

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/358350594>

# Knowledge, Attitude, and Practice toward the Novel Coronavirus-2019 (COVID-19) Outbreak: A Cross-sectional Study in Palestine

Article in *Biomedical Sciences* · January 2022

DOI: 10.4103/abhs.abhs\_16\_22

CITATIONS

0

READS

47

4 authors, including:



Hatem A Hejaz

53 PUBLICATIONS 864 CITATIONS

SEE PROFILE

Some of the authors of this publication are also working on these related projects:



Pharmaceutics [View project](#)



<https://abhsjournal.net/aheadofprint.asp> [View project](#)

## Original Article

# Knowledge, Attitude, and Practice toward the Novel Coronavirus-2019 (COVID-19) Outbreak: A Cross-sectional Study in Palestine

Hatem A. Hejaz<sup>1</sup>, Inad Nawajah<sup>2</sup>, Maaly Wredat<sup>1</sup>, Walaa Melhem<sup>1</sup>

<sup>1</sup>Department of Pharmacy, College of Pharmacy and Medical Sciences, <sup>2</sup>Department of Mathematics, College of Science & Technology, Hebron University, Hebron, Palestine

### ABSTRACT

**Background:** Coronavirus disease-2019 (COVID-19) outbreak is a global concern and the World Health Organization (WHO) has declared it as a public health emergency of international concern.

**Objectives:** This study aimed to assess knowledge, attitude, and practices (KAP) toward COVID-19 among the general population of Palestine at the time of the COVID-19 pandemic.

**Materials and Methods:** A cross-sectional study was conducted using an online questionnaire; a series of questions regarding the KAP of the population about COVID-19 was asked, and participants' demographic characteristics and source of information regarding COVID-19 were collected and analyzed using Statistical Package for the Social Sciences (SPSS) software program, version 26.0.

**Results:** Seven hundred twenty-four individuals participated in this study. The average age of the participants was 28 years (standard deviation [SD] = 10.7), the majority were females 558 (77.1%), with a bachelor's degree 480 (66.3%), and 229 (31.6%) students. Most of them from Hebron governorate 609 (84.1%) and many of them reported that they wear a mask when they leave their house and avoid shaking hands, 494 (68.2%), 424 (58.6%), respectively. The results indicate that Palestinians have a good level of knowledge about COVID-19 with a positive attitude and good compliance with Palestinian government measures. The result showed a significant correlation between female gender, higher age, and higher education with KAP. However, male gender, nonhealth-care-related professions, single, and lower level of education were significantly associated with lower knowledge scores. There was no clear satisfaction with the government's role in limiting and controlling the spread of COVID-19.

**Conclusions:** Palestinian population showed decent knowledge, appropriate practice, and a positive attitude toward the COVID-19 outbreak.

**Keywords:** Attitude, COVID-19, KAP, knowledge, Palestine, practice, SARS-CoV-2


### BACKGROUND

Last December 2019 in the city of Wuhan, China, a group of people suffering from idiopathic pneumonia was admitted, and these symptoms were associated with eating bats and seafood, and then it was determined that the cause of infection

was the new coronavirus. The World Health Organization (WHO) declared it a global pandemic on March 12, 2020 [1,2]. The current pandemic of coronavirus disease-2019 (COVID-19) is a type of coronavirus disease caused by the severe acute respiratory syndrome virus 2 (SARS-CoV-2), which causes serious respiratory illness such as pneumonia

Submitted: 04-11-2021 Revised: 15-12-2021  
Accepted: 17-12-2021 Published: 19-01-2022

**Address for correspondence:** Dr. Hatem A. Hejaz,  
Department of Pharmacy, College of Pharmacy and Medical Sciences, Hebron University, P.O. Box 40, Hebron, Palestine.  
E-mail: [hhejaz@hebron.edu](mailto:hhejaz@hebron.edu)

Access this article online	
<b>Website:</b> <a href="http://www.abhsjournal.net">www.abhsjournal.net</a>	<b>Quick Response Code</b> 
<b>DOI:</b> 10.4103/abhs.abhs_16_22	

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

**For reprints contact:** [WKHLRPMedknow\\_reprints@wolterskluwer.com](mailto:WKHLRPMedknow_reprints@wolterskluwer.com)

**How to cite this article:** Hejaz HA, Nawajah I, Wredat M, Melhem W. Knowledge, attitude, and practice toward the novel coronavirus-2019 (COVID-19) outbreak: A cross-sectional study in Palestine. *Adv Biomed Health Sci* 0;0:0.

and lung failure. The WHO launched the virus that causes the novel coronavirus-2019, and then it was renamed by the International Committee for the Study of Coronavirus Group (CSG) as “SARS-CoV-2” and the disease named COVID-19 by the WHO [3]. Coronaviruses are single-stranded RNA viruses, spherical, polymorphic, with a radius of 80–120 nm, and sizes ranging from 50 to 200 nm [4]. They cause diseases in humans called human coronaviruses (HCoVs) and cause diseases related to the respiratory, nervous, and digestive systems in various species of birds and mammals [5]. Coronaviruses belong to the *Coronaviridae* family of the order *Nidovirales* [2] and it constitutes the largest group within the *Nidovirales* suborder and this order includes four families, which are *Coronaviridae*, *Arteriviridae*, *Mesoniviridae*, and *Roniviridae*. *Coronaviridae* are divided into four subfamilies, including  $\alpha$ -/ $\beta$ -/ $\gamma$ -/ $\delta$ -coronavirus;  $\alpha$ - and  $\beta$ -CoV have the potential to infect mammals, whereas  $\gamma$ - and  $\delta$ -CoV induce infection in birds [1]. Alpha coronavirus includes HCoV-229E and HCoV-NL63, whereas beta coronavirus includes HCoVHKU1, HCoV-OC43, Middle East respiratory syndrome coronavirus (MERS-CoV), and SARS-CoV [6]. Human coronaviruses, HCoV-229E, HCoV-NL63, HCoV-OC43, and HCoV-HKU1, cause mild infections in the respiratory system and are responsible for 15%–30% of colds, especially in children and adults [7,8]. Coronaviruses have earned their name due to their complex structural shape, as coronaviruses feature an unusually large RNA genome and stick-like glycoprotein spikes projecting from the surface of their shell. These protrusions give rise to a distinctive substructure that resembles a solar corona [5].

