



Original Article

Knowledge, attitude, and practice towards COVID-19 and pets among pet owners referred to veterinary clinics in Iran

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Summary

Covid-19 or severe acute respiratory syndrome is a novel beta coronavirus. SARS-CoV-2 has a putative animal origin. As SARS-CoV-2 started outspreading in the whole world, potential spill overexposure was considered in companion and pet animals, similarly because of their strict social relationship with humans. As the novel coronavirus prevalence spreads in the world with devastating impacts on human health, pets and companion animals are also becoming unessential sacrifices among the pandemic panic and concern amid the public that companion animals might play a role in spreading COVID-19 pets being obsolete or even killed. These facts led to a KAP survey design to evaluate knowledge, attitude, and practice towards COVID-19 and pets among pet owners referring to veterinary clinics. This study was conducted as a cross-sectional paper-based survey. The questionnaire comprised 56 items, of which nine were on socio-demographic profiles, 41 were on KAP of COVID-19 and pets, and the other six items were on the source of individual information about this subject. The questionnaire was answered by 462 participants anonymously in October 2020. All the statistical analyses were performed by using a statistical package for social sciences (SPSS) version 26.0. Based on the results, most general population (62.7%) had moderate knowledge about the Covid-19, and 22.1% had insufficient knowledge about this subject. The present study indicated that a higher knowledge score concerning COVID-19 was notably related to a higher likelihood of having a positive tendency and good practice when the COVID-19 outbreak. Also, our findings presented that the majority of participants (62.3%) obtained their information from social media.

Keywords: COVID-19, Iran, Pet, Veterinary clinics

Introduction

Covid-19 or Severe Acute Respiratory Syndrome (SARS)-CoV-2 is a novel beta coronavirus and genetically related to the last SARS-CoV. Similar

to other hypervirulent HCoVs, SARS-CoV-2 has a putative animal origin, likely descended from a related bat CoV that spilled over to humans either directly or after adaptation in other animal species

like Malayan pangolin (Decaro et al., 2020). Human individuals with confirmed SARS-CoV-2 may have clinical signs, such as fever, dry cough, fatigue, myalgia, dyspnea, angina, diarrhea, acute cardiac injury, shortness of breath, and finally, death, especially in high-risk groups, with an incubation period between 2-14 days following exposures to the virus (Sun et al., 2020). Although, contamination ways are not completely recognized, the virus is transmitted mainly through respiratory droplets emitted during coughing, sneezing, talking, or breathing. Recently, growing evidence also suggested transmission through fomites by eye conjunctiva, hand-to-mouth, or touching the nose with hands contaminated by saliva or respiratory droplets (Leroy et al., 2020). For ages, pets have contributed to the physical, social, and emotional well-being of humans. Because of their proximity to humans, they can be a direct or indirect source of many zoonotic infections or vice versa (Sandhu and Singh, 2014). Most coronavirus infections in pets primarily lead to gastrointestinal disease with few exceptions, including hepatitis virus in mice, feline infectious peritonitis virus (FIPV) in cats, canine respiratory coronavirus in dogs, and infectious bronchitis virus (IBV) in birds (Sun et al., 2020, Almendros, 2019). As SARS CoV-2 started spreading globally between February and March 2020, potential spill over exposure (viral RNA) was noted in companion animals, likely due to their strict social interactions with humans (Sun et al., 2020). Various reports of SARS-CoV-2 infection in domestic and non-domestic animals such as cat, dog, ferret, tiger, and lion, has become a common concern around the world (Almendros, 2019). It was previously shown that SARS-CoV does not infect or causes disease in poultry (Jackwood, 2020). SARS-CoV-2 can transmit from humans to animals. The possible transmission may occur through touching their noses or mouth by infected hands defiled with respiratory droplets or saliva (Chen, 2020). Further, in a recent experimental study, it was observed that cats infected with SARS-CoV-2 could transmit the virus to naïve cats

that come into contact with them (Tazerji et al., 2020).

