.35%. Higher knowledge score was associated with higher education, being a professor, and residing in cities. Lower knowledge score was associated with being unemployed, marital status other than single or married, and living in rural areas. Almost all of our participants had favorable attitudes and practices toward COVID-19.*
Conclusion. *Overall, Iranians showed a satisfactory KAP towards COVID-19. We suggest more attention to informing people living in rural areas and unemployed, as they were related to more risky behaviors and had lower knowledge scores regarding COVID-19.*

Introduction

In December 2019, China reported the outbreak of the novel Coronavirus, later named COVID-19, in the city of Wuhan in Hubei Province [1]. The virus spread rapidly throughout the world. World Health Organization (WHO) announced the situation as a global pandemic on March 12, 2020, and noted that this is the first pandemic by a coronavirus and the first pandemic that can be controlled at the same time [2].

The first officially confirmed cases of COVID-19 in Iran were announced on February 19, 2020, in Qom province [3]. Numbers have been rising day by day, and as of April 18, 2020, about one week after the Nowruz holidays in Iran, 79,494 cases and 4958 deaths are confirmed in Iran, more than any other country in the Eastern Mediterranean Region [4].

National health administrations in Iran, as well as international health organizations such as the Centers for Disease Control and Prevention (CDC) and WHO, started making recommendations based on the current knowledge about the situation. They aimed to restrict the direct social contacts, increase public awareness about the symptoms of COVID-19 and protection against it, and promote thoughtful use of medical equipment such as masks [5-7].

Some governors adopted isolating their cities as a strategy to fight against the spread of COVID-19. Iranian officials decided not to impose compulsory quarantines and sufficed to recommend people to stay at their homes and applied limited restrictions in commuting between and within the cities.

The first weeks of the COVID-19 outbreak in Iran coincided with Nowruz (Persian New Year Holiday), which Iranians celebrate with family gatherings and travel. The president of Iran and health authorities requested people to stay home for New Year celebrations, but unfortunately, some citizens ignored it, and more than 1.2 million people took the roads to travel during the holidays [8].

To combat the current pandemic requires the public to understand the situation and trust officials who are trying to limit the spread of COVID-19. To gain people's cooperation and trust for self-isolation, basic knowledge about the means of virus transmission and prevention methods is necessary, and affects their attitude and practice towards COVID-19, according to the Knowledge, Attitude, and Practice (KAP) theory [9].

As it has not been studied before, understanding the level of public awareness about COVID-19 has vital importance in facilitating the management of its outbreak in Iran. In this study, we aimed to assess the Iranians'

public knowledge, attitude, and practice (KAP) toward COVID-19, right after the Nowruz holidays.

Methods

QUESTIONNAIRE

Zhong et al. designed a reliable questionnaire to assess KAP toward COVID-19 amongst Chinese residents nearly one week after the Hubei Province's lockdown initiation [10]. In the first stage, we provided the Persian version of the questionnaire. Two independent translators translated the questionnaire from English to Persian (T1 and T2). An expert panel, including the translators, two cardiologists, and an infectious medicine specialist, reviewed the Persian translations and synthesized a unit translation of the questionnaire according to both translations. As guidelines and recommendations on COVID-19 are constantly changing, we revised the questions and answers according to the latest recommendations of WHO [5]. For cultural adaptation, three questions were added to the practice section of the questionnaire. The panel approved the face validity of the questionnaire. The knowledge section of the questionnaire also has acceptable internal consistency, according to Zhong et al. study [10].

We sent the questionnaire to fifty Iranians and asked them to evaluate its fluency. According to their comments, we made some changes to the questionnaire and the final version was approved by the expert panel.

The questionnaire is made of three sections. The first section includes 12 statements and gauges knowledge about COVID-19. K1 to K4 statements are about clinical presentations of COVID-19, K5 to K7 are about its transmission routes, and the last five statements are about prevention. The participants may select *True*, *False*, or *I do not know* for each statement. Each correct answer values, one point, and total knowledge score can be as high as 12. A higher score indicates better knowledge of COVID-19. The second section evaluates attitude toward COVID-19 and consists of two *Yes*, *No* questions. The third section assesses the participants' practice concerning the COVID-19 outbreak and consists of five *Yes*, *No* questions.