The first appearance of coronaviruses was in 1965 and 2002 [4,9]. SARS appeared for the first time in Guangdong Province, in China, which resulted in more than 8000 infections and 744 deaths, before it was controlled in 2003. In 2012, the MERS spread in Saudi Arabia, and from there it spread to countries around the world, resulting in 2494 cases and 858 deaths [10]. The last outbreak was last December 2019 in Wuhan, China, where the SARS-CoV-2 spread and led to COVID-19. SARS-CoV-2 is similar to other coronaviruses, is an unsegmented, envelope of a single positive strand of RNA with a diameter of 65–125 nm belonging to  $\beta$ -CoV, and is characterized by the outer membrane consisting of trimeric-S glycoproteins that allow the virus to bind to the receptor for angiotensin-converting enzyme 2 (ACE2) [11]. These receptors are present in the cells of the lower respiratory tract [12]. SARS-CoV-2 enters the host cell using the transmembrane serine protease 2 (TMPRSS2) plus ACE 2, [3] following binding *via* the receptor-binding domain (RBD)-of the S glycoprotein. The S protein undergoes large-scale conformational changes that allow the virus to endocytose into the cell cytoplasm where it undergoes replication. SARS-CoV-2 is replicated by a continuous synthesis of RNA and a unique, muted transcription of DNA, and the regulation of the transcription process is linked to factors including the primary coronavirus, RNA protein, which increases

transcription efficiency [12,13]. The source of COVID-19 is still unknown, and there are continuous attempts to know the host animal for this coronavirus, as it is believed that the host animal is bats, seafood, or pangolins, and hence the spread of the disease has been linked to the seafood market in Wuhan, China [14]. All ages are susceptible to infection by people who show symptoms, through sneezing or coughing drops, and in other cases, an infection can occur from people who do not show symptoms and before symptoms appear. COVID-19 can be transmitted in several ways, including direct contact with infected animals, as is the case in the initial cases of the disease in the Chinese Wuhan market, [15] or from one person to person and this is considered to be the main form of transmission. The transmission of the disease from an infected person occurs in two ways: either through direct exposure to a sneeze or cough droplets or during the speech of an infected person or direct contact with him [16], or through indirect exposure to the infected person; by touching contaminated surfaces with the virus, and then the virus transmitted to the mucous membranes in the upper parts of the body, especially the mouth, eyes, or nose [17]. Where many studies show the ability of the virus to survive on contaminated surfaces; coronavirus can survive for 72 h on a plastic surface, for 24 h on cardboard, and for up to 4 h on copper surfaces [18].

The clinical features of this disease vary, ranging from no symptoms to critical including death. The disease is classified according to its severity into mild, moderate, severe, and critical. Fever, cough, muscle pain or fatigue, shortness of breath, and headache are the most common mild-to-moderate symptoms seen in people with confirmed cases of COVID-19 [19,20]. At the same time, nausea, vomiting, diarrhea, and other digestive symptoms could be within an incubation period of 14 days following exposure to the virus [19,21]. Symptoms can develop into critical in some patients, including acute respiratory distress syndrome (ARDS), respiratory failure, and multiple organ dysfunction syndromes, in addition to chest pain, heart palpitations, acute myocardial infarction, heart failure, and other cardiovascular symptoms and may lead to death [22,23]. Most fatal and severe cases such as ARDS occurred between the elderly and people with underlying diseases such as cancer, hypertension, diabetes, heart, lung, and kidney diseases [22,24].

SARS-CoV-2 is characterized by its rapid spread so early, rapid and accurate detection helps in limiting its spread and controlling it, and preventing the development of symptoms. It is not possible to rely solely on clinical diagnosis in diagnosing a patient with SARS-CoV-2; therefore, tests must be performed to ensure the presence or the absence of the virus. One of the most important and most common tests is the real-time reverse transcription polymerase chain reaction (real-time RT-PCR) test, which is the gold standard test for the molecular diagnosis of viral and one of the best

and most accurate methods for detecting COVID-19 nucleic acids in nasopharyngeal swabs and the turnaround time is from a few hours to 2 days [25,26]. If a nasopharyngeal swab cannot be taken, an oropharyngeal sample (OP), a middle nasal swab (NMT), an anterior orifice sample (nasal swab, NS), and a nasopharyngeal wash/suction sample or a nasal aspiration (NA) sample can be collected instead [27]. One of the real problems with the RT-PCR test is to show false-positive or false-negative results due to the presence of amplification inhibitors in the sample or insufficient organisms in the sample arising from improper aggregation, transport, or handling. To avoid inconsistent results, it would be better to use different types

of samples (stool and blood) along with the respiratory system sample and the test requires high-quality samples to avoid false-negative results. There is currently no specific antiviral vaccine or drug regimen used to treat COVID-19 patients. There are many candidate vaccines, such as mRNA-1273, in phase III clinical trials, but it is unlikely that a vaccine will be available against the virus before the end of 2020 [28]. At the beginning of the corona pandemic, antimalarial drugs (chloroquine or hydroxychloroquine) received widespread attention in treating COVID-19, and the Food and Drug Administration authorized their use. But after monitoring COVID-19 patients, the Food and Drug Administration issued a license to use antimalarial only in

**Table 1: Demographic characteristics of participants (n = 724)**

Variable	n	%	Variable	n	%
Gender					
Male	166	22.9			
Female	558	77.1			
Age			Family income <sup>a</sup>		
Under 20 years old	140	19.3	Less than 2000	313	43.2
From 20 to 35 years old	471	65.1	2000–less than 4000	258	35.6
From 36 to 50 years old	89	12.3	4000–6000	97	13.4
More than 50 years	24	3.3	More than 6000	56	7.7
Marital status			Work (occupation)		
Single	372	51.4	I do not work	259	35.8
Married	347	47.9	Student	229	31.6
Divorce	3	0.40	Government employee	67	9.3
Widowed	2	0.30	Private sector	104	14.4
Place			Medical field		
City	505	69.8	Other	31	4.3
Village	202	27.9			
Camp	17	2.3			
Education					
School	124	17.1			
Diploma	79	10.9			
Bachelors	480	66.3			
Postgraduate	41	5.7			

**Table 2: Governorate**

	Frequency	Percent	Valid percent	Cumulative percent
Hebron	609	84.1	84.1	84.1
Ramallah	18	2.5	2.5	86.6
Bethlehem	26	3.6	3.6	90.2
Jerusalem	40	5.5	5.5	95.7
Jericho	1	0.1	0.1	95.9
Nablus	16	2.2	2.2	98.1
Jenin	4	0.6	0.6	98.6
Tulkarm	4	0.6	0.6	99.2
Gaza	6	0.8	0.8	100.0
Total	724	100.0	100.0	