As the novel coronavirus prevalence spreads in the world with devastating impacts on human health, pets and companion animals are also becoming unessential sacrifices among the pandemic panic and concern amid the public that companion animals might play a role in spreading COVID-19 pets being obsolete or even killed. While, based on the early data so far, except for the risk of physical transmission, no significant evidence suggests that pets or other animals pose a substantial threat to people or other animals concerning transmitting SARS-CoV-2 (Parry, 2020). These facts led to a KAP survey design to evaluate knowledge, attitude, and practice towards COVID-19 and pets among pet owners referring to veterinary clinics.

Materials and methods

Study design

The present study was conducted as a cross-sectional paper-based survey. The estimation of the sample size was performed by assuming a value corresponding to a given confidence level ($= 95\%$) ($z = 1.96$, percentage of the primary indicator ($p = 0.5$, standard error ($c = 0.01$). In this study, the calculated sample size was 385 participants, and with design effect = 1.2 reaching a sample size of nearly 462 participants.

Questionnaire preparation

Here, a questionnaire developed by WHO and OIE training material for the prevention and control of COVID-19 was applied. Before the final survey was completed, changes were made as needed to better comprehend the questions by the participants, and the arrangement of the questions was looked into to ensure its efficiency. The final questionnaire was reviewed for face validity by the expert panel at the Faculty of Veterinary Medicine of Tehran University and was pilot tested on 21 knowledge subjects from the target population, who were not included in the study.

Questionnaire properties

The questionnaire comprised a total of 56 items, of which nine were on socio-demographic profiles, 41 were on KAP of COVID-19 and pets, and the other

six items were on the source of individuals' information about this subject. The knowledge section of the questionnaire included 21 items (**Table 1**): Part A contained 11 items about the characteristics, symptoms and prevention and control of the disease in humans (K1-K11), and part B contained 10 items regarding the characteristics, symptoms, and prevention and control of the disease in pets (K12-K21). These items were evaluated on a "correct," "incorrect," and "I don't know" basis, with "true" having 2

points, "I don't know" has 1 point, and "false" 0 points. Overall, the knowledge score ranged from 0 to 44, with three categories, including low knowledge (with total score of under 27), moderate knowledge (with total score 27 to 34), and high knowledge (with total score more than 34). To assess the attitude of the general public towards the Covid-19 and pets, 10 items were evaluated (A1-A10) with an almost similar scoring system as previous ("true", "false", and "I don't know") (**Table 2**).

Table 1. List of knowledge questions that were asked from study participants (Iran, 2020)

		Correct	Incorrect	Don't know
K1) The symptoms of covid-19 infection appear between 2-14 days.		Correct	Incorrect	Don't know
K2) Headache, diarrhea, and sore throat can be symptoms of Covid-19 disease in humans.		Correct	Incorrect	Don't know
K3) Fever, sneezing, runny and stuffy nose are the main symptoms of Covid-19 disease in humans.		Correct	Incorrect	Don't know
K4) Severe Covid-19 symptoms are more common in the elderly, those with underlying disease and pregnant women.		Correct	Incorrect	Don't know
K5) Touching surfaces infected with Covid-19 virus can cause Covid-19 disease itself.		Correct	Incorrect	Don't know
K6) Covid-19 virus transmission occurs only through respiratory particles caused by cough or sneezing.		Correct	Incorrect	Don't know
K7) A person with Covid-19 disease who has no symptoms cannot transmit the virus to others.		Correct	Incorrect	Don't know
K8) Children and young people do not get Covid-19 disease.		Correct	Incorrect	Don't know
K9) In the Covid-19 outbreak, unnecessary traffic with full compliance to personal hygiene instructions has no problem.		Correct	Incorrect	Don't know
K10) There is currently no effective drug or vaccine available for the definitive treatment and prevention of coronary heart disease.		Correct	Incorrect	Don't know
K11) Diagnosis and treatment of Covid-19 disease is the most effective way to control and prevent it.		Correct	Incorrect	Don't know
K12) In a Covid-19 outbreak, the contact of your pet with other domestic and non-domestic animals should be avoided.		Correct	Incorrect	Don't know
K13) It is essential to wash the hands before and after petting or hugging pets.		Correct	Incorrect	Don't know
K14) There have been several reports of domestic cats and dogs being infected with the Covid-19 virus.		Correct	Incorrect	Don't know
K15) The symptoms of possible disease in domestic cats and dogs may be very mild.		Correct	Incorrect	Don't know
K16) According to reports published so far, the transmission of Covid-19 has occurred only from humans to pets and not vice versa.		Correct	Incorrect	Don't know
K17) Pets of people with coronary heart disease should also be kept in-home quarantine.		Correct	Incorrect	Don't know
K18) Coronavirus agents in pets are identical to the causal agent of Covid-19 in humans.		Correct	Incorrect	Don't know
K19). To date, there have been no reports of ornamental, backyard, or poultry birds being infected with Covid-19.		Correct	Incorrect	Don't know
K20) It is not necessary to bathe domestic dogs with water and detergents immediately after returning from the daily dog walk.		Correct	Incorrect	Don't know
K21) Pets and non-pet animals may be mechanical carriers of the Covid-19 virus.		Correct	Incorrect	Don't know

