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Research Article

COVID-19 Routes of Transmission, Protection Aids, and Immunity Enhancement: Community-Based Online Knowledge Survey Among Palestinians

Faten Allyan[1], Shenaz Najjar[2], Hazem Agha[3], Atef Massad[1], Ayman Abu Mustafa[4], Khalid Jamal Khadoura[5]

[1]Department of Biomedical Science, Israa University-Gaza, Faculty of Medical Sciences, Gaza, Palestine
[2]Health Sciences Department, Faculty of Graduate Studies, Arab American University, Ramallah, Palestine
[3]Department of Public Health Nutrition, Faculty of Public, Al-Quds University, Jersalem, Palestine
[4]Continuing Education Departement, Palestine College of Nursing, Ministry of Health, Gaza, Palestine
[5]Department of Nursing, Israa University-Gaza, Faculty of Medical Sciences, Gaza, Palestine

ORCID iDs of the authors: F.A. 0000-0002-5683-9636, S.N. 0000-0002-4555-7713 , H.A. 0000-0001-7568-4986, A.M. 0000-0002-1353-2749, A.A.M. 0000-0002-0521-6586, K.J.K. 0000-0002-9538-2296

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Abstract

AIM: Coronavirus disease in 2019 has been defined as a pandemic by the World Health Organization. This study aimed to assess the level of knowledge toward the coronavirus disease 2019 among the Palestinian population.

METHOD: A cross-sectional online survey among 554 Palestinians was designed. A structured self-administered online questionnaire was distributed among 190 participants from West Bank and 364 from Gaza Strip during the outbreak through social media. The survey was conducted between 10th and 24th of October, 2020.

RESULTS: Of the total enrolled participants, 401 were males and 153 were females; the mean age was 28.4 years with a standard deviation of 10.97. Results showed that the means of knowledge about coronavirus disease 2019 were: 76.7% (standard deviation=12.8), 72.2 (standard deviation=10.3), 77.7% (standard deviation=11.0) for general knowledge, the transmission of coronavirus disease 2019, and immunity and protection aids, respectively. Univariate regression revealed significant associations among the level of knowledge and gender, governorates, education levels, and employment status. However, only gender remained a significant explanatory variable in multivariable analysis, as females were nearly four times more knowledgeable than males (OR=3.94; 95% CI =1.71, 9.07; p=.001).

CONCLUSION: In general, Palestinians had good knowledge about coronavirus disease 2019, modes of transmission, and immunity knowledge. Knowledge was less among males than females. This may need more effort by using different tools of communication to reach more to the male gender.

Keywords: COVID-19, immunity, knowledge, protection aids, routes of transmission

Introduction

On January 30, 2020, the World Health Organization (WHO) declared the coronavirus disease 2019 (COVID-19) outbreak as a public health outbreak as it continued to dramatically spread across the world (Joshi, 2020). Coronavirus disease 2019 is an infectious disease caused by coronavirus. Most people who are infected with the COVID-19 virus experience little, mild to moderate respiratory illness and may recover without treatment (Alhazzani et al., 2020; Zhang et al., 2020). The WHO global health emergency committee also stated that the spread of COVID-19 can be reduced by early detection, isolation, treatment, and the implementation of public contact tracing strategies (Worldometers, 2020). As of the beginning of October 2020, more than 33.6 million people worldwide were infected with COVOID-19 and more than 1 million died due to COVID-19 infection globally. In Palestine, until August 2021, 318,435 people were confirmed to have been infected with COVID-19 and more than 3615 died due to COVID-19 infection (Puspitasari et al., 2020). The level of panic is correlated with knowledge and attitude among the population. Coronaviruses belong to the *Coronaviridae* family, have a diameter of 65–125 nm, and contain a single strand of RNA with lengths ranging from 26 to 32 kb (Ryalino, 2020). The common symptoms of COVID-19 include fever, dry coughing, and fatigue that may lead to serious symptoms such as difficulty in breathing, chest pain, difficulty in talking, and moving (Lotfi et al., 2020).

