## Original Research Article

# Knowledge and practice in Jordan regarding the outbreak and prevention of COVID-19: a questionnaire-based study

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## *Abstract*

*Purpose: To investigate public awareness and source of information regarding the management of the 2019 Coronavirus (COVID-19) pandemic among Jordanians.*

*Methods: A descriptive cross-sectional online survey was conducted in Jordan during the COVID-19 outbreak from March 25th to April 29th, 2020. A validated online questionnaire addressing participants' current awareness about COVID-19 pandemics, source of information, and perspectives of their role. Data were analyzed using Statistical Package for Social Science (SPSS) software. Descriptive analysis data were reported as mean and standard deviations for continuous variables and percentages were used for qualitative variables. P-values ≤ 0.05 were considered significant.*

*Results: This study involved 409 participants that had a mean age of 26.2 ± 8.7 years and 76.3 % were females. Nearly 67.7 % of the participants obtained their information about COVID-19 from social media, and 16.6 % from governmental agencies. Furthermore, 70.7 % of participants believed that wearing a medical face mask is not necessary to protect against COVID-19, about 95.6 % of the participants agreed to take COVID-19 detection tests when they suffer from symptoms related to COVID-19 infection, and 98.8 % agreed to visit the hospital if they have the infection.*

*Conclusion: This survey has shown the importance of public awareness in the prevention and control of pandemic diseases. Most Jordanian participants have good knowledge of COVID-19 as a deadly disease that spreads rapidly among the population in a community. Furthermore, the people have awareness of drugs that enhance the immune system. This public awareness made Jordan one of the countries with reduced number of weekly recorded cases of COVID-19 at the beginning of the pandemic.*

*Keywords: Public awareness, COVID-19, Social media, Lockdown, Outbreak, Jordan*

## INTRODUCTION

In December 2019, pneumonia associated with the *Coronavirus* disease 2019 (COVID-19) appeared in Wuhan, China, and caused mild to moderate illness for most infected people [1]. In 2020, the researchers isolated a novel COVID-19 virus from infected patients [2], and the WHO formally recognized COVID-19 as a pandemic virus [3]. The COVID-19 pandemic became a

worldwide challenge affecting individuals of all socioeconomic groups, races, nations, and continents [4].

In Jordan, the WHO official records in November 6th, 2020 reported 101,248 infected people and 1,136 death cases. This gives an average of 9,926 cumulative cases per one million and around 111 cumulative deaths per one million, indicating a high mortality rate since the beginning of the pandemic. These numbers further showed community transmission of *Coronavirus* among Jordanian people. However, around 1786 infected cases needed treatment in hospitals that had exceeded the bed capacity of hospitals offering treatments for new patients. This leads the government to lockdown schools, universities, mosques, gems, and cafes in Jordan until January 8th, 2021.

COVID-19 is a single-stranded RNA and belongs to the *Coronaviridae* family, and *Beta Coronavirus* genus [5]. COVID-19 has been reported as a communicable virus. The pathogenicity of the virus has been linked to the envelope spike protein which promotes viral assembly and release [6]. The symptoms of COVID-19 include fever, dry cough, fatigue, pneumonia [7], difficulty in breathing, chest pain, difficulty in talking, and moving, lymphopenia, gastrointestinal symptoms, and asymptomatic infection [5,8,9]. The elderly and patients with pre-existing medical conditions, including diabetes, hypertension, cancer, heart, lung, liver, and renal diseases, have been noticed to have a higher potential risk for severe disease and mortality [7-10]. SARS-CoV-2 can spread through body fluid droplets from the mouth or nose, during coughs, sneezes, and talks [11-13].

Current treatment guidelines from Center for Disease Control and Prevention (CDC) as well as WHO majorly focus on symptomatic management and application of infection prevention measures [14-18]. Furthermore, there are global concerns about the attitudes and behaviors exhibited by the lay public toward people suspected or confirmed to have COVID-19.

This study aimed to investigate public awareness of participants' regarding the current COVID-19 virus pandemic and the source of their information during lockdown which was considered very important for the protection, treatment, and management of COVID-19 infection.

# METHODS

## Study design and participants

This study was conducted in Jordan during the COVID-19 lockdown (from March 25th, 2020 to April 29th, 2020). The study objectives were addressed in a descriptive cross-sectional online survey.