Table 2. List of practice questions that were asked from study participants (Iran, 2020).

	Yes	No	Don't know
A1) Do you think the Covid-19 outbreak is a serious issue?			
A2) Do you think the Covid-19 outbreak will eventually be controlled?	Yes	No	Don't know
A3) Do you think it is possible for Covid-19 to be transmitted from pets to humans?	Yes	No	Don't know
A4) Do you think the possibility of Covid-19 being transmitted from pets to humans is serious?	Yes	No	Don't know
A5) Has the Covid-19 outbreak made you pessimistic about keeping pets?	Yes	No	Don't know
A6) Have people around you asked you to stop keeping a pet because of the risk of a Covid-19 outbreak?	Yes	No	Don't know
A7) Are you worried about infecting Covid-19 by your pet?	Yes	No	Don't know
A8) Are you worried about transmitting Covid-19 to your pet by yourself?	Yes	No	Don't know
A9) Are you getting information regarding Covid-19 in a pet from a veterinarian?	Yes	No	Don't know
A10) Are you getting information regarding Covid-19 in a pet from the doctor?	Yes	No	Don't know

Table 3. List of practice questions about Covid-19 and pets that were asked from study participants (Iran, 2020).

P1) Do you reduce your unnecessary travels to prevent the spread of the Covid-19 virus?	Yes	No
P2) Do you observe 1 to 3 meters of social distance in your social relationships?	Yes	No
P3) Do you use a mask regularly outside the home?	Yes	No
P4) Since the onset of the Covid-19 outbreak, have you taken your pet out of the house except to see a veterinarian?	Yes	No
P5) Since the onset of the Covid-19 outbreak, has your pet been in contact with any other animal except in veterinary clinics?	Yes	No
P6) Since the onset of the corona epidemic, have you consulted your veterinarian to strengthen your pet's immune system?	Yes	No
P7) After entering the house, do you wash your hands with detergent and water before touching your pet?	Yes	No
P8) Do you avoid touching or having contact with your pet if you get Covid-19 disease?	Yes	No
P9) Have you had periodic checkups and vaccinations of your pet in the past few months while following the hygienic instructions?	Yes	No
P10) Do you pay more attention to the use of collars and cages in public places during the Covid-19 outbreak?	Yes	No

Considering the general population's practice and approach towards the Covid-19 and pets, 10 items were evaluated (P1-P10). These items were evaluated on a true or false basis (**Table 3**). Finally, the source of the individuals' information about COVID-19 and pets was recorded. It included TV/Radio, social media, veterinarians, human physicians, friends and relatives, and scientific journals and articles. Participants could choose

more than one of these sources that have been mentioned.

Data collection

In the current study, 462 participants were contributed anonymously from the 10th to the 22nd of October 2020. Demographic variables were recorded along with other factors regarding the populations' knowledge, attitude, practice, and risk assessment concerning COVID-19. Participation in the study was strictly voluntary, and all ethical

considerations were considered under the Helsinki convention, and the revisions were taken into account. Precautions were taken to ensure that confidentiality and tracing of the identity of the subjects were not possible.