**Table 3: Research community knowledge (K) about COVID-19**

No.	Question	Options	Yes (100%)	No (100%)		
K.1	What do you think about the causes of corona disease?	Bacteria	58(8%)	666(92%)		
		Fungi	9 (1.2%)	715(98.8%)		
		Virus	625(86.3%)	999(1%)		
		Animal	71(9.8%)	653(90.2%)		
		Other than that	47(6.5%)	677(93.5%)		
		I do not know	63(8.7%)	661(91.3%)		
K.2	What is the origin and source of Corona disease? (can choose more than one answer)	Animals that transmitted it to humans	273(37.7%)	451(62.3)		
		It was manufactured by humans in laboratories	367(50%)	357(50%)		
		Other than that	151(20.9%)	573(97.1%)		
		I do not know	22 (2.3%)	702(97.7%)		
K.3	Who is highly vulnerable to corona disease? (more than one answer can be chosen)	Elderly	513(70.9%)	211(29.1%)		
		Who suffers from chronic diseases, such as diabetes, stress, and heart disease	569(78.6%)	155(21.4%)		
		People with low immunity	600(82.9%)	124(17.1%)		
		Who suffers from chronic lung disease	485(67%)	239(63%)		
		Children	99(13.7%)	625(86.3%)		
		Pregnant women	133(18.4%)	591(81.6%)		
		Females	11(1.5%)	713(98.5%)		
		I do not know	11(1.5%)	713(98.5%)		
K.4	What are the symptoms of corona disease in your opinion? (can choose more than one answer)	Headache	548(75.7%)	176(24.3%)		
		High temperature	664(91.7%)	60(8.3%)		
		Cough	518(71.5%)	206(28.5%)		
		Shortness of breath	641(88.5)	83(11.5%)		
		Fatigue	565(78%)	159(22%)		
		Runny nose	185(25.6%)	539(74.4%)		
		Sneezing	285(39.4%)	439(60.5%)		
		Muscle pain	360(49.7%)	364(50.3%)		
		Loss of smell	640(88.4%)	84(11.6%)		
		Loss of sense of taste	683(88.1%)	41(11.9%)		
		Bleeding	21(2.9%)	703(97.1%)		
		Other than that	14(1.6%)	710(98.4%)		
		I do not know	12(1.7%)	712(98.3%)		
		K.5	What is/ are the main primary sources for your information about corona disease and its symptoms? (can choose more than one answer)	Television	220(30.4%)	504(69.5%)
				Radio	69(9.5%)	655(90.5%)
Newspapers	48(6.6%)			676(93.4%)		
Internet	453(62.6%)			271(37.4%)		
Social Media	524(72.4%)			200(27.6%)		
Friends	145(20%)			579(80%)		
Family members	138(19.1%)			586(80.9%)		
Health staff (health professionals)	282(39%)			442(61%)		
	Government awareness campaigns	155(21.4%)	569(78.6%)			

**Table 3: Continued**

No.	Question	Options	Yes (100%)	No (100%)
K.6	Which of these things might contribute to the spread of infection to the disease? (more than one answer can be chosen)	Shake hands with infected individuals	463(64%)	261(36%)
		Close contact with people infected with the virus	553(76.4%)	1712(3.6%)
		Contact with contaminated surfaces	368(50.8%)	356(49.2%)
		Touching an object or surface with the virus on it, then touching the mouth, nose, or eyes	542(74.9%)	182(25.1%)
		Capturing respiratory droplets of infected individuals through the air while sneezing or coughing	540(74.6%)	184(25.4%)
		Mosquitoes/flies	42(5.8%)	682(94.2%)
		Other than that	5(0.5%)	71(99.5%)
K.7	Which of the following can help in protecting and preventing the disease? (can choose more than one answer)	Social distance and self-isolation	592(81.8%)	132(18.2%)
		Surface cleaning with dilute chlorine	413(57%)	311(43%)
		Antibiotics	145(20%)	579(80%)
		Eat garlic and onions	182(25.1%)	542(74.9%)
		Handwashing with soap	566(78.2%)	158(21.8%)
		Avoid going to crowded places	588(81.2%)	136(18.8%)
		Wearing a mask	601(82%)	123(18%)
		Wearing gloves	372(51.4%)	352(48.6%)
		Hand sterilization	575(97.4%)	149(2.6%)
K.8	If washing hands with soap contributes to the prevention and protection of disease, then what is the ideal minimum period for washing hands with soap?	Hand washing is not important to prevent disease	1(0.1%)	723(99.9%)
		Less than 20 s	72(9.9%)	652(90.1%)
		20 s–1 min	593(81.9%)	131(18.1%)
		I do not know	36(5%)	688(95%)
		Other than that	22(2.1%)	702(97.9%)
		Other than that	22(2.1%)	702(97.9%)
K.9	What is the period from the infection of the disease until the appearance of symptoms (the incubation period)?	Less than 7 days	135(18.6%)	589(81.4%)
		1–14 days	503(69.5%)	221(30.5%)
		2–21 days	43(5.9%)	681(94.1%)
		1–3 months	1(0.1%)	723(99.9%)
		I do not know	39(5.4%)	685(94.6%)
		Other than that	3(0.5%)	721(99.5%)
K.10	What is the ideal distance between two people during social distance and isolation?	No distance is required; does not matter at all	19(2.6%)	705(97.4%)
		Less than 1 m	42(5.8%)	682(94.2%)
		1–2 m	637(87.9%)	87(12.1%)
		I do not know	21(1.9%)	703(98.1%)
		Other than that	5(1.8%)	719(98.2%)

hospitals and for clinical trials because they were linked to the risk of heart rhythm problems, especially when combined with the antibiotic azithromycin [29,30]. The first case of corona was diagnosed in Palestine on March 5, 2020, and as a result, the

Palestinian Consultative Council declared a state of emergency and imposed measures that include closure in the Bethlehem governorate, followed by a closure in other governorates in the West Bank on March 8 and imposed a curfew and