Eligible participants for the study were drawn randomly from the general public, academic institutions, and pharmacy students. Participation in the study posed no risk to the participants and was voluntary. The study received institutional administrative approval and followed internal guidelines for human studies. Participants who completed the survey were considered to have given informed consent for participation in the study.

At the time of the survey, due to the prevailing lockdown conditions, to obtain a representative sample, due consideration was given to the characteristics such as geographic region and type of work setup. During data analysis, additional factors such as age, gender, educational level, and working experience were considered [13].

## Sample size

The minimum representative sample size of 385 was determined using the Raosoft online sample size calculator [18], with a 5 % margin of error, a 99 % confidence interval, and a 50 % response distribution. Based on this calculation, 409 samples were used in this study.

## Survey development

The questionnaire was administered in Arabic. Several sources were used to generate a pool of questions considered to be relevant to the study objectives. The questions were prepared and then reviewed by the research team in order to combine concepts and to remove duplicates if any.

The questionnaire of this study was based on a broad literature search using a variety of databases including Research Gate, PubMed, and Google Scholar. Thus, relevant literature related to the public practice of participants was identified. The questions included in the questionnaire were prepared based on reviewed literature with some modifications [20]. The contents as well as face validity were carried out. First, a group of experts provided feedback on the items of the survey, then it was modified as

per their comments [21]. Next, the modified draft of the survey went through pilot testing on 20 participants to provide feedback about the clarity and comprehensibility of the items in the survey. The final version of the questionnaire comprised four main sections with a total number of 49 questions that addressed the aim of the study. The questionnaire included the following aspects: The first section included items to collect socio-demographic data such as sex, age, educational level, occupation, and health-related problems. The second section included items aimed at assessing the knowledge and awareness of participants about COVID-19. The potential participants were asked how much they knew about COVID-19, including, symptoms, modes of transmission, how to prevent transmission, the spread of virus, and awareness on source of information and the latest *Coronavirus* updates regarding methods of treatment. The third section asked about how much they knew about the effects of food and drugs on the immune system and protection against viral infections. While the final section asked about the government's decisions activated from March 15th 2020 regarding curfews and other decisions to protect the citizens in Jordan, and the role of Jordanian health authorities in the management of COVID-19 pandemic, and sufficiency of necessary awareness campaigns in the country [10].

For each of these sections, there were several detailed items, e.g., participants were questioned about the modes of *Coronavirus* transmission, such as if the virus can be transmitted with respiratory droplets from person to person through close contacts and after touching surfaces that were contaminated by the virus. Other questions investigated participants' awareness regarding high-risk patients in addition to the symptoms that are associated with *Coronaviruses* such as fever, dry cough, and shortness of breath, muscle aches, and gastrointestinal symptoms. Also, *Coronavirus* treatment was questioned, such as if the combination of hydroxychloroquine and azithromycin have been used as a preventive therapy against COVID-19 infection, or if there is an agreement to use these antibiotics to treat COVID-19 infection [17].

Other questions asked about practices of participants to protect against *Coronavirus* infection such as using salt gargles, drinking of warm water, taking immune boosting medications such as Zn supplements, vitamin C, vitamin D, and medicinal herbs such as the role of garlic, ginger, citrus fruits, bananas, almonds, and walnuts were also questioned. The

questionnaire was formatted into Google forms; an internet-based software, commonly used for data collection via a personalized survey [10].

**Survey implementation**

Study participants were recruited through social media (Facebook, WhatsApp and Email). Those interested in participating can open a link to view the Ethics Committee approved information about the study initially and then proceed to the questionnaire. To minimize missing data, the participants were invited to fill all the items in the online questionnaire, and at the end of the questionnaire, participants were directed to click the submit option and finally the online questionnaire was sent to the drive. Afterwards, the correct answers to the awareness part of the survey were provided to the participants (shown in the information section) to enhance their awareness about the prevention of *Coronavirus*, symptoms and suggested treatments.

**Statistical analysis**

Data retrieved from the online survey were entered into Microsoft Excel and then imported into the Statistical Package for Social Sciences (SPSS) version 22 (SPSS Inc, Chicago, IL, USA). The descriptive analysis was undertaken using mean and standard deviations (SD) for continuous variables and then, percentages for qualitative variables. Checking for data normality was carried out using the Shapiro-Wilk test with *p*-value less than 0.05 indicating normally distributed continuous variables. The differences between the various groups were evaluated using Chi-square test and Fisher exact test for categorical variables. *P*- 0.05 was considered significant.