In the questionnaire, we included questions on demographic characteristics of the participants, such as age, gender, marital status, provinces they live in, educational level, and occupational status. The questionnaire began with a complete explanation of the study goals and an indication of volunteer participation in the study. Participants could agree and move on to the question segments as they wish. Our study is approved by the Ethics Committee of Tehran University of Medical Sciences and Iran National Committee for Ethics in Biomedical Research with Ethics Code IR.TUMS.MEDICINE. REC.1399.239.

PARTICIPANTS

We included volunteer participants who were born and lived in Iran, were able to read Persian, and at least were 15 years old. According to the 2016 census in Iran, the population of Iranians who are 15 years old or older is about 61,000,000 [11]. Considering the margin of error of 1% to 5% and Confidence level of 95%, according to the formula of the *Sample size* we targeted a sample size of 385 to 9,603 people.

$$Sample\ size = \frac{\frac{P(1-P)Z^2}{e^2}}{1 + (\frac{P(1-P)Z^2}{Ne^2})}$$

PROCEDURE

We uploaded our questionnaire in Google forms [12] and used popular social media platforms in Iran, such as Telegram and WhatsApp, to distribute the questionnaire throughout the country. We sent people explanatory messages alongside the link to the questionnaire. Questionnaires were completed anonymously, and we asked people to ignore the message if they are not willing to participate in the study. Data collection lasted from April 4 to April 10, 2020. This period is about six weeks after the start of the COVID-19 outbreak in Iran and just after the Nowruz holiday. We got 1,015 responses during this period. We had participants from 27 out of 31 provinces of Iran.

DATA ANALYSIS

We calculated the percentage of participants in each demographic group, and the rate of the correct answers to each knowledge question and yes or no responses to each attitude or practice statement. Mean knowledge score and its standard deviation (SD) were calculated for the whole population and demographic groups. The result of the Kolmogorov-Smirnov test showed that knowledge scores were not distributed normally ($p < 0.001$), therefore we used the Kruskal-Wallis analysis to see whether there was a significant difference within demographic groups or not. If we observed a significant difference between groups with the Kruskal-Wallis analysis, a complementary Mann-Whitney test was used for paired groups to find where the exact difference was.

The percentage of yes and no answers to each attitude and practice statement was calculated for demographic groups, and the Chi-squared test was used to see whether there is a significant difference between groups or not. For each attitude and practice question, we calculated the mean and SD of knowledge score across those who answered the question with yes and no. We used the Kruskal-Wallis analysis to see whether there is a significant difference between them or not. We considered the level of significance at 0.05.

Results

A total of 1015 participants completed the questionnaire with a mean age of 35.32 years (SD: 11.95; range: 15-80). The number of participants from each province is shown in Table I.

Table II designates the statements of the knowledge section of the survey and the number of correct answers to

Tab. I. Participants distribution among Iran provinces.

Provinces	Number of participants	Percentage of participants
Alborz	23	2.3 %
Bushehr	16	1.6 %
East Azarbayjan	11	1.1 %
Fars	10	1.0 %
Gilan	45	4.4 %
Hamedan	21	2.1 %
Hormozgan	170	16.7 %
Isfahan	30	3.0 %
Kerman	11	1.1 %
Kermanshah	10	1.0 %
Khuzestan	13	1.3 %
Markazi	28	2.8 %
Mazandaran	122	12.0 %
Razavi Khorasan	29	2.9 %
Tehran	419	41.3 %
Other	55	5.5%

each statement. The mean COVID-19 knowledge score is 10.60 (SD: 1.48, range: 0-12), and the overall correct response rate to the knowledge statements is 88.35%. The K5 statement appears to be the most challenging for our respondents, as only 49.7% of them chose the correct answer to that statement.

The demographic characteristics of the participants and their mean knowledge scores are shown in Table III. Marital statuses other than single or married (divorced, widowed, etc.) were associated with a lower knowledge score ($p < 0.05$). No significant difference was seen between those who were single or married. Higher educational level was related to higher knowledge about CO-VID-19. Knowledge scores were significantly different comparing three different groups of educational level ($p < 0.05$) with participants, who had a bachelor's degree or more, got a higher knowledge score. Among different occupations, teachers and professors had the most top knowledge scores, and on the other hand, unemployed participants on average got lower points.