**Table 4: Attitudes of residents of Palestine about COVID-19**

No.	Question	Options	Yes (%)	No (%)
A1.	In your opinion, which of the following can prevent/help prevent such a global epidemic in the future? (you can choose more than one answer)	Reducing international flights and travel	274(37.8%)	450(62.2%)
		Improving surveillance in the human and animal health sectors	390(53.9%)	334(46.1%)
		Establish global early warnings and warning systems for infectious diseases	340(47%)	384(53%)
		Cooperation between workers in the field of environmental, animal, and human health	324(44.8%)	400(55.2%)
		Intensify the search for preventive measures such as vaccinations/diagnosis	455(62.8%)	455(37.2%)
		Raising public awareness of proper hygiene/healthy habits	468(64.6%)	256(35.4%)
		Prioritize human life/health well-being over animals or the environment	116(16%)	608(84%)
		A2	What do you think we can do as a society to limit the spread of corona disease? (more than one answer can be chosen)	Follow up, respect, and adhere to my country's health recommendations
Eat healthy foods/exercise	359(49.6%)			365(50.4%)
Not attending religious gatherings	179(24.7%)			545(75.3%)
Keeping social distance/avoiding crowds and crowded places	575(79.4%)			149(20.6%)
Volunteer to provide support whenever possible	201(27.8%)			523(72.2%)
Avoid shaking hands and kissing the face	546(75.4%)			178(24.6%)
A.3	Which crowded places should be avoided during corona disease to be protected/ prevent the disease? (more than one answer can be chosen)			Individuals do not have to avoid going to crowded places to be protected/ prevent the disease
		Schools and universities	397(54.8%)	327(45.2%)
		Religious places (mosques and churches)	301(41.6%)	423(58.4%)
		Workplaces	276(38.1%)	448(61.9%)
		Public transport	461(63.7%)	263(36.3%)
		Hospitals	463(64%)	261(36%)
		Stadiums	336(46.4%)	388(53.6%)
		Clubs	397(54.8%)	327(45.2%)
		Weddings and parties	627(86.6%)	97(13.4%)
Mourning places	547(75.6%)	177(24.4%)		

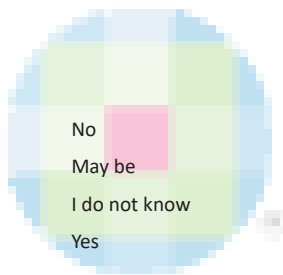
**Table 4: Continued**

No.	Question	Options	Yes (%)	No (%)
A.4	Who is supposed to wear a mask/muzzle? (can choose more than one answer)	No one has to wear a mask/muzzle	24(3.3%)	700(96.7%)
		All people	552(76.2%)	172(23.8%)
		Corona patient only	152(21%)	572(79%)
		People in contact with a Corona patient	238(32.9%)	486(67.1%)
		Medical staff only	226(31.2%)	498(68.8%)
		Other than that	7(0.7%)	714(99.3%)
A.5	How do you feel about the corona pandemic and the current situation? (more than one answer can be chosen)	I feel fear and tension	206(28.5%)	518(71.5%)
		I'm bored	431(59.5%)	293(40.5%)
		I feel optimistic	77(10.6%)	647(89.4%)
		I do not care	195(26.9%)	529(73.1%)
		Other than that	9(0.9%)	715(99.1%)
A.6	How satisfied are you with your country's response to the corona pandemic?	Not satisfied	288(39.8%)	436(60.2%)
		Partially satisfied	284(39.2%)	440(60.8%)
		Satisfied	123(17%)	601(83%)
		More than satisfied	10(1.4%)	734(98.6%)
		Very satisfied	284(39.2%)	440(60.8%)
A.7	How satisfied are you with the media/social media coverage of the corona epidemic?	Very satisfied/keep me and provide me with updates	121(16.7%)	603(83.6%)
		It makes me feel more anxious	120(16.6%)	604(83.4%)
		There is not enough information	142(19.6%)	582(80.4%)
		There are more lies than the truth	264(36.5%)	460(63.5%)
		I am not following any updates for this media	77(10.6%)	647(89.4%)
		Watching TV and movies	333(46%)	391(54%)
		Read books and magazines	217(30%)	507(70%)
		Volunteer work	62(8.6%)	662(91.4%)
A.8	How do you adapt/adapt during this stage, the corona pandemic? (more than one answer can be chosen)	Work from home	306(42.3%)	418(57.7%)
		Spending time with the family	441(60.9%)	283(57.7%)
		Indoor exercise	147(20.3%)	577(97.7%)
		Talk to myself	127(17.5%)	597(82.5%)
		Sleeping all the time	152(21%)	572(79%)
		Play video games	86(11.9%)	638(88.1%)
		Other than that	47(5.1%)	677(94.9%)



**Table 4: Continued**

No.	Question	Options	Yes (%)	No (%)
A.9	Do you think that traveling to an infectious area or contacting someone who has traveled to an area where the disease is prevalent is a risk factor for developing and transmitting the infection?	Yes	515(71.1%)	
		No	49(6.8%)	
		May be	146(20.2%)	
		I do not know	9(1.2%)	
A.10	Can a person be infected with corona disease more than once?	Yes	467(64.5%)	
		No	61(8.4%)	
		May be	150(20.7%)	
		I do not know	46(6.4%)	
A.11	In your opinion, is there an effective treatment or vaccine for corona disease?	Yes	182(25.1%)	
		No	298(41.2%)	
		I do not know	244(33.7%)	
A.12	Should people who have been in contact with a person infected with the coronavirus immediately isolate themselves in a suitable place?	Yes	622(85.9%)	
		No	39(5.4%)	
		May be	57(7.9%)	
		I do not know	6(0.8%)	
		Yes	130(18%)	
A.13	Do you think the Palestinian government has or is doing enough to stop the global epidemic in Palestine?	No	419(54.9%)	
		May be	175(24.2%)	
		Yes	333(45.6%)	
A.14	Will you accept a vaccine against corona if available?	No	247(34.1%)	
		May be	147(20.3%)	
		Yes	333(45.6%)	



prevented the movement of citizens between cities. By closing unnecessary shops and all educational facilities and religious places by the Palestinian government, these measures were effective in reducing the outbreak of the disease. Palestinian government also provided training to hospitals and health facilities on essential protective equipment, medical supplies, and medicines. The Palestinian government has also contained the spread of the virus by imposing a ban on citizens who are suspected of having COVID-19 (who show symptoms or have a positive test result) and isolating them in-home quarantine, as well as banning incoming travelers in government quarantine for 2 weeks [31,32]. The aims of this study were to assess knowledge, attitude, and practices (KAP) toward COVID-19,

to detect related associated sociodemographic variables, and to enhance the KAP about COVID-19 in Palestine.