Statistical analysis

Here, we used a statistical package for social sciences (SPSS Inc., Chicago, Illinois, USA, version 26.0), Chi-square, Fisher's exact, and one-way ANOVA tests for statistical analysis. Data were presented as mean \pm SD and proportions as appropriate. The statistical significance level was set at $p < 0.01$. Univariate followed by multivariate linear regression analyses were used to determine the relationship between variables and KAP in our study, which were nominated by the backward stepwise method.

Results

Demographic information

In the current study, 462 filled questionnaires were received from the participants. In this study, 60.6% of participants were female versus 39.4% male. The mean age of participants was 31.06 years old ($SD = 9.974$; range 13-70). 61.5% of questionnaires were collected in Tehran, and 38.5% of them were collected in Rasht. 57.1% of participants were single, and the other 42.9% were married. 36.4% of participants owned a dog, 32% owned a cat, and 31.6% owned birds.

Knowledge information

The questionnaire's knowledge section consisted of 21 items: 11 about the characteristics, symptoms, and prevention and control of the disease in humans (K1-K11) and 10 regarding the characteristics, symptoms, and prevention and control of the disease in pets (K12-K21). Based on our results that are summarized in **Figure 1**, most of the general population (62.7%) had moderate knowledge about the Covid-19. The mean overall knowledge score was 29.25 ($SD = 4.188$). The means of part A and part B of knowledge items were 15.67 ($SD = 2.760$) and 13.58 ($SD = 2.588$), respectively. Based on one-way ANOVA test analysis, our study's overall knowledge scores were considerably variable among cities, education

levels, the field of study, and different species ownership. In the case of participants living in Rasht, having higher education and studying in the fields of experimental sciences and ownership of cats were significantly associated with higher scores in overall knowledge items ($P < 0.01$). The higher knowledge scores were seen in the age range 21-30 years old, but it was not significant ($P > 0.05$).

Attitude information

Based on the results summarized in **Figure 2**, more than 97% (97.4%) of participants thought the Covid-19 pandemic is a serious concern. 46.3% of total participants were optimistic about controlling the Covid-19 pandemic, but 37.2% had no opinion about this. 27.7% of total participants consider the possibility of transmitting the disease's causal agent from animal to human, but almost 25% (25.1%) of them took it seriously. Covid-19 pandemic made only 8.6% of pet owners pessimistic about keeping their pets. More than 23% (23.4%) of participants has been recommended to stop adopting their pets by their relatives. Eventually, a low percent (15.6%) of participants were worried about the possibility of infecting themselves with their pets, while a higher percent (42%) of them were worried about the reverse route of infection. Regarding obtaining information about the relationship between Covid-19 infection in humans and pets, 66.2% of participants stated that they obtain the information from veterinarians, and 61.5% from doctors. Being male, living in Rasht, and ownership of dogs was significantly associated with obtaining information from the veterinarians as compared with those being female, living in Tehran, and ownership of birds. Surprisingly, higher education was significantly associated with a lower desire to get information about covid-19 and pets from doctors.

Practice information

The practice section results are summarized in **Figure 3**. They showed that being female, elder, living in Tehran, and ownership of birds were significantly associated with following general guidelines to prevent Covid-19 infection. During

the Covid-19 outbreak, most of the participants have not taken their pets out of the house or have not contacted them with any other animal except for veterinary clinics. Almost half of the participants have consulted with their pet vet to strengthen their pets' immune system function. 75.75% of participants stated that they would avoid touching and contacting their pets if they become infected with the Covid-19 virus. Almost all participants stated that they wash their hands with

water and detergents before touching their pets when they have already returned home from the outdoor. 73% of the pet owners stated that they referred their pets to the vet for periodic check-ups despite following the hygienic instructions. In the meantime, this percentage was significantly lower in owners of birds compared to other species. 77% of dog owners stated that since the Covid-19 pandemic happened, they are paying more attention to collars in public places.