Coronavirus disease 2019 can spread through human-to-human transmission and indirect contact with a contaminated object. Coronavirus disease 2019 can be transmitted through body fluid droplets from the mouth or nose, which can spread when a person with COVID-19 coughs, sneezes, and talks. Droplets typically cannot transverse more than 6 feet

Corresponding Author: Khalid Jamal Khadoura
E-mail: k.khadourah@gmail.com

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(almost 2 m) (Abdelhafiz et al., 2020). Coronavirus disease 2019 remains intact and contagious in droplets and can remain suspended in the air for up to 3 h; a person can become infected if they touch the surface contaminated with severe acute respiratory syndrome coronavirus-2 objects and then make contact with mucous membranes such as the eyes, nose, or mouth (Abdelhafiz et al., 2020).

The knowledge, attitudes, and practices people hold toward the disease play an integral role in determining a society's readiness to accept behavioral change measures from health authorities. Knowledge can influence the perceptions of persons due to their past experiences and beliefs. It can also delay the recognition and handling of potential COVID-19 patients during the pandemic period (Oppenheim et al., 2019). The WHO has stated that education is a critical step in controlling COVID-19 side to side to other steps as isolation, prevention, controlling the transmission, and treatment of infected persons. It is believed that adherent to the following would be important to minimize the spread of infection: staying at home (home quarantine), avoiding any direct contact with any healthy (patients without symptoms) or infected person, maintaining 2 m of social distance when in contact with others, adhering to using a face mask, especially when dealing with coughing or sneezing persons, avoiding shaking hands, frequently washing hands for at least 20 seconds with soap and water or hand sanitizer with at least 60% alcohol, particularly after touching common surface areas, avoiding touching eyes, nose, and mouth with unwashed hands, and disinfecting surfaces using household sprays or wipes (Lotfi et al., 2020). Thus, it is wise to assess community knowledge and increase efforts toward improving community awareness regarding standards of preventive methods and public health measures. In addition, having the vaccine plus an appropriate immunomodulatory diet and proper mental support will eventually be effective against COVID-19.

However, the level of knowledge and perceptions of the Palestinian community toward COVID-19 remain unclear. This study is aimed to explore the level of knowledge and the quality of information of COVID-19 among Palestinians during this peak period. Therefore, this study aimed to present a summary of knowledge during the COVID-19 pandemic among the general population in Palestine.

Research Questions

1. What is the level of knowledge about COVID-19 among the Palestinian population during the pandemic?
2. What is the level of knowledge about the routes of transmission of COVID-19?
3. What is the level of knowledge about the immunity enhancement methods and protection aids against COVID-19?

Method

Study Design

This is a descriptive analytic cross-sectional study.

Sample

Participants from all Palestinian governorates from both West Bank (WB) and Gaza Strip (GS) were invited to be a part of this study. Five hundred fifty-four participants participated in this study (190 from WB and 364 From GS). Participants' inclusion criteria included access to the internet, being above 18 years old, being willing to participate, and understanding Arabic. Invitations were launched via popular internet social media available in Palestine, particularly Facebook and WhatsApp.

Data Collection Tool

A group of multidisciplinary researchers developed a structured self-administered questionnaire with the assistance of experts in infectious disease and infection control strategies in addition to epidemiologists, nutritionists, and immunologists. The questionnaire consisted of four sections; the first part was about sociodemographic data (age, gender, profession, education level, governorate, and marital status); the second part measured general knowledge about coronavirus and contained 15 statements; third part measured people knowledge regarding the transmission of coronavirus and consisted of 28 questions. The last part examined the level of knowledge about immunity enhancements and protection aids against coronavirus with 24 statements. All domains were scaled on a three-point scale (yes, no, I do not know).

The questionnaire was translated into Arabic language and then validated. The content validity was assured by the experts' inputs. The internal consistency of the whole questionnaire was assessed by Cronbach's alpha (.701) which yielded a good enough result. The questionnaire was constructed on a Google forum and distributed through the internet social media. The Arabic questionnaire is available in the link in the annex.

The Google forum link of the questionnaire was first distributed to the authors who forwarded it to their contact list. The link to the survey was also posted in WhatsApp and Facebook groups. The average time to fill the survey was 15 minutes at most. Data were collected from October 10 to October 24, 2020.