**MATERIALS AND METHODS**

**Study design**

This study was based on a cross-sectional survey conducted between December 2020 and January 2021 in Palestine. A structured questionnaire consisting of 38 questions was designed and developed by the research team according to the guidelines for clinical and community management of COVID-19 by the WHO. Some questions were based on previous studies carried out in other countries about COVID-19, with the needed adjustment and others were self-created by the

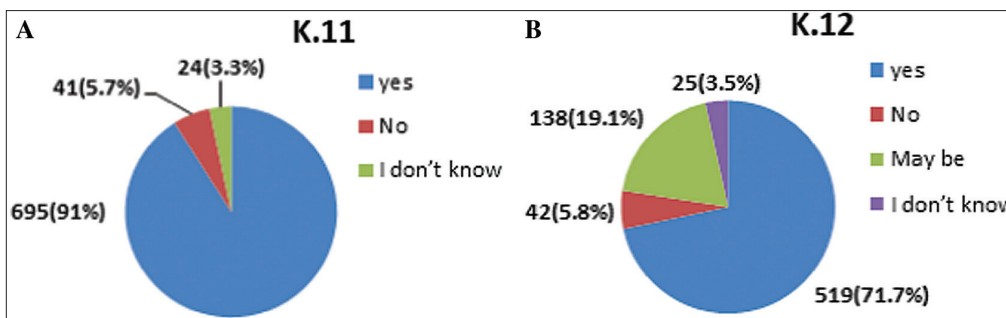


Figure 1: (A) Is it possible that a person infected with coronavirus will not show any symptoms? (B) Can people with the disease without symptoms transmit the virus to others?

research team. Then the questionnaire was translated to Arabic, validated by three experts, and distributed. The first section of the questionnaire (eight questions; Tables 1 and 2) included demographic characteristics (gender, educational level, marital status, and place of residence), whereas the second part was related to the KAP of Palestinians. The knowledge section of the questionnaire consisted of 12 questions (K1–K12) as shown in Table 3 and Figure 1. To evaluate the attitude of the general public toward the disease, 14 questions were asked (A1–A14) [Table 4]. Regarding the general population’s practice and approach toward the disease, four questions were asked (P1–P4) [Table 5 and Figure 2].

#### Data collection

A cross-sectional and anonymous online population-based survey was conducted. A questionnaire was designed for the Google survey tool (Google Forms), and the generated link was shared with the public on social media (i.e., Facebook, WhatsApp). The link was also shared personally to the contact list of investigators and research assistants. The investigators’ decision to collect the data using online approaches was predicated on maintaining social distance during the strict lockdown in Palestine. Through the link, the participants could view the questions simply by clicking on them and answering the questions. The cover page of the questionnaire included a short introduction regarding the objectives, procedures, the voluntary nature of participation, declarations of confidentiality, and anonymity. After the questionnaire was evaluated, it was formatted on Google Form and placed online, and kept for about 2 months. Participation was voluntary and confidential. All the data were collected in 2 months’ period. Data were downloaded and entered into Microsoft Excel (Microsoft, Redmond, Washington). Descriptive statistics were computed for all variables by using the Statistical Package for the Social Sciences (SPSS) software program, version 26.0 (developed by IBM, Armonk, New York, USA).

#### Statistical analysis

The data were analyzed using the SPSS software program, version 26.0. Chi-square analyses were performed to see if

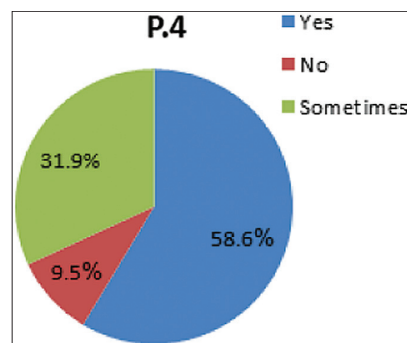


Figure 2: Have you recently avoided cultural behaviors, such as shaking hands, due to coronavirus?

there is a relation between different variables. The frequency distribution of independent variables (sociodemographic characteristics and study characteristics) was computed for all 724 participants.

## RESULTS

### Demographic characteristics

A total of 724 participants (98% response rate) responded to the questionnaires. The personal characteristics (including number and percentage) for the subjects are presented in Table 1. As shown in Table 1, 22.9% of the participants were men and 77.1% are women, and the majority of them were married (47.9%). The education level of the participants was as follows: 17.1% of the participants did not finish their schools or studied up to 12th grade, 10.9% diploma, 66.3% bachelors, and 5.7% postgraduate. The majority of the participants (43.2%) had a low family income (less than US\$600). The mean age of the respondents was 28 years (standard deviation [SD] = 10.7) with the majority (65.1%) between 20 and 35 years. As shown in Table 2, most of the respondents lived in cities (69.8%).

### Participants’ knowledge toward coronavirus disease-2019

As shown in Table 3, the main sources for finding out information about COVID-19 were the Internet (62.6%) and social media (72.4%). They believed that the main cause of the disease is viruses (86.3%), whereas the

**Table 5: Practices of residents of Palestine toward COVID-19**

No.	Question	Options	Yes (%)	No (%)
P.1	Do you comply with and abide by the government's order of all compulsory measures it takes in combating corona disease (such as closures and staying at home)?	Do not adhere to or follow them at all	44(6.1%)	680(93.9%)
		I apply some, but not all	216(29.8%)	508(70.2%)
		I adhere to most of the procedures	333(46%)	391(54%)
		I adhere to all recommendations and procedures	131(18.1%)	593(81.9%)
P.2	When you leave the house, what type of mask/muzzle are you using?	I never wear masks/muzzles	79(10.9%)	645(89.1%)
		Homemade cloth mask	138(19.1%)	586(80.9%)
		Medical mask (surgical grade)	494(68.2%)	230(31.8%)
		Other than that	13(1.8%)	711(98.2%)
P.3	Who is mainly to blame for the outbreak of the corona case in Palestine? (you can choose more than one answer)	The government	341(47.1%)	383(52.9%)
		Citizens	456(63%)	268(37%)
		World Health Organization	181(25%)	534(75%)
		Israeli occupation	175(24.2%)	549(75.8%)
		I do not know	115(15.9%)	609(84.1%)
	Other than that	14(1.4%)	710(98.6%)	