Table IV shows attitudes regarding COVID-19 by demographic characteristics. In total, 85.3% of the participants thought that COVID-19 would eventually be controlled. Attitude regarding the success in the control of COVID-19 differed across age groups and marital status categories, significantly ($p < 0.05$). Participants, who were 45-59 years old, were more optimistic regarding success in controlling the disease. Almost all of the respondents (97.8%) believed that their practice of hygienic and health measures would help in controlling the spread of COVID-19. This attitude (A2) differed significantly among occupational groups ($p < 0.05$), and 100% of teachers and professors agreed to this statement.

Tab. II. Percent of correct answers to questions of knowledge section and participants' attitude and practice toward COVID-19.

Statements	
Knowledge	Correct answers (%)
K1. The main clinical symptoms of COVID-19 are fever, fatigue, dry cough, and shortness of breath	978 (96.4)
K2. Unlike the common cold, stuffy nose, runny nose, and sneezing are less common in persons infected with the COVID-19 virus	755 (74.4)
K3. There currently is no effective cure for COVID-2019, but early symptomatic and supportive treatment can help most patients recover from the infection	936 (92.2)
K4. Not all persons with COVID-2019 will develop into severe cases. Only those who are elderly, have chronic illnesses, and are obese are more likely to be severe cases	925 (91.1)
K5. Eating or contacting animals would result in the infection by the COVID-19 virus	504 (49.7)
K6. Persons with COVID-2019 cannot infect the virus to others when a fever is not present	881 (86.8)
K7. The COVID-19 virus spreads via respiratory droplets of infected individuals	947 (94.7)
K8. Ordinary residents can prevent the infection by the COVID-19 virus by washing their hands frequently	900 (88.7)
K9. It is not necessary for children and young adults to take measures to prevent the infection by the COVID-19 virus	969 (95.5)
K10. To prevent the infection by COVID-19, individuals should avoid going to crowded places such as train stations and avoid taking public transportations	994 (97.9)
K11. Isolation and treatment of people who are infected with the COVID-19 virus are effective ways to reduce the spread of the virus	978 (96.4)
K12. People who have contact with someone infected with the COVID-19 virus should be immediately isolated in a proper place. In general, the observation period is 14 days	980 (96.6)
Attitudes and practices	Yes (%) / No (%)
A1. Do you agree that COVID-19 will eventually be successfully controlled with the application of the right strategies?	866 (85.3) / 149 (14.7)
A2. Do you agree that taking health measures by you will help in controlling the spread of the COVID-19?	993 (97.8) / 22 (2.2)
P1. Have you gone to any crowded place in the past week?	82 (8.1) / 933 (91.9)
P2. Have you traveled in the past month?	44 (4.3) / 971 (95.7)
P3. When greeting people during the past month, have you shake their hands or kissed them?	50 (4.9) / 965 (95.1)
P4. Have you visited your relatives or friends during the Nowruz holiday?	100 (9.9) / 915 (90.1)
P5. In the past month, have you washed your hand frequently with soap and water or alcohol-based solutions?	978 (96.4) / 37 (3.6)

Tab. III. Demographic characteristics of participants and knowledge score of COVID-19 by demographic variables.

Characteristics		Number of participants (%)	Knowledge score (mean ± SD)	P value
Gender	Male	432 (42.6)	10.64 ± 1.54	0.16
	Female	583 (57.4)	10.57 ± 1.44	
Age group	15-29	397 (39.1)	10.47 ± 1.67	0.063
	30-44	403 (39.7)	10.67 ± 1.31	
	45-59	165 (16.3)	10.77 ± 1.49	
	60+	50 (4.9)	10.50 ± 1.18	
Marital status	Single	432 (42.6)	10.63 ± 1.47	**0.014**
	Married	561 (55.3)	10.61 ± 1.50	
	Other	22 (2.2)	9.91 ± 1.31	
Educational level	High school or less	25 (2.5)	9.28 ± 2.46	**< 0.001**
	High school diploma or college	203 (20.0)	10.01 ± 1.98	
	Bachelor's degree and higher	787 (77.5)	10.77 ± 1.23	
Occupation	Student	168 (16.6)	10.37 ± 1.62	**0.004**
	Teacher/Professor	84 (8.3)	10.89 ± 1.05	
	Health care worker	64 (6.3)	10.66 ± 1.03	
	Office worker	236 (23.3)	10.68 ± 1.17	
	Retired	81 (8.0)	10.49 ± 1.87	
	Unemployed	167 (16.5)	10.30 ± 1.90	
	Other	215 (21.2)	10.84 ± 1.36	
Place of living	City	966 (95.2)	10.66 ± 1.35	**< 0.001**
	Village	49 (4.8)	9.43 ± 2.90	