Statistical Analysis

Data were first extracted and then analyzed using Statistical Package for the Social Sciences (SPSS IBM Corp., Armonk, NY, USA) software version 25. Then data were checked for missing and outliers. Because missing values were above 5% in 64 questionnaires, they were excluded and the other 64 were excluded because the age of participants was below 18 years. Descriptive statistics were used to summarize the characteristics of participants and the level of knowledge. Continuous variable (age and body mass index) was presented as a mean and standard deviation. The total score of knowledge was converted to a percentage, over a range of 0–100%. The knowledge scores were classified as low (<60%), moderate (60–79.99%), and good knowledge (≥80%). Continuous variable (age and body mass index) was presented as a mean and standard deviation. Differences in the level of knowledge were analyzed using independent Student's *t*-test and one-way analysis of variance where available. Responses regarding knowledge were dichotomized into correct and non-correct at a level of 60%. Multivariable logistic regression analysis was run. Confounding factors were detected by the backward-stepwise elimination method at the level of .2. Statistically significant differences were considered when $p < .05$.

Ethical Consideration

Ethical approval to conduct the study was obtained from the Palestinian Health Research Council (Helsinki committee) in Palestine (No. PHRC/HC/780/20; October 5, 2020). Every participant read in advance a cover letter attached to the questionnaire which includes information about the study and its objective, the voluntary participation and anonymity of individuals, and the right to discontinue if felt discomfort with the survey conducted.

Results

Participant's Characteristic

Five hundred and fifty-four online questionnaires were sent through social media (Facebook and WhatsApp) and completed by participants. The characteristics of the participants are illustrated in Table 1. Out of the total 554 participants, 401 are males (72.4%) and 153 are females (27.6%) with a more frequent age range of 18–22 years (46.8%), while 12.3%, 9.7%, and 31.2% of participants had an age range of 23–26, 27–30, and more than 30 years old respectively. Among the included participants, most of them had normal weight (56.0%), 27.3% were overweight, 13.4% obese, and 3.4% underweight. The results showed that the majority of the included participants were from the WB (65.7%), while 34.3.0% of them were from the GS. Regarding marital status, the results pointed out that more than half of the enrolled participants were unmarried (56.5%), while 43.5% of them were married. The results showed that the highest group of the study population have finished bachelor's degree (83.6%), while 11.7% have finished secondary school or less, and the lowest group were highly educated (4.7%). By designation, more than half of the study participants were unemployed (54.3%), while 22.2% were working in the medical sector, 10.8% in the education sector, and 12.5% in other sectors.

Participant's Medical History

Regarding the distribution of the study population according to participants' medical history, the present study reported that 7.4% of participants suffered from chronic diseases; the most frequent of these diseases was hypertension which represented 39.0%, while 26.8% suffered from diabetes mellitus, 22.0% suffered from respiratory diseases 2.4% suffered from heart disease, and 9.7% had others diseases, Table 1.

Responses of Participants to All Domains of Knowledge About COVID-19

Table 2 demonstrates the distribution of the study participants according to their responses about COVID-19 knowledge. Results of general knowledge about COVID-19 (Annex 1) pointed out that 47.8% of the study participants had a high general knowledge level, and the average general knowledge score was 76.7 ± 12.8 out of 100. In terms of knowledge level about the routes of transmission of COVID-19 (Annex 2), the results showed that only 22.2% of the study participants had a high knowledge level, and the average knowledge score was 72.2 ± 10.3. Regarding the level of knowledge about immunity and protection aids against COVID-19 (Annex 3), the results showed that 54.9% of participants had a high knowledge level, and the knowledge average was 77.7 ± 11. The results of the overall total score showed that 32.1% of participants had a high

Table 1.
Participant's Characteristic (N = 554)

Characteristic	Frequency	Percent	Mean ± SD
Age (years)			28.43 ± 10.97
18–22	259	46.8	
23–26	68	12.3	
27–30	54	9.7	
More than 30	173	31.2	
BMI (kg/m²)			24.67 ± 5.09
Underweight	19	3.4	
Normal	310	56.0	
Overweight	151	27.3	
Obese	74	13.4	
Gender			
Male	401	72.4	
Female	153	27.6	
Governorates			
Gaza Strip	190	34.3	
West bank	364	65.7	
Social status			
Unmarried	313	56.5	
Married	241	43.5	
Education levels			
Higher education	26	4.7	
Bachelor degree	463	83.6	
Secondary school or less	65	11.7	
Employment status			
Unemployed	301	54.3	
Medical sector	123	22.2	
Education sector	60	10.8	
Other sectors	70	12.5	
Total	554	100.0	
Do you suffer from any chronic disease?			
No	513	92.6	
Yes	41	7.4	
If the answer to the previous question is yes, select it from the mentioned ones:			
Hypertension	16	39.0	
Diabetes mellitus	11	26.8	
Heart diseases	1	2.4	
Respiratory diseases	9	22	
Others	4	9.8	
Total	41	100	

Note: SD = standard deviation; BMI = body mass index.