percentage of those who do not know the cause is 8.7%. Two hundred seventy-three (37.7%) of the respondents showed that the source of the disease was from animals and then transmitted to humans from the animals, and 50% of the participants believed that the COVID-19 virus was manufactured by humans in laboratories. The respondents answered that the groups who are most vulnerable to infection with the virus are people with low immunity (80.9%) and those with chronic diseases such as diabetes and high blood pressure. The largest percentage of respondents (69.5%) showed that the incubation period ranged between 1 and 14 days, and the symptoms that appear on the patients were fever (91.7%), headache (75.7%), shortness of breathing (88.5%), fatigue (78%), and cough (71.5%). Nevertheless, as shown in Figure 1, the largest percentage of respondents get complicated because the infection can take place without showing symptoms (91%) and the patient can transmit it to another person (71.7%). Five-hundred forty of the respondents (74.6%) mentioned that the virus can be transmitted through coughing or sneezing to an infected person, whereas 76.4% mentioned the transmission of the virus can be through direct contact with an infected person. Five hundred ninety-three (81.9%) showed that the ideal time for handwashing is 1–2 min and that all persons should

wear a mask whether infected or not. Five hundred fifty-two (76.2%) mentioned that disease prevention is through social and self-distance, 592 (81.8%) through isolation, 575 (97.4%) by using sterilizer, 566 (78.2%) by washing hands with soap, and 588 (81.2%) by avoiding crowded places.

**Participants' attitudes (A) toward coronavirus disease-2019**

Table 4 contains questions to assess participants' attitudes toward COVID-19. Most of the respondents (419, 54.9%) believed that the Palestinian government was not responding effectively to the corona epidemic, 288 participants (39.8%) were dissatisfied with that, and 182 (25.1%) agreed that effective treatment or vaccination against the disease could be available, and it also included measures. The majority of the participants' (n = 552, 76.2%) mentioned the preventive from the disease includes wearing masks for all persons (infected and non-infected). Most of the participants (n = 575, 79.4%) also mentioned it is possible to limit the spread of COVID-19 by keeping social distance/avoiding crowds and crowded places. In this regard, the crowded places mentioned by the respondents which should be avoided during corona disease to be protected/prevent the disease was as the following: parties and weddings (n = 627, 86.6%), places of mourning (n = 547, 75.6%), and hospitals (n = 463, 64%) as shown in Table 4. While 546 of the participants (75.4%) mentioned by avoid shaking hands/kissing

the face, the society can limit the spread of the corona disease. Five hundred forty-five (75.3%) of the respondents followed up, respected, and adhered to the health recommendations of the country, whereas 622 (85.9%) agreed on the necessity of self-isolation in case of contact with an infected person. When the participants were asked how they feel about the corona pandemic and the current situation, their answers were as the following: 431 of the respondents (59.5%) are feeling boredom, 206 (28.5%) feels fear and tension, 195 (26.9%) they do not care/lack of interest, and 77 (10.6%) feel optimistic. The media/social media coverage of the corona epidemic makes some respondents feel more anxious. Two hundred sixty-four (36.5%) of respondents said that there are more lies than the truth in the media/social media, whereas 121 (16.7%) said that they are very satisfied, as the media provides them with all the updates. To adapt to the current situation, it was reported that the majority of respondents (441, 60.9%) were spending time with family with 333 (46%) watching TV and movies, 306 (42.3%) working from home, and 217 (30%) reading books and magazines. Table 4 shows also prevalence, the risk factors for developing, transmitting the disease, opinion about the vaccine (no vaccines were available during collecting the data), and treatment of corona disease.

#### **Participants' practices toward coronavirus disease-2019 (P)**

Table 5 includes four questions to assess practices for preventing COVID-19. The first question was about the extent of the participant's compliance with the compulsory government measures it imposed, in which 333 (46%) of participants adhered to most measures, 131 (18.1%) adhered to all measures, and 44 (6.1%) did not comply to the procedures. The second question was about the type of muzzle they wear when they leave the house, 494 of the participants (68.2%) answered that they wear a medical mask, while 138 (19.1%) wear a household cloth mask, and 79 (10.9%) they do not wear any type of muzzles. The third question was about who is responsible for the outbreak of corona disease in Palestine, as 456 of the respondents (63%) answered that the citizens are mainly to blame for the outbreak of COVID-19; because most of them do not adhere to or follow the government's order or the compulsory measures taken in combating corona disease. While 341 (47.1%) and 175 (24.2%) of the participants mentioned that the community and the Israeli occupation respectively were responsible for the outbreak of the corona case in Palestine [Table 5]. The fourth question was about avoiding cultural behaviors such as shaking hands, 424 of the participants (58.6%) answered that they avoid shaking hands and 231 of them (31.9%) avoid shaking hands sometimes.

#### **DISCUSSION**

This study is the first epidemiological survey that aimed to assess the KAP of individuals in Palestine regarding

COVID-19. Citizens' commitment to the preventive measures imposed by the Palestinian government toward COVID-19 depends on the level of knowledge and awareness about this epidemic. The level of knowledge and awareness of citizens about COVID-19 plays an important role in adhering to the preventive measures imposed by the Palestinian government to limit the spread of the disease. This poll was dominated by women 558 (77.1%), bachelors 372 (51.4%), people aged 20–35 years 471 (65.1%), and holders of a Bachelor's degree 480 (66.3%). Through the survey results of the questionnaire, it was found that the level of knowledge is good about COVID-19 among the studied sample in this survey. Our results were similar to a previous study regarding the KAP toward COVID-19 in China, [33] which also showed an overall correct rate of 90% knowledge among the Chinese; however, a lower knowledge regarding the transmission routes and groups at higher risk was achieved among the general population of Palestine. The high correct answer rate regarding knowledge about COVID-19 among the Palestinian population may be due to high exposure to the information provided by the government and media about the virus since the start of the outbreak. Another reason could be the fact that 66.3% of the participants held an academic degree and responded actively to the severe condition of the pandemic and the overwhelming news reports, by collecting information from reliable sources. This is supported by the considerably positive correlation between the level of education and knowledge regarding COVID-19 and is similar to the results of other studies in this regard [33].

Our study showed that the majority of participants obtained their information from social media and the Internet. Also, there was a significant correlation between having higher knowledge of the disease and health-care workers whose source of information was social media as well as scientific articles and journals. In this regard, health-care-related professionals should carefully evaluate COVID-19-related information and use scientific and authentic materials as their source of information. The levels of knowledge and practices we found were significantly higher in women and in those who were ever married, who were older, those with higher education levels, those working in the health-care sector or related areas, and those who were worried about getting COVID-19.