# RESULTS

Knowledge, attitude, and practices during the COVID-19 pandemic were reported by 409 participants. The questionnaire was collated, and responses were analyzed to evaluate demographic data. The sample size for the study was reached (n = 409) which exceeded the Raosoft online sample (n ≥ 385), with a mean age of 26.2 years (Table 1). The gender of the participants was 76.3 % females, while 68.9 % of participants were not married/single. Furthermore, the majority of the married participants (males and females) had at least three dependents or more (39.4 %), 46.6 % of the participants lived in Amman, the capital of Jordan, 45.5 % of participants had a bachelor's degree, and 35.9 % with a middle diploma degree at Al-Balqa Applied University (Table 1).

**Table 1:** Socio-demographic details of participants who responded to the questionnaire, (N = 409*)

| Parameter | N (%) |
|---|---|
| *Age (years:* 26.2 ± 8.7 *)* | 409 (100) |
| *Gender* | |
| Female | 312 (76.3) |
| Male | 97 (23.7) |
| *Education level* | |
| High school or less | 37 (9.0) |
| Middle Diploma | 147 (35.9) |
| Bachelor | 186 (45.5) |
| Higher education | 39 (9.5) |
| *Residence* | |
| Capital City | 190 (46.5) |
| Middle area | 141 (34.5) |
| North area | 55 (13.5) |
| South area | 23 (5.6) |
| *Marital status* | |
| Single | 282 (68.9) |
| Married | 120 (29.3) |
| Divorced | 7 (1.7) |
| *Number of dependents* | |
| 1 | 29 (22.8) |
| 2 | 29 (22.8) |
| ≥ 3 | 50 (39.4) |
| Yes | 72 (17.6) |
| No | 337 (82.4) |
| *What is your field of work?* | |
| University student | 183 (44.7) |
| Governmental sector | 97 (23.7) |
| Private sector | 55 (13.4) |
| I do not work | 74 (18.1) |

*Some data was missing, subsequently totals do not always add to 409

Concerning occupation, 44.7 % of participants were university students, and 37.1 % of participants worked in the government and private sectors. Furthermore, majority (82.4 %) of participants did not live with elderly people, grandparents, uncles, or relatives.

Regarding the sources of information about COVID-19 treatment, the study indicated that most participants obtain their information mostly from the general social media, followed by Jordanian Ministry of Health official reports, family and friends, and published research papers and seminars (Figure 1).

Regarding the perception, believes, attitudes, and practices of participants during the COVID-19 pandemic, about 83.9 % of participants believed that COVID-19 appeared at the end of the year 2019 in the fish market and then spread to the rest of the world, 47.2 % were considered the bat the main source of the virus, 81.4 % thought the dry cough, dry through, and fever specific symptoms of COVID-19 infection, 44.5 % agreed the virus could stay on surface between 7

- 12 h, while 37.2 % of agreed that the immunocompromised patients were likely to die due to complication of COVID-19 infection (Table 2).
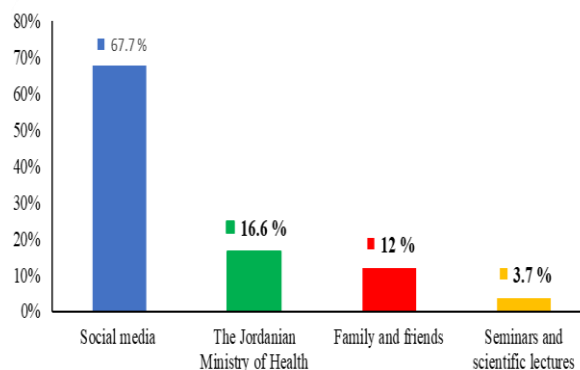


**Figure 1:** Sources of information about COVID-19 among the studied participants (n = 409)

The present study shows the extent to which Jordanian society adheres to government decisions during a period of COVID-19 spreading, for example: 96.8 % of participants abided by the curfew laws, and also 94.9 % accepted the government decision to impose home quarantine, 97.8 % of them were support decision to quarantine all arrivals to Jordan through airports, land, and sea crossings. Furthermore, 81.9 % of people think that the government had succeeded in the current period in controlling the spread of this virus and has taken the right decisions (Table 3).