Mean ± standard deviation knowledge score in whole population: 10.60 ± 1.48

Tab. IV. Attitudes regarding COVID-19 by demographic characteristics.

Characteristics		Number (percent) of each answer					
		A1: final success in control of outbreak			A2: people's role in control of outbreak		
		Yes	No	P-value	Yes	No	P-value
Gender	Male	364 (84.3)	68 (15.7)	0.411	425 (98.4)	7 (1.6)	0.303
	Female	502 (86.1)	81 (13.9)		568 (97.4)	15 (2.6)	
Age group	15-29	315 (79.3)	82 (20.7)	**< 0.001**	386 (97.2)	11 (2.8)	0.459
	30-44	349 (86.6)	54 (13.4)		394 (97.8)	9 (2.2)	
	45-59	157 (95.2)	8 (4.8)		164 (99.4)	1 (0.6)	
	60+	45 (90.0)	5 (10.0)		49 (98.0)	1 (20)	
Marital status	Single	351 (81.3)	81 (18.8)	**0.004**	422 (97.7)	10 (2.3)	0.766
	Married	494 (88.1)	67 (11.9)		549 (97.9)	12 (2.1)	
	Other	21 (95.5)	1 (4.5)		22 (100.0)	0 (0.0)	
Educational level	High school or less	22 (88.0)	3 (12.0)	0.388	25 (100.0)	0 (0.0)	0.727
	High school diploma/college	179 (88.2)	24 (11.8)		198 (97.5)	5 (2.5)	
	Bachelor's degree and higher	665 (84.5)	122 (15.5)		770 (97.8)	17 (2.2)	
Occupation	Student	135 (80.4)	33 (19.6)	0.326	167 (99.4)	1 (0.6)	**0.002**
	Teacher/professor	74 (88.1)	10 (11.9)		84 (100.0)	0 (0.0)	
	Health care worker	54 (84.4)	10 (15.6)		63 (98.4)	1 (1.6)	
	Office worker	201 (85.2)	35 (14.8)		231 (97.9)	5 (2.1)	
	Retired	72 (88.9)	9 (11.1)		80 (98.8)	1 (1.2)	
	Unemployed	149 (89.2)	18 (10.8)		156 (93.4)	11 (6.6)	
	Other	181 (84.2)	34 (15.8)		212 (98.6)	3 (1.4)	
Place of living	City	827 (85.6)	139 (14.4)	0.245	946 (97.9)	20 (2.1)	0.346
	Village	39 (79.6)	10 (20.4)		47 (95.9)	2 (4.1)	
Mean knowledge section score (SD)		10.66 (1.36)	10.23 (2.03)	**0.030**	10.64 (1.37)	8.95 (3.79)	**0.015**

Tab. V. Practices regarding COVID-19 by demographic characteristics.