Table 2.
Distribution of the Study Population According to Their Knowledge About COVID-19 (N = 554)

Variable and Level	*n* (%)	Mean (SD)	Min	Max
General knowledge about COVID-19		76.7 (12.8)	37.5	100.0
High	265 (47.8)			
Moderate	238 (43.0)			
Low	51 (9.2)			
Transmission of COVID-19 domains		72.2 (10.3)	28.6	96.4
High	123 (22.2)			
Moderate	375 (67.7)			
Low	56 (10.1)			
Immunity and protection aids knowledge against COVID-19		77.7 (11.0)	28.6	100.0
High	304 (54.9)			
Moderate	207 (37.3)			
Low	43 (7.8)			
Total		75.53 (8.3)	46.63	93.65
High	178 (32.1)			
Moderate	347 (62.6)			
Low	29 (5.2)			

Note: *n* = number of subjects; SD = standard deviation; COVID-19 = coronavirus disease 2019; min = minimum; max = maximum; maximum score of mean = 100 points; high = 80% or more; moderate = 60–79.9%; low = less than 60%.

knowledge level, and the average total knowledge level about COVID-19 was 75.53 ± 8.3.

Participants' Medical History and Knowledge About COVID-19 in Relation to Their Characteristics

Table 3 shows that there were statistically significant differences among the mean of knowledge levels and the categories of education. Post hoc test showed that the educational level of secondary school or less has statistically significant differences compared to bachelor degree and high education ($p < .05$), while there were no statistically significant differences between bachelor's degree compared to high education ($p > .05$). Regarding the employment status, the statistical test showed that there were statistically significant differences in the mean of knowledge levels among employment status categories. Moreover, the results showed that there was a statistically significant difference in the mean knowledge level among males compared to females ($p = .001$). In total, the difference in the mean of knowledge level in GS was statistically significant compared to WB ($p < .001$). Generally, results showed that there are no statistically significant differences in the mean of knowledge levels for the other participants' characteristics ($p > .05$).

In the mean of knowledge levels among those who suffered from any chronic disease, the results showed that there were no statistically significant differences between participants with comorbidities and without ($p > .05$). However, there were statistically significant differences in the mean of knowledge levels according to the type of chronic disease. The results showed that the difference in mean of knowledge among the participants with hypertension was statistically significant compared to other diseases ($p < .05$), while there were no statistically significant differences in the mean of knowledge levels with other categories ($p > .05$).

Multivariable Logistic Regression of Poor Knowledge Explanatory Factors

The analysis exposed that the only explanatory variable for knowledge level was gender. Table 4 shows that the female gender was nearly four times more knowledgeable than male (odds ratios (OR) = 3.94; 95% CI: 1.71, 9.07; $p = .001$). No other variables remained statistically significant.

Discussion

On March 5, the government of Palestine declared a state of emergency in order to curb the spread of the virus. Palestine is one of the highest population Arab region countries crowded with people, especially Gaza Strip. Worldwide efforts have been applied to limit the spreading of the disease, these efforts comprised strict policies by the governments, together with personal radically change individual daily habits including behaviors, lifestyles and elevating the awareness of the general public regard disease. This study evaluated the level of knowledge about the COVID-19 among the Palestinian population in three main domains:

In general, the respondents in the present online survey had a good general knowledge of COVID-19, and the study results came in line with previous studies conducted in different Arab countries: Egypt, Jordan, and Saudi Arabia (Abdelhafiz et al., 2020; Khaled et al., 2020; Khasawneh et al., 2020). Also, in

Table 3.
The Mean Differences in Knowledge Related to Participants' Descriptive Characteristics (N = 554)