With regard to the mode of transmission, most of the participants (97.8 %) agree that COVID-19 viruses can be transmitted from an infected person who does not show any symptoms, and about 93.6 % of the participants believed that droplets containing viruses transmit *Coronaviruses* and cause infections. Nearly, 70.7 % of the participants didn't agree that COVID-19 was transmitted while shopping in large malls and not in small stores, 63.8 % of the participants believed that *Coronaviruses* can be transmitted through plastic bags used in shopping, and 70.2 % think that packaging, receiving and distribution of packaged materials (food, drug, hygiene, and clothes) increased the risk of COVID-19 transmission. About 56 % of the participants believed that contaminated packages might transmit COVID-19 viruses and 98.8 % agreed they should visit the hospital if they get infected. Around 95.6 % of participants agreed they would take a test if they have *Coronavirus* symptoms (Table 4).

**Table 2:** Perception, beliefs, attitudes and practices of participants regarding COVID-19 pandemic, (N = 409*)

| Item | Response | Frequency (%) |
|---|---|---|
| The new *Coronavirus* appeared at the end of the year 2019 in the fish market and then spread to the rest of the world. | True | 83.9 |
| | False | 10.3 |
| | Don't know | 5.9 |
| What do you think is the source of the virus? | Bat | 47.2 |
| | Genetically modified virus | 29.3 |
| | Human and Bat | 6.4 |
| | Other | 17.1 |
| What are the symptoms of infection with the virus? | Dry cough, dry throat, and fever | 81.4 |
| | Other | 18.6 |
| How long the time COVID-19 virus lived on the surfaces? | 5-6 hours | 28.4 |
| | 7-12 hours | 44.5 |
| | 48 hours | 12.2 |
| | 96 hours or more | 14.9 |
| Which groups most likely to develop complications as a result of infection with the emerging corona virus? | Elderly | 30.1 |
| | Immunocompromised | 40.6 |
| | Respiratory diseases | 26.9 |
| | Other | 2.4 |
| The groups most likely to die of complications as a result of infection with the emerging corona virus? | Elderly | 34.7 |
| | Immunocompromised | 37.2 |
| | Respiratory diseases | 24.2 |
| | Other | 3.9 |
| Have you had contact with someone coming from countries where the virus is spreading? | Yes | 3.4 |
| | No | 95.6 |
| | Not sure | 0.7 |
| Have you recently traveled to countries where the virus is spreading? | Yes | 2.9 |
| | No | 96.8 |
| If you show symptoms similar to COVID-19, or contact with a person coming from an infected area, will you inform the concerned authorities and conduct the necessary tests? | Yes | 95.6 |
| | No | 2.9 |
| | Not sure | 1.5 |
| If the result of your examination is positive, and he is infected with *Coronavirus*, will you adhere to the quarantine to protect yourself and your community? | Yes | 98.8 |
| | No | 1.0 |
| | Not sure | 0.2 |
| Do you think that *Coronavirus* COVID-19 is a factory virus with political and economic goals of biological warfare? | Yes | 42.8 |
| | No | 20.0 |
| | Not sure | 37.2 |

*Some data was missing, subsequently totals do not always add to 409

About 24.7 and 21.3 % of participants said they would drink medicinal herbs and ginger and eat garlic as an effective method to prevent *Coronavirus* infection, respectively. Further, 68 % of participants agreed that should take immune boosting medications and vitamins which help to prevent infections, 48.2 and 43.3 % of participants stated that continuous use of salt gargles help to prevent infections and drinking warm water on an empty stomach every half-hour can helps in reducing of virus infections, respectively. About 79.7 % of the participants believed that eating oranges, citrus fruits, and leafy vegetables helps to protect against the *Coronavirus*, and around 35.2 % of them take vitamin C supplements (1000 mg), 46.5 and 40.1 % agreed to eat bananas and nuts such as almonds to improve immunity against *Coronaviruses*. Meanwhile, 40.3 % of them did not agree to use sesame and olive oil to protect them from lung infections (Table 5).