Characteristics		P1: going to crowded places			P2: travel in the past month			P3: shaking hands or kissing			P4: visiting others			P5: washing hands frequently		
		Yes	No	P	Yes	No	P	Yes	No	P	Yes	No	P	Yes	No	P
Gender	Male	59 (13.7)	373 (86.3)	< 0.001	31 (7.2)	401 (92.8)	< 0.001	24 (5.6)	408 (94.4)	0.425	51 (11.8)	381 (88.2)	0.072	417 (96.5)	15 (3.5)	0.800
	Female	23 (3.9)	560 (96.1)		13 (2.2)	570 (97.8)		26 (4.5)	557 (95.5)		49 (8.4)	534 (91.6)		561 (96.2)	22 (3.8)	
Age group	15-29	31 (7.8)	366 (92.2)	0.519	23 (5.8)	374 (94.2)	0.040	30 (7.6)	367 (92.4)	0.007	49 (12.3)	348 (87.7)	0.006	384 (96.7)	13 (3.3)	0.420
	30-44	32 (7.9)	371 (92.1)		19 (4.7)	384 (95.3)		15 (3.7)	388 (96.3)		43 (10.7)	360 (89.3)		385 (95.5)	18 (4.5)	
	45-59	17 (10.3)	148 (89.7)		2 (1.2)	163 (98.8)		2 (1.2)	163 (98.8)		7 (4.2)	158 (95.8)		159 (96.4)	6 (3.6)	
	60+	2 (4.0)	48 (96.0)		0 (0.0)	50 (100.0)		3 (6.0)	47 (94.0)		19 (2.0)	49 (98.0)		50 (100.0)	0 (0.0)	
Marital status	Single	34 (7.9)	398 (92.1)	0.967	21 (4.9)	411 (95.1)	0.770	24 (5.6)	408 (94.4)	0.727	48 (11.1)	384 (88.9)	0.384	415 (96.1)	17 (3.9)	0.878
	Married	46 (8.2)	515 (91.8)		22 (3.9)	539 (96.1)		25 (4.5)	536 (95.5)		49 (8.7)	512 (91.3)		542 (96.6)	19 (3.4)	
	Other	2 (9.1)	20 (90.9)		1 (4.5)	21 (95.5)		1 (4.5)	21 (95.5)		3 (13.6)	19 (86.4)		21 (95.5)	1 (4.5)	
Educational level	High school or less	3 (12.0)	22 (88.0)	0.368	2 (8.0)	23 (92.0)	0.397	3 (12.0)	22 (88.0)	0.120	4 (16.0)	21 (84.0)	0.481	21 (84.0)	4 (16.0)	< 0.001
	High school diploma/college	12 (5.9)	191 (94.1)		6 (3.0)	197 (97.0)		13 (6.4)	190 (93.6)		22 (10.8)	181 (89.2)		191 (94.1)	12 (5.9)	
	Bachelor's degree and higher	67 (8.5)	720 (91.5)		36 (4.6)	751 (95.4)		34 (4.3)	753 (95.7)		74 (9.4)	713 (90.6)		766 (97.3)	21 (2.7)	
Occupation	Student	6 (3.6)	162 (96.4)	0.001	12 (7.1)	156 (92.9)	0.083	11 (6.5)	157 (93.5)	0.142	19 (11.3)	149 (88.7)	0.054	160 (95.2)	8 (4.8)	0.024
	Teacher/professor	6 7.1	78 (92.9)		5 (6.0)	79 (94.0)		4 (4.8)	80 (95.2)		12 (14.3)	72 (85.7)		77 (91.7)	7 (8.3)	
	Health care worker	11 (17.2)	53 (82.8)		2 (3.1)	62 (96.9)		4 (6.3)	60 (93.8)		7 (10.9)	57 (89.1)		62 (96.9)	2 (3.1)	
	Office worker	23 (9.7)	213 (90.3)		14 (5.9)	222 (94.1)		11 (4.7)	225 (95.3)		30 (12.7)	206 (87.3)		234 (99.2)	2 (0.8)	
	Retired	50 (6.2)	76 (93.8)		0 (0.0)	81 (100.0)		0 (0.0)	81 (100.0)		2 (2.5)	79 (97.5)		79 (97.5)	2 (2.5)	
	Unemployed	5 (3.0)	162 (97.0)		4 (2.4)	163 (97.6)		13 (7.8)	154 (92.2)		10 (6.0)	157 (94.0)		157 (94.0)	10 (6.0)	
	Other	26 (12.1)	189 (87.9)		7 (3.3)	208 (96.7)		7 (3.3)	208 (96.7)		20 (9.3)	195 (90.7)		209 (97.2)	6 (2.8)	
	Student	6 (3.6)	162 (96.4)		12 (7.1)	156 (92.9)		11 (6.5)	157 (93.5)		19 (11.3)	149 (88.7)		160 (95.2)	8 (4.8)	
Place of living	City	79 (8.2)	887 (91.8)	0.606	42 (4.3)	924 (95.7)	0.929	46 (4.8)	920 (95.2)	0.283	97 (10.0)	869 (90.0)	0.369	933 (96.6)	33 (3.4)	0.084
	Village	3 (6.1)	46 (93.9)		2 (4.1)	42 (4.3)		4 (8.2)	45 (91.8)		3 (6.1)	46 (93.9)		45 (91.8)	4 (8.2)	
Mean knowledge section score (SD)		10.50 (1.39)	10.61 (1.49)	0.433	10.45 (1.15)	10.61 (1.50)	0.135	10.08 (1.82)	10.63 (1.46)	0.015	10.49 (1.42)	10.61 (1.49)	0.183	10.64 (1.37)	9.49 (3.12)	0.013