The percentage of respondents whose answer was correct about the cause of the disease was a virus (625, 86.3%), and the main symptoms of the virus were fever (664, 91.7%) and shortness of breath (641, 88.5%). It was found that most of the participants in this study know the incubation period of the virus which is 1–14 days "the period from the infection of the disease until the appearance of the symptoms" as 503 of

the respondent (69.5%) mentioned that. While the majority of the participants ( $n = 553$ , 76.4%) know that direct contact with the infected person with the virus contributes to the spread of infection to the disease and that self-isolation ( $n = 592$ , 81.8%), and avoiding crowded places contributes to reducing the disease prevalence ( $n = 588$ , 81.2%). Most of the respondents ( $n = 333$ , 46%) were reported to comply with the majority of government directives and wear a mask ( $n = 494$ , 68.2%), avoiding cultural behavior such as shaking hands ( $n = 424$ , 58.6%). This knowledge by the participants was reflected positively in the benefit of the awareness campaigns carried out by the Palestinian government on prevention and curbing the spread of COVID-19 through television and social media. However, there is a significant percentage who did not respond to government orders ( $n = 44$ , 6.1%) and did not wear masks when leaving the house ( $n = 79$ , 10.9%). If we compare the practices of residents of Palestine toward COVID-19 in wearing masks with other studies in different countries such as Bangladesh, Malaysia, and Nepal [34-36]. In Bangladesh, the percentage of those who do not wear face masks is 24.45%, which is a higher percentage than the percentage of Palestinians (10.9%) [34]. while in Malaysia, a low percentage (48.8%) of people wear face masks [35], whereas in Nepal a high percentage (88.2%) of people wear face masks [36]. Thus, Palestinians are better than Malaysian and Bengali people in wearing face masks during COVID-19, but not better than Nepalese in this issue. The high percentage of adhering to government orders and wearing a face mask when leaving the house indicates good knowledge and awareness of citizens about preventing SARS-CoV-2 infection and limiting its spread. However, good knowledge and awareness of Palestinians toward COVID-19 should not prevent the proliferation of educational programs and awareness campaigns by the Palestinian government, and it is advisable to use social media and TV channels to avoid infection and to increase knowledge and awareness of the disease; since they are the primary sources for the information about corona disease and its symptoms. Another parameter we looked at regarding knowledge and practices toward COVID-19 was the attitude parameter of how worried our participants were about getting infected. Indeed, we found that being worried about the possibility of being infected with the COVID-19 causing virus does significantly associate with higher knowledge. Our participants had a positive overall attitude toward COVID-19, particularly, the isolation of the COVID-19 cases, optimism about finding a treatment, and developing a vaccine. This is similar to the attitude of participants in relevant studies [33,35]. However, our sample showed concern about catching the disease and did not seem to have trust in the measures taken by the Palestinian government to manage the COVID-19 epidemic. Our findings indicate that the educational background and occupation (the different health-care fields)

are correlated positively with knowledge and practices. Men typically showed less knowledge and attitudes as well as less cautionary practices as compared with women. This issue might be that most of the men in this survey may have been obliged to go to work and not adhere to the lockdown/social distancing as many families in Palestine rely mainly on men for income. Our sample participants show good practices as the majority avoided cultural behaviors (such as shaking hands), wear masks/muzzles, and comply with and adhere to most of the procedures which the Palestinian government has taken to reduce the spread of the disease. On the contrary, it was found that On the contrary, it was found that people with health complications and serious concerns about getting COVID-19 did not have better knowledge and attitude.

## CONCLUSION

In short, this study was able to provide a comprehensive examination of the KAP of Palestinians toward COVID-19. The results indicate that Palestinians have a good level of knowledge about COVID-19 with a positive attitude and good compliance with Palestinian government measures. Knowledge and awareness of the mode of disease transmission, basic hygiene principles, and measures in public health crises are vitally important for developing effective control measures. This can help in controlling the spread of COVID-19 if individuals were forced to adhere to social distancing and appropriate preventative practices. There was no clear satisfaction with the government's role in limiting and controlling the spread of COVID-19. The two governments must intensify their efforts in spreading knowledge and awareness, and establishing educational programs, and broadcasting them through social media and television, as there was a noticeable role for social media in contributing to obtaining information about COVID-19.

## Limitations

One of the obstacles of the study is the distributing the questionnaire online and through social media, as there is a possibility that the questionnaire will not reach all people due to the lack of internet access/people having no internet access or otherwise, thus many people unable to participate in the study. The largest percentage of those who filled out the questionnaire are young and the percentage of elderly is small. This may be due to the inability to reach the questionnaire through the Internet, so it is best to develop technology that helps them.

## Ethical policy and institutional review board statement

The study was approved by the Palestinian MOH. The identities of participants remained unknown and confidential; the data were only used for research purposes.



## Conflicts of interest

There are no conflicts of interest.

## Authors' contribution

HAH is the supervisor, developed the mythology, and wrote the article. IN carried out the analysis part and wrote the analysis section. MW and WM carried out the research and collected the results.