Concerning participants' practices to prevent COVID-19 infection, 91.7 % of participants agreed that paper money might increase the spreading of *Coronaviruses*, 72.9 % they accepted to wearing medical gloves and protective masks outdoors, and 89.2 % favored ventilating and sterilizing the house daily. About 82.2 % of the participants washed clothes that were used outdoors and in markets, at a temperature higher than 45 °C with strong cleaning and sterilization materials because the virus can stick to the clothes and stays on them for a long time, 74.8 % of participants sterilized

**Table 2:** Perception, beliefs, attitudes and practices of participants regarding COVID-19 pandemic (N = 409*; *contd.*)

| Item | Response | Frequency (%) |
|---|---|---|
| Do you think that the COVID-19 will end at the beginning of the summer with the rise in temperature? | Yes | 31.3 |
| | No | 19.6 |
| | Not sure | 49.1 |
| With the increasing number of people infected with COVID-19 in Jordan, do you support the government's decision to quarantine all arrivals to Jordan through airports, land and sea crossings? | Yes | 97.8 |
| | No | 1.2 |
| | Not sure | 1.0 |
| If you are a resident of Jordan, did you abide by the curfew laws? | Yes | 96.8 |
| | No | 0.7 |
| | Not sure | 2.4 |
| Do you support the adopted state decisions and imposing home quarantine? | Yes | 94.9 |
| | No | 1.5 |
| | Not sure | 3.7 |
| I mixed with my friends and family during the home quarantine and made many visits? | Yes | 4.2 |
| | No | 91.4 |
| | Not sure | 4.4 |
| Do you follow the COVID-19 news and daily report that is broadcast by various media about the number of infected people and the rate of recovery? | Yes | 93.4 |
| | No | 4.2 |
| | Not care | 2.4 |
| Did the Ministry of Health publications and the various media help educate the Jordanian society and prevent it from contracting the *Coronavirus*, from your point of view? | Yes | 81.4 |
| | No | 4.4 |
| | Not sure | 14.1 |
| Do you think that the government exaggerated the decisions that were taken to protect society from the spread of the COVID-19 virus? | Yes | 4.4 |
| | No | 91.4 |
| | Not sure | 4.2 |
| Do you think that the government has succeeded in the current period in controlling the spread of this virus and has taken the right decisions? | Yes | 81.9 |
| | No | 3.4 |
| | Not sure | 14.7 |
| Do you think that the government may have to impose more aggressive decisions to preserve the health situation in Jordan? | Yes | 75.6 |
| | No | 7.6 |
| | Not sure | 16.8 |
| Is Jordanian society aware enough to confront the COVID-19 epidemic? | Yes | 28.9 |
| | No | 40.1 |
| | Not sure | 31.0 |

*Some data was missing, subsequently totals do not always add to 409

car handles and door handles with alcohol before use it (Table 6).

Surprisingly, about 70.7 % of participants believed that wearing medical masks did not necessarily protect against *Coronavirus*, around 48.4 % of participants believed that there are antibiotics approved for use in treating COVID-19, and 46 % of participants supported the use of paracetamol only as an antipyretic to remove the symptoms of COVID-19.

Regarding attitudes and practices of participants about using medications in the prevention and treatment of COVID-19, 19.3 % of the participants agreed that there were antibiotics approved for use in the treatment of COVID-19; 48.2 % of the participants accepted the use of "hydroxychloroquine" and azithromycin for the treatment of *Coronavirus* infection, 22.6 % of the

participants were accepted using "hydroxy-chloroquine" only in the treatment of COVID-19 (Table 7).

The most useful practice resulting in this study is the awareness of Jordanian people of immunity and drugs that boost the immune system. The data showed that 79.7 % of people had taken immune-raising medications and vitamins to improve immunity and prevent infection by COVID-19 viruses. Interestingly, the participant with a bachelor's degree believe more than others in immunity-boosting drugs and special vitamins in preventing the virus ($p < 0.01$); moreover, 68 % of them eat oranges, citrus fruits, and leafy vegetables to help to protect against *Coronavirus* by improving the level of immunity for the reason that they contain high levels of vitamin C (Table 7).