Characteristics	N	Mean	SD	Statistical Test			Post Hoc
				t*	F**	p	
Age (years)							
18–22	259	75.82	8.18		1.443	.229	
23–26	68	74.94	8.48				
27–30	54	73.51	9.66				
More than 30	173	75.96	7.90				
BMI							
Underweight	19	77.69	7.45		.455	.714	
Normal	310	77.74	11.20				
Overweight	151	78.11	10.42				
Obese	74	76.32	12.29				
Gender							
Male	401	76.59	7.75	3.439		0.001	
Female	153	73.90	9.40				
Governorates							
Gaza Strip	190	77.60	8.26	3.614		<.001	
West bank	364	74.93	8.22				
Social status							
Unmarried	313	76.45	8.33	1.941		.053	
Married	241	75.07	8.27				
Education levels							
Higher education[a]	26	81.87	9.14		6.052	.003	a vs. b = .076
Bachelor's degree[b]	463	77.95	10.88				a vs. c = .002
Secondary school or less[c]	65	73.85	11.85				b vs. c= .005
Employment							
I do not work[a]	301	74.60	10.81		3.078	0.027	a vs. b = .089
The medical section[b]	123	79.60	10.30				a vs. c = .929
Education sector[c]	60	77.46	13.97				a vs. d= .041
Another sector[d]	70	77.60	10.58				b vs. c = .216
							b vs. d = .003
							c vs. d = .142
Medical history							
Do you suffer from any chronic disease?							
No	513	75.77	8.36	–.771	-	.441	-
Yes	41	76.81	7.84				
If the answer to the previous question is yes, select from the following diseases:							
Hypertension[a]	16	73.81	13.01	-	3.755	0.032	a vs. b = .106
Diabetes mellitus[b]	11	80.09	6.67				a vs. c = .011
Other[c]	14	83.33	6.67				b vs. c= .414

Note: *Student's independent *t*-test; **one-way analysis of variance (ANOVA).

Table 4.
Analysis of Factors Identifying Poor Knowledge Level Among the Study Population

						95% CI	
Univariate Regression	***β***	**S.E.**	**Wald**	***p***	**UOR**	**Lower**	**Upper**
Gender (female)	1.37	.43	10.37	.001	3.94	1.71	9.07
Governorates (Gaza)	.72	.19	14.40	.001	2.05	1.41	2.96
Marital status (unmarried)	.39	.19	4.38	.036	1.48	1.03	2.13
Education levels							
Higher education	1.54	.50	9.46	.002	4.67	1.75	12.46
Bachelor's degree	.66	.33	4.12	.042	1.94	1.02	3.66
Employment status							
The medical section	.09	.23	.17	.682	1.10	.71	1.71
Education sector	.31	.29	1.12	.290	1.36	.77	2.40
Another sector	–.86	.34	6.43	.011	0.42	.22	0.82
History of HTN	.12	.89	.02	.895	1.12	.20	6.43
History of DM	.81	.79	1.05	.305	2.25	.48	10.60
			Multivariable regression				
Gender							
Female	1.37	.426	10.370	.001	3.94*	1.71	9.07
Male®	0	-	-	-	1	-	-
Constant	–3.666	.320	131.053	.000	.026*		

Note: ® = Reference; UOR = unadjusted odds ratios; DM = diabetes mellitus; HTN = hypertension; *adjusted odds ratios.

line with other international counties as in Kenya and Nigeria (Austrian et al., 2020; Olapegba et al., 2020) which indicated high COVID-19 knowledge among their populations. Good knowledge of respondents toward COVID-19 is probably due to the age groups of participants which were between 18 and 22 years. As this group used more different types of social media communication and sought information about COVID-19, this gave them a high impact of awareness.

Regarding the transmission of the virus, the majority of participants agreed that patients with chronic diseases were more susceptible than others to get infected with COVID-19. This matched numerous studies (Abdelhafiz et al., 2020; Liang et al., 2020; Lotfi et al., 2020b; Peng et al., 2020). The vast majority of the respondents in this study believed that the patients with comorbid diseases were susceptible to more risk. This has been consistent with many studies published about COVID-19 in China (Liang et al., 2020; Lotfi et al., 2020b) and Jordan (Khasawneh et al., 2020).