Different practices concerning COVID-19 by demographic characteristics are shown in Table V. The majority of the respondents did not go to crowded places in the past week (91.9%). Only 4.3% of our participants reported traveling, and 4.9% of the participants had shaken hands or kissed others in the last month. 9.9% of them visited their family and friends during the Nowruz holiday. Almost all of our participants washed their hands frequently during the last month (96.4%). Health care workers were in crowded places more than others (p < 0.05). Youths (age group: 15-29 years old) traveled, shook hands or kissed others, and visited others during Nowruz, significantly more than other age groups. Washing hands frequently is significantly associated with higher educational levels (p < 0.001). Office workers sanitized their hands more commonly than other occupational groups (p < 0.05). The mean knowledge score was significantly higher in respondents who sanitized their hands frequently than those who did not (p < 0.05).

Discussion

We evaluated Iranians' knowledge, attitude, and practice (KAP) toward COVID-19. Previously similar studies were conducted in the USA and China to evaluate KAP toward COVID-19 in their populations. The mean knowledge score of our participants was 10.6 in our study, resembling the mean knowledge score reported by Zhong et al. in their study (10.8) [10]. This mean score suggests a satisfactory level of knowledge about COVID-19 in these two populations. The mean knowledge score in the USA's population is considerably lower (9.72) [13], which might be due to the USA's less experience with such epidemics in the past and the fact that the study was conducted in the first weeks of the COVID-19 outbreak in the USA.

In our study, the mean knowledge score is higher among participants with higher educational levels, which is in line with previous studies. Only 2.5% of our respondents had a high school level of education or less, which can be a confounding factor in our study, as we have a 12.4% illiteracy rate among Iranians [14]. Regarding the rate of illiteracy in Iran, the real knowledge level toward COVID-19 can be less in the general Iranian population. Mean knowledge score was lower among unemployed participants in our study, which matches what Clements reported, as the knowledge level was lower in participants with lower incomes. The lower level of knowledge among those with less income and lower educational levels may indicate the correlation of socioeconomic factors to knowledge toward COVID-19. We recommend placing more focus on informing and empowering lower socioeconomic societies against COVID-19, as they are the most vulnerable population in this outbreak. For example, those who had washed their hands more frequently had higher levels of knowledge in our study.

Besides, those with higher levels of education had washed their hands more regularly. As hand washing is one of the main ways to prevent the spread of the infectious agent, lack of enough hand washing can lead to the spreading of COVID-19 among those with a lower level of knowledge. The COVID-19 knowledge level is lower in the rural population in comparison with the urban population. The rate of illiteracy is 21.5% in rural areas of Iran, comparing to 9.2% in urban society [14]. Lower-income and lower educational levels may be determining factors in the rural population's lower awareness of COVID-19.

The mean knowledge score was higher among those who were confident of ultimate control of COVID-19 with the right strategies, which is in line with what Zhong et al. reported before. Participants who were single and those who were younger were less optimistic about the success in controlling the epidemic. As the knowledge score does not significantly differ between age groups and marital statuses, other factors may be contributed to the pessimism of this group of our participants. A study suggests that hopelessness is most prevalent among 24-30 years old age group in Iran [15].