## REFERENCES

- Erfani A, Shahriarirad R, Ranjbar K, Mirahmadizadeh A, Moghadami M. Knowledge, attitude and practice toward the novel coronavirus (COVID-19) outbreak: A population-based survey in Iran. *Bull World Health Organ* 2020;98:150.
- Ouassou H, Kharchoufa L, Bouhrim M, Daoudi NE, Imtara H, Bencheikh N, et al. The pathogenesis of coronavirus disease 2019 (COVID-19): Evaluation and prevention. *J Immunol Res* 2020;2020:1357983.
- Mittal A, Manjunath K, Ranjan RK, Kaushik S, Kumar S, Verma V. COVID-19 pandemic: Insights into structure, function, and hACE2 receptor recognition by SARS-CoV-2. *PLoS Pathog* 2020;16:e1008762.
- McIntosh K. Coronaviruses: A comparative review. *Curr Top Microbiol Immunol/Ergebnisse der Mikrobiologie und Immunitätsforschung* 1974;63:85-129.
- Masters PS. The molecular biology of coronaviruses. *Adv Virus Res* 2006;66:193-292.
- Su S, Wong G, Shi W, Liu J, Lai ACK, Zhou J, et al. Epidemiology, genetic recombination, and pathogenesis of coronaviruses. *Trends Microbiol* 2016;24:490-502.
- Corman VM, Muth D, Niemeyer D, Drosten C. Hosts and sources of endemic human coronaviruses. *Adv Virus Res* 2018;100:163-88.
- Mesel-Lemoine M, Millet J, Vidalain PO, Law H, Vabret A, Lorin V, et al. A human coronavirus responsible for the common cold massively kills dendritic cells but not monocytes. *J Virol* 2012;86:7577-87.
- Kahn JS, McIntosh K. History and recent advances in coronavirus discovery. *Pediatr Infect Dis J* 2005;24:S223-7, discussion S226.
- Peeri NC, Shrestha N, Rahman MS, Zaki R, Tan Z, Bibi S, et al. The SARS, MERS and novel coronavirus (COVID-19) epidemics, the newest and biggest global health threats: What lessons have we learned? *Int J Epidemiol* 2020;49:717-26.
- Hussain A, Kaler J, Tabrez E, Tabrez S, Tabrez SSM. Novel COVID-19: A comprehensive review of transmission, manifestation, and pathogenesis. *Cureus* 2020;12:e8184.
- Fehr AR, Perlman S. Coronaviruses: An overview of their replication and pathogenesis. *Methods Mol Biol* 2015;1282:1-23.
- Sola I, Almazán F, Zúñiga S, Enjuanes L. Continuous and discontinuous RNA synthesis in coronaviruses. *Annu Rev Virol* 2015;2:265-88.
- Gralinski LE, Menachery VD. Return of the coronavirus: 2019-nCoV. *Viruses* 2020;12:135.
- Singhal T. A review of coronavirus disease-2019 (COVID-19). *Indian J Pediatr* 2020;87:281-6.
- Aluga MA. Coronavirus disease 2019 (COVID-19) in Kenya: Preparedness, response and transmissibility. *J Microbiol Immunol Infect* 2020;53:671-3.
- Harapan H, Itoh N, Yufika A, Winardi W, Keam S, Te H, et al. Coronavirus disease 2019 (COVID-19): A literature review. *J Infect Public Health* 2020;13:667-73.
- van Doremalen N, Bushmaker T, Morris DH, Holbrook MG, Gamble A, Williamson BN, et al. Aerosol and surface stability of SARS-cov-2 as compared with SARS-cov-1. *N Engl J Med* 2020;382:1564-7.
- Wang D, Hu B, Hu C, Zhu F, Liu X, Zhang J, et al. Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus-infected pneumonia in Wuhan, China. *JAMA* 2020;323:1061-9.
- Mo P, Xing Y, Xiao Y, Deng L, Zhao Q, Wang H, et al. Clinical characteristics of refractory coronavirus disease 2019 in Wuhan, China. *Clin Infect Dis* 2021;73:e4208-13.
- Pan L, Mu M, Yang P, Sun Y, Wang R, Yan J, et al. Clinical characteristics of COVID-19 patients with digestive symptoms in Hubei, China: A descriptive, cross-sectional, multicenter study. *Am J Gastroenterol* 2020;115:766-73.
- Zhou F, Yu T, Du R, Fan G, Liu Y, Liu Z, et al. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: A retrospective cohort study. *Lancet* 2020;395:1054-62.
- Long B, Brady WJ, Koyfman A, Gottlieb M. Cardiovascular complications in COVID-19. *Am J Emerg Med* 2020;38:1504-7.
- Murthy S, Gomersall CD, Fowler RA. Care for critically ill patients with COVID-19. *JAMA* 2020;323:1499-500.
- Wang X, Zhong M, Liu Y, Ma P, Dang L, Meng Q, et al. Rapid and sensitive detection of COVID-19 using CRISPR/cas12a-based detection with naked eye readout, CRISPR/cas12a-NER. *Sci Bull (Beijing)* 2020;65:1436-9.
- Suleyman G, Fadel RA, Malette KM, Hammond C, Abdulla H, Entz A, et al. Clinical characteristics and morbidity associated with coronavirus disease 2019 in a series of patients in metropolitan Detroit. *JAMA Netw Open* 2020;3:e2012270.
- Mathuria JP, Yadav R. Laboratory diagnosis of SARS-CoV-2: A review of current methods. *J Infect Public Health* 2020;13:901-5.
- Jackson LA, Anderson EJ, Roupael NG, Roberts PC, Makhene M, Coler RN, et al. An mRNA vaccine against SARS-CoV-2—preliminary report. *N Engl J Med* 2020;383:1920-31.
- U.S. Food and Drug Administration. FDA Cautions against Use of Hydroxychloroquine or Chloroquine for COVID-19 Outside of the Hospital Setting or a Clinical Trial due to Risk of Heart Rhythm Problems. Available from: <https://www.fda.gov/drugs/drug-safety-and-availability/fda-cautions-against-use-hydroxychloroquine-or-chloroquine-covid-19-outside-hospital-setting-or>. [Last accessed on 2021 May 15].
- Mahase E. COVID-19: WHO halts hydroxychloroquine trial to review links with increased mortality risk. *BMJ* 2020;369:m2126.
- AlKhaldi M, Kaloti R, Shella D, Al Basuoni A, Meghari H. Health system's response to the COVID-19 pandemic in conflict settings: Policy reflections from Palestine. *Glob Public Health* 2020;15:1244-56.
- Hejaz HA. Palestinian strategies, guidelines, and challenges in the treatment and management of coronavirus disease-2019 (COVID-19). *Avicenna J Med* 2020;10:135-62.
- Zhong BL, Luo W, Li HM, Zhang QQ, Liu XG, Li WT, 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;16:1745-52.
- Haque T, Hossain KM, Bhuiyan MMR, Ananna SA, Chowdhury SH, et al. Knowledge, attitude and practices (KAP) towards COVID-19 and assessment of risks of infection by SARS-CoV-2 among the Bangladeshi population: An online cross-sectional survey. *Res Square* 2020;1-16. doi:10.21203/rs.3.rs-24562/v2.
- Azlan AA, Hamzah MR, Sern TJ, Ayub SH, Mohamad E. Public knowledge, attitudes and practices towards COVID-19: A cross-sectional study in Malaysia. *PLoS One* 2020;15:e0233668.
- Hussain A, Garima T, Singh BM, Ram R, Tripti RP. Knowledge, attitudes, and practices towards COVID-19 among Nepalese Residents: A quick online cross-sectional survey. *Asian J Med Sci* 2020;11:6-11.