The level of responses toward methods of transmission varied depending on the type of question; however, almost all of the respondents knew the methods of transmission of the virus and main symptoms of infection and believed that washing hands frequently with normal soap and using medical mask are optimal modes of preventing COVID-19. This finding was consistent with many previous studies (Khaled et al., 2020; Khasawneh et al., 2020; Saravanan et al., 2020; Taghrir et al., 2020). In addition, around 61% of the participants believed that the psychological factor (stress, anxiety, and fear) was related to infection with COVID-19. This result was in accordance with many studies conducted in the United Arab Emirates, Morocco, and China that also expressed adequate knowledge of the psychological effects of COVID-19 (Saravanan et al., 2020; Sfendla & Hadrya, 2020; Taghrir et al., 2020; Wang et al., 2020). Also, in India, the study results showed that anxiety, worries, paranoia about acquiring infection, and sleep disturbances during the COVID-19 pandemic were common among most respondents (Roy et al., 2020).

The majority of the study participants believed that it would not be easy to produce an approved vaccine and supposed there would be no effective treatment or vaccine against COVID-19. This result was confirmed with an epidemiological survey in North Central Nigeria (Olapegba et al., 2020). In Egypt, most of the participants were willing to get the vaccine once it was available (Abdelhafiz et al., 2020). As for the knowledge toward nutrients, eating foods rich in vitamins, drinking water frequently, and strengthening immunity through healthy eating habits and lifestyle. The results of the study harmonized with the study in Poland that revealed that it observed significant adaption in dietary needs, food consumption, lifestyle, behaviors, and daily routines (Górnicka et al., 2020). Also, these results coincided with other studies that showed high adherence to healthy dietary patterns in respondents who increased the intake of vegetables, fruits, whole grains, fish, and water, and many studies reported that fruits and vegetables supplying micronutrients can boost immune function (Górnicka et al., 2020; Muscogiuri et al., 2020).

Conclusion and Recommendation

This study provides a comprehensive assessment of the knowledge among residents of GS and WB toward COVID-19 during the pandemic. In general, Palestinians participating in this survey had good knowledge about COVID-19, routes of transmission of COVID-19, protection aids against COVID-19, and immunity enhancement aids, which are important to limit the spread of the disease. However, knowledge was less among males than females. This may need more effort by using different tools of communication to reach more to the male gender.

Ethics Committee Approval: Ethics committee approval was received for this study from the Palestinian Health Research Council (Helsinki committee) (Date: October 5, 2020, No: PHRC/HC/780/20).

Informed Consent: Every participant read in advance a cover letter attached to the questionnaire which includes information about the study and its objective, the voluntary participation and anonymity of individuals, and the right to discontinue if feeling discomfort with the survey were considered.

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Annex 1.
General Knowledge of Participants About COVID-19

General Knowledge About COVID-19	Yes		No	
	n	%	*n*	%
1. Epidemic COVID-19 begin recently with the development of science	109	19.7	445*	80.3
2. Among the most common causes of COVID-19 epidemics				
a. Overcrowded places	442*	79.8	112	20.2
b. Lack of diversification of food	169	30.5	385*	69.5
c. Do you mean sedentary life and lack of movement	108	19.5	446*	80.5
d. Weakened immune system	408*	73.6	146	26.4
e. Building construction	54*	9.7	500	90.3
f. Medical development	74	13.4	480*	86.6
3. The source of COVID-19 is bats	408*	73.6	146	26.4
4. COVID-19 was able to change its shape and composition	369*	66.6	185	33.4
5. Medicine can eliminate COVID-19 germs	33	6.0	521*	94.0
6. COVID-19 rapidly spread threat to humanity	282*	50.9	272	49.1
7. COVID-19 gets deadlier and more versatile	371*	67.0	183	33.0
8. The main source of COVID-19 spread is animals	293*	52.9	261	47.1
9. COVID-19 disease began to spread in China	537*	96.9	17	3.1
10. COVID-19 transmission path from animal to human and from human to human	433*	78.2	121	21.8

Note: COVID-19 = coronavirus disease 2019; *key answer.

Annex 2.
Knowledge of Responders About Modes of Transmission of COVID-19

Transmission Routes of COVID-19 Domains	Yes		No	
	n	%	*n*	%
1. Patients with chronic diseases are more susceptible than others to infection with COVID-19	509*	91.9	45	8.1
2. Is the psychological factor (stress, anxiety, fear) related to infection with the COVID-19?	338*	61.0	216	39.0
3. The more vulnerable people to COVID-19 is/are:				
a. Adult male	116	20.9	438*	79.1
b. Adult female	5	0.9	549*	99.1
c. Pregnant	308*	55.6	246	44.4
d. Children	262*	47.3	292	52.7
e. Elderly people	527*	95.1	27	4.9
4. The route of COVID-19 transmission between persons is through:				
a. Eating contaminated food	106	19.1	448*	80.9
b. Drinking contaminated water	94	17.0	460*	83.0
c. Cough and sneeze	499*	90.1	55	9.9
d. Touching contaminated surfaces	480*	86.6	74	13.4
e. Touching infected persons	478*	86.3	76	13.7
f. Touching eye and nose	395*	71.3	159	28.7
5. The proportion of prevention and protection actions against COVID-19 around you is high	199*	35.9	355	64.1