Zhong et al. and Clements reported a correlation between knowledge score and age among Chinese and American populations; in contrast, we did not find any difference between the knowledge score of various age groups. Our study's 15 to 29 years old people had significantly higher knowledge scores (mean = 10.47) than the same age group in Clements study (mean = 9.19). It appears age is not a determining factor regarding knowledge about COVID-19 in Iran, and other factors are more important. The KAP theory suggests that an increase in knowledge can lead to a more approving attitude and practice. In this case, we hypothesized that a higher understanding of the public about COVID-19 should lead to more trust in health authorities and follow health recommendations. The majority (85%.3) of our participants were optimistic about the successful control of the COVID-19 outbreak, which is less than what Zhong et al. reported among the Chinese population (90.8%). This difference might be due to acquiring different strategies by Iran and China, as china set more restrictions and handled the situation more vigorously. On the other hand, news of the death of two patients due to COVID-19 was among the first news published about the outbreak in Iran [16], which led to public panic and despair about COVID-19 in Iran.

Almost all (97.8%) of our participants believed that taking health measures by them is helpful in the control of the COVID-19 outbreak. These participants had higher knowledge scores compared to those who did not believe in the efficacy of taking health measures, which indicates the importance of people's awareness and how it affects their behaviors.

Among our survey's participants, 8.1% reported visiting crowded places in a week ago. Based on Zhong's findings, only 3.6% of Chinese people did the same, which may be due to strict isolating orders of the government of China. We conducted our survey one week after the Nowruz holiday in Iran when almost nobody goes to work. We assume that the percentage of people who leave their houses will go up, as most of the occupations are reopening. Clements findings showed that 30% of Americans had attended large gatherings recently, as there were no restriction orders in the USA at the time of conducting this study.

There is no significant difference between level of knowledge among those who had visited crowded places and those who had not. Based on our findings, there is an association between visiting crowded places with occupation and gender. Unemployed participants went to crowded places less (3%) among all professions, and male (13.7%) participants tended to go to crowded places more than females (3.9%). A quarter of our female participants were unemployed, comparing to 4.9% of men. These findings may suggest that the main determining factor of visiting crowded places is occupation, and emphasizes on the necessity of applying restrictions for reopening the jobs.

Knowledge scores did not significantly differ between participants who travel during the last month and those who didn't. In our study, traveling was directly associated with the male gender and younger age. A study shows that risk-taking behaviors are more common among males and younger adults, which may explain our findings regarding traveling during the COVID-19 outbreak [17].

Participants who were 15 to 29 years old had significantly kissed or shook hands and visited others during Nowruz, more comparing to other age groups. These results show that among our participants, teenagers and younger adults have neglected the recommendations of health officials during Nowruz. Similar findings reported by Zhong et al. in which younger participants had less compliance toward wearing face masks. As knowledge scores were not significantly different among different age groups, such behaviors may be related to more risk-taking behavior in younger adults [18]. Further actions are needed to increase younger populations' compliance in taking health measures.

LIMITATIONS

Although we tried our best to include all groups of people in our study, the distribution of people by socioeconomic status is not like current Iran's status. The reason for such differences may be explained by the fact that people with better socioeconomic status have more access to social media platforms, and more fractions of them may decide to participate in voluntary studies such as our study. Future studies concentrating on those with low socioeconomic status may be indicated to assess their knowledge, attitude, and practice toward COVID-19.

Conclusions

The level of knowledge about COVID-19 is satisfactory in Iranians who participated in our study. Those with lower education levels and those who were unemployed had significantly less knowledge about COVID-19, which indicates the lower levels of knowledge in those with low socioeconomic status. People's jobs were related to their presence in crowded areas, which indicates the need for precise assessment of the situation for re-

opening the jobs in Iran as it can lead to the spread of COVID-19. Risky behaviors such as kissing other or visiting families are more prevalent among younger adults who should be considered for further actions.

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Conflict of interest statement

The authors declare no conflict of interest.

Authors' contributions

ANA conceived the study. ANA and FA did the statistical analysis, made the survey form, gathered data, and drafted the manuscript. PP, RA, MSK, and RAB contributed in data gathering. All authors revised the manuscript and performed a review of the literature. All authors have read and approved the latest version of the manuscript for publication.

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Correspondence: Faezeh Aghajani, Tehran University of Medical Sciences, Keshavarz Blvd, Poorsina Ave, Tehran, Iran - Tel. +989102302305 - E-mail: faezehaghajani.fa@gmail.com