**Table 3:** Perception, beliefs, attitudes, and practices of participants regarding COVID-19 pandemic transmission, (N = 409*).

| Item | Response | Frequency (%) |
|---|---|---|
| What are the ways of transmitting the *Coronavirus* COVID-19? | Droplet | 93.6 |
| | air | 4.60 |
| | Don't know | 1.70 |
| Can you transmit the infection from an infected person who does not show symptoms? | True | 97.8 |
| | No | 1.50 |
| | Don't know | 0.70 |
| What is the safe distance that you use while mixing with people outside the home? | 1.0 meter | 36.2 |
| | 1.5 meter | 24.2 |
| | 2.0 meter | 36.9 |
| | Don't Know | 2.70 |
| Wearing of face masks can prevent spread of COVID-19. | Yes | 7.60 |
| | No | 70.7 |
| | Not sure | 21.8 |
| COVID-19 is transmitted during shopping in large malls and not in small stores. | Yes | 12.2 |
| | No | 64.5 |
| | Not sure | 23.2 |
| Plastic bags used in shopping can transmitted COVID-19. | Yes | 63.8 |
| | No | 2.7 |
| | Not sure | 33.5 |
| COVID-19 can transmitted by groceries and receiving packages and packages from distributors. | Yes | 70.2 |
| | No | 2.0 |
| | Not sure | 27.8 |
| The contents of the packages maybe contaminated before packing and putting in the parcels. | Yes | 56.0 |
| | No | 3.9 |
| | Not sure | 40.0 |

*Some data was missing, subsequently totals do not always add to 409.

**Table 4:** Perception, beliefs, attitudes, and practices of using herbals and specific food in COVID-19 prevention, (N = 409*)

| Item | Response | Frequency (%) |
|---|---|---|
| Medicinal herbs can prevent COVID-19 infection. | Yes | 24.7 |
| | No | 27.1 |
| | Not sure | 48.1 |
| Garlic and ginger can prevent COVID-19 infection. | Yes | 21.3 |
| | No | 36.2 |
| | Not sure | 42.6 |
| Immune-raising medications and special vitamins can help to prevent COVID-19 infections. | Yes | 68.0 |
| | No | 15.2 |
| | Not sure | 16.9 |
| Continuous use of salt gargle can help to prevent infection and kill COVID-19 virus. | Yes | 48.2 |
| | No | 27.1 |
| | Not sure | 24.7 |
| Drinking warm water on an empty stomach every half hour can help to reduce COVID-19 infection. | Yes | 43.3 |
| | No | 21.0 |
| | Not sure | 35.7 |
| Eating oranges, citrus fruits and leafy vegetables can help to protect against COVID-19 virus by raising the level of immunity. | Yes | 79.7 |
| | No | 4.60 |
| | Not sure | 15.7 |
| Do you use 1000 mg C vitamin medication? Will it help reduce virus infection? | Yes | 35.2 |
| | No | 30.1 |
| | Not sure | 34.7 |
| Drinking sesame oil "Serge" and olive oil can prevent COVID-19 virus and protect the throat and lungs. | Yes | 13.7 |
| | No | 40.3 |
| | Not sure | 46.0 |
| Eating unroasted nuts can help to raise immunity and protect against COVID-19. | Yes | 46.5 |
| | No | 11.7 |
| | Not sure | 41.8 |
| Eating bananas can help to raise immunity and protect against COVID-19. | Yes | 40.1 |
| | No | 14.7 |
| | Not sure | 42.2 |

*Some data was missing, subsequently totals do not always add to 409

**Table 5:** Daily participants practices in COVID-19 prevention, (N = 409*)

| Parameter | Answer | Frequency (%) |
|---|---|---|
| Did you use the medical mask while leaving the house? | Yes | 72.9 |
| | No | 27.1 |
| Washing clothes must be done at a temperature > 45 ̊C and using strong cleaning and sterilization materials because COVID-19 virus sticks to the clothes and stays on them for a long time | Yes | 82.2 |
| | No | 4.6 |
| | Not sure | 13.2 |
| Ventilate and sterilize the house daily can protect against COVID-19. | Yes | 89.2 |
| | No | 5.6 |
| | Not sure | 5.1 |
| Banknotes can spread the virus among people. | Yes | 91.7 |
| | No | 0.7 |
| | Not sure | 7.5 |
| Sanitization of car handle, the power button and door handle can help to prevent COVID-19. | Yes | 74.8 |
| | No | 19.6 |
| | Not sure | 5.4 |