(*Continued*)

Annex 2.
Knowledge of Responders About Modes of Transmission of COVID-19 (Continued)

Transmission Routes of COVID-19 Domains	Yes		No	
	n	%	*n*	%
6. A Procedures that reduce the risk of infection with COVID-19:				
a. Mask (medical muzzle)	501*	90.4	53	9.6
b. Washing hands frequently	506*	91.3	48	8.7
c. Avoiding crowded places	493*	89.0	61	11.0
d. Frequent showers	188	33.9	366*	66.1
e. Drinking filtered water only	54	9.7	500	90.3
7. If COVID-19 patient recovered, is recurrent infection expected?	400*	72.2	154	27.8
8. Does COVID-19 affected with temperature?	205*	37.0	349	63.0
9. The symptoms associated with COVID-19 infection is/are:				
a. Diarrhea	265	47.8	289*	52.2
b. Cough	220*	39.7	334	60.3
c. High temperature	520*	93.9	34	6.1
d. Vomiting	134	24.2	420*	75.8
e. Hard breathing	506*	91.3	48	8.7
f. Sore throat	400*	72.2	154	27.8
g. Nasal congestion	286*	51.6	268	48.4

Note: COVID-19 = coronavirus disease 2019; *key answer.

Annex 3.
Knowledge Regarding Immunity and Protection Aids Against COVID-19

Immunity and Protection Aids Against Covid-19	Yes		No	
	n	%	*n*	%
1. Easy to produce a vaccine against COVID-19	33	6.0	521*	94.0
2. Until now, no effective treatment or vaccine against COVID-19 is present	127	22.9	427*	77.1
3. The procedure protect against COVID-19 infection is/are:				
a. Avoiding smoking	311*	56.1	243	43.9
b. Strengthening the immunity	525*	94.8	29	5.2
c. Drinking water frequently	405*	73.1	149	26.9
d. Eating food rich in vitamins	469*	84.7	85	15.3
e. Staying up late and not getting enough sleep	34	6.1	520*	93.9
4. One of the most important ways to prevent COVID-19 infection is to make sure that the immune system is strengthened	547*	98.7	7	1.3
5. There is any relation between immunity and infection with COVID-19	526*	94.9	28	5.1
6. Immunity of human body needs time to get improved				
a. Strengthening immunity by:				
(i) Healthy eating habits and lifestyle	511*	92.2	43	7.8
(ii) Eating vegetables and citrus fruits	479*	86.5	75	13.5
(iii) Eating onions and garlic	353*	63.7	201	36.3
(iv) Breathing fresh air	220	39.7	334*	60.3
7. The reasons that can weaken the immunity system:				
a. Eating habits	357	64.4	197*	35.6

(*Continued*)

Annex 3.
Knowledge Regarding Immunity and Protection Aids Against COVID-19 (Continued)

Immunity and Protection Aids Against Covid-19	Yes		No	
	n	%	*n*	%
b. Obesity	406*	73.3	148	26.7
c. Crowded cities	278	50.2	276*	49.8
8. The ways to protect the body from obesity and weakness				
a. Daily physical activities	517*	93.3	37	6.7
a. Eating healthy meals, prepared by healthy methods, free from fats	493*	89.0	61	11.0
a. Eating regular meals, avoiding random ones, being careful about not skipping breakfast	340*	61.4	214	38.6
a. Replacing unhealthy drinks (soft drinks) with healthy drinks	425*	76.7	129	23.3
9. Fear and anxiety affect the immune system and thus cause infection with the virus	360*	65.0	194	35.0
10. Smoking affects the immune system and thus causes infection with the virus	431*	77.8	123	22.2
11. There is a relationship between immunity strength and enough sleep	419*	75.6	135	24.4

Note: COVID-19 = coronavirus disease 2019; *key answer.