*Some data was missing, subsequently totals do not always add to 409

**Table 6:** Perception, beliefs, attitudes and practices of participants regarding using medications in prevention and treatment of COVID-19, (N = 409)

| Item | Response | Frequency (%) |
|---|---|---|
| There are antibiotics approved for use in the treatment of *Coronavirus* COVID-19. | Yes | 19.3 |
| | No | 48.4 |
| | Not sure | 21.8 |
| | Don't know | 8.6 |
| Do you support the use of paracetamol antipyretics only in case of symptoms of COVID-19 and high fever, and not using other analgesics such as ibuprofen and others? | Yes | 46.0 |
| | No | 26.9 |
| | Not sure | 27.1 |
| The anti-malaria drug "hydroxychloroquine" and the antibiotic azithromycin are used in the treatment of COVID-19. | Yes | 48.2 |
| | No | 14.7 |
| | Not sure | 37.2 |
| The anti-malaria drug "hydroxychloroquine" can prevent COVID-19. | Yes | 22.5 |
| | No | 34.5 |
| | Not sure | 43.0 |

## DISCUSSION

This study assessed participants' knowledge, practice, and attitude among the Jordanian population towards *Coronavirus* COVID-19. Since the study sites were well distributed throughout Jordan, these findings are likely to be representative of Jordan's population. Most of the participants reported that the first COVID-19 infection was identified in Wuhan, the capital city of Hubei province in China. About half of the participants thought that bats were the source of COVID-19 viruses. One of the notable results of this study is that the majority of participants believed that "*Coronavirus* is a factory virus with political and economic goals of biological warfare". This indicates that there was no clear knowledge about the source of COVID-19 in the society, and further education is required that might help to better understand the source of COVID-19 and their mode of transition.

In this study, 93.6 % of respondents correctly recognized the transmission modes of COVID-19 that is indicative of good knowledge. This was in agreement with studies carried out by Zhong *et al* [21], Abdelhafiz *et al* [22], and Bhagavathula *et al* [24] which showed that 98.8, 95.9 and only 39 % of respondents correctly recognized the transmission modes of the novel *Coronavirus*. This study also showed that the majority of participants obtained knowledge about COVID-19 from social media. Similarly, a study done in India among medical and allied health science students found that the majority of students obtained knowledge about COVID-19 from social media 65.17 % [15], and also another study by Bhagavathula *et al* [24] revealed that the participants' main source of

**Table 7:** Association between participants' characteristics and their perceptions, beliefs, attitudes and practices towards COVID-19 pandemic, (N = 409*)

| Item | Gender | Marital status | Education level | Working |
|---|---|---|---|---|
| | | | *P*-value* | |
| Clothes used during gatherings must be washed at a temperature > 45 °C and using strong cleaning and sterilization materials because the virus sticks to the clothes and stays on them for a long time? | 0.035 | NS | 0.01 | NS |
| Do you ventilate and sterilize the house daily? | 0.004 | NS | NS | 0.002 |
| Did you use the medical mask while leaving the house? | NS | 0.018 | NS | 0.004 |
| Does drinking medicinal herbs help prevent infection with COVID-19? | NS | NS | 0.022 | NS |
| Do you follow the daily COVID-19 news and the report that is broadcast by various media on the number of infected people and the rate of recovery? | 0.008 | NS | NS | NS |
| Can taking immune-raising medications and special vitamins help prevent the COVID-19? | NS | NS | NS | 0.001 |
| Do you think that the government has succeeded in the current period in controlling the spread of this virus and has taken the right decisions? | NS | NS | 0.015 | 0.009 |
| Do you think that the government exaggerated the decisions that were taken to protect society from the spread of the COVID-19? | NS | NS | NS | 0.001 |

*Chi square test was used for categorical dependent variables, NS: not significant

information was the official government websites (33 %) followed by social media (30 %) [23]. Furthermore, a survey conducted in Pakistan reported that social media (87.68 %) remained the primary source of information among healthcare professionals [24]. This indicates that social media and internet sources provided a wide range of information available including unverified biased deceptive information, which can easily misguide the public. Therefore, the focus should be on educating and providing authentic information to health science students so that the right information can be conveyed to the community. Majority of participants in this study believed that the Ministry of Health publications can provide a good source of knowledge about COVID-19 and that social media help educate Jordanian society on the right practices that reduce the case of infection with COVID-19. In addition, the majority of the participants also believed that wearing face masks did not necessarily protect people from getting infected with COVID-19. Similar to the results of this study, only 37.8 and 29.7 % of people from the US and UK agreed that wearing sterile medical masks can protect against COVID-19 [21]. The general public was advised to wear a medical mask which is counted as one of the most effective preventive measures in the general protocol to protect from COVID-19 infection. However, the acceptance of wearing face masks might be influenced by cultural differences [14], therefore, only a low proportion of people agreed to wear the masks. In contrast to public opinion, the results showed that 72.9 % of participants

were wearing a face mask outside the home. Furthermore, the majority of married people and students are more obligated to wear the face mask outside, respectively. This study further indicated that the majority of participants believed that "clothes worn during gatherings and shopping in the markets must be cleaned at a temperature higher than 45 °C using strong detergents and sterilization materials", surprisingly, most respondents were females with a bachelor's degree (*p* < 0.01) and believed that the reason for this, was because the virus sticks to the clothes and stays on them for a long period. This might be because females are more educated and experienced with degerming of clothes during laundry. Regarding ventilating and sterilizing their houses daily, there was a significant difference between females and males concerning their beliefs; females believed that ventilating and sterilizing their house daily helped to prevent COVID-19 viruses.

In addition, the results indicated almost half of the participants responded correctly that antibiotics are not effective in preventing or treating COVID-19. However, some respondents also thought that antibiotics might be useful. In an Indian study, 53.3 % of the participants agreed that no antibiotic is approved for the treatment of COVID-19 [15]. This kind of result indicated that participants are educated and get the knowledge that the use of antibiotics is considered ineffective against COVID-19. The respondents were divergent on the use of herbal

medicines and eating garlic and ginger to protect against COVID-19 infection. Similarly, 33.1 % of Egyptian public also incorrectly stated that eating garlic could prevent the spread of disease [21]. The majority of participants who had a bachelor's degree believe more than others that drinking medicinal herbs has a role in COVID-19 prevention ($p < 0.022$).

Also, this study assessed public opinion about using drugs to prevent COVID-19. Many participants were not sure about the role of hydroxychloroquine alone and some of them thought it has been used as a preventative therapy against COVID-19 infection [17]. It may be posited that Jordanian people need to be made aware of current preliminary recommendations for the symptomatic management of mild COVID-19 cases, i.e., fluids, antipyretics, and rest. On the other hand, many participants knew that azithromycin has been tried along with hydroxychloroquine in the treatment of COVID-19 infection. Some physicians have tried or may be using treatments such as chloroquine or hydroxychloroquine accompanied by a ventilator system as a treatment protocol for patients with severe respiratory distress symptoms [16].

### Limitations of the study

Among the study limitations is the sampling approach, which depends on the accessibility of respondents to internet-based services and their disposition to participate in online-based surveys. In addition, the study was conducted purely on the Jordanian population and, thus, the study findings might not apply to other populations in the region and the world. Therefore, additional confirmation studies are needed in the future. The limitation of this cross-sectional study is the use of a convenient non-random sampling approach with a small sample size. Although, the questionnaire assessed Jordanian people's knowledge, attitude, awareness, and practice towards COVID-19, this study does not assess the reasons behind the lack of some knowledge and awareness toward COVID-19. Furthermore, considerations should be given to understanding the healthcare providers' knowledge, attitude, awareness, and practice towards COVID-19. Moreover, increasing the sample size would also lead to more comprehensive findings.

## CONCLUSION

Jordanian people have adequate awareness about COVID-19. Females have more knowledge and awareness about global protection protocols against COVID-19. It has been observed that the majority of participants acquire the information from social media which is an unauthentic resource for obtaining pieces of evidence about diseases and sources of transition. Furthermore, Jordanian people show awareness of immunity and drugs that improve the immune response during COVID-19 infection. The use of global international protocols for protection from COVID-19, and using the documented sources of knowledge about COVID-19 spreading and infection should be addressed in future through webinars, leaflets, and educational operations to improve and correct information and practices regarding COVID-19.

## DECLARATIONS

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