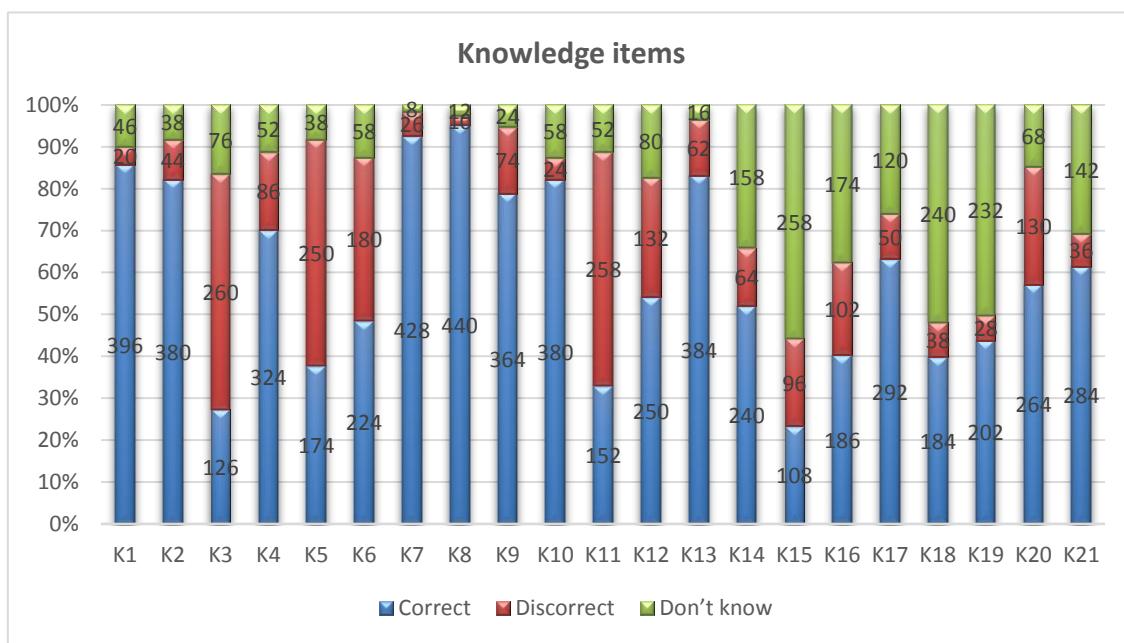


Fig. 1. Frequency of responses to the knowledge questions by study participants (Iran, 2020; N = 462).

Source of information

Participants were asked where they obtained their disease-related information. (**Figure 4**). They could have more than one choice. The results percentages are summarized in the table below. According to their selections, social media, vets, TV/radio, scientific papers, doctors, and friends were the most sources of their Covid-19-related information, respectively.

Discussion

The Coronavirus disease-2019 (covid-19) outbreak resulting in pneumonia with an unknown source was associated with the Huanan Seafood Wholesale Market in Wuhan, Hubei province, China. It is the third

coronavirus appeared in the last 20 years (Lu et al., 2020, Wang et al., 2020).

To the best of our knowledge, this is the first study in Iran investigating the KAP towards COVID-19 and pets amongst Iranian pet owners. Based on our results, most of the general population (62.7%) had moderate knowledge about the Covid-19, and 22.1% had low knowledge about this subject. Participants were better in knowledge items part A and this better practice rate regarding knowledge about COVID-19 in humans among pet owners has its roots partly in their high exposure to the information provided by the government and media about the virus since the start of the pandemic situation. Another reason could be the fact that 64.9% 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. But, it seems that knowledge about Covid-19 in pets was lower than that in humans. One of the reasons is the government and media's lack of

information about the virus in pets and other animals (Erfani et al., 2020; Ajilore et al., 2017; Zhoa et al., 2020). Regardless of the knowledge and awareness of many countries for COVID-19 during early 2020, it extends very quickly. It seems that FBT has got less consideration relative to pathways of transmission and prevention (Saeedi and Rafat, 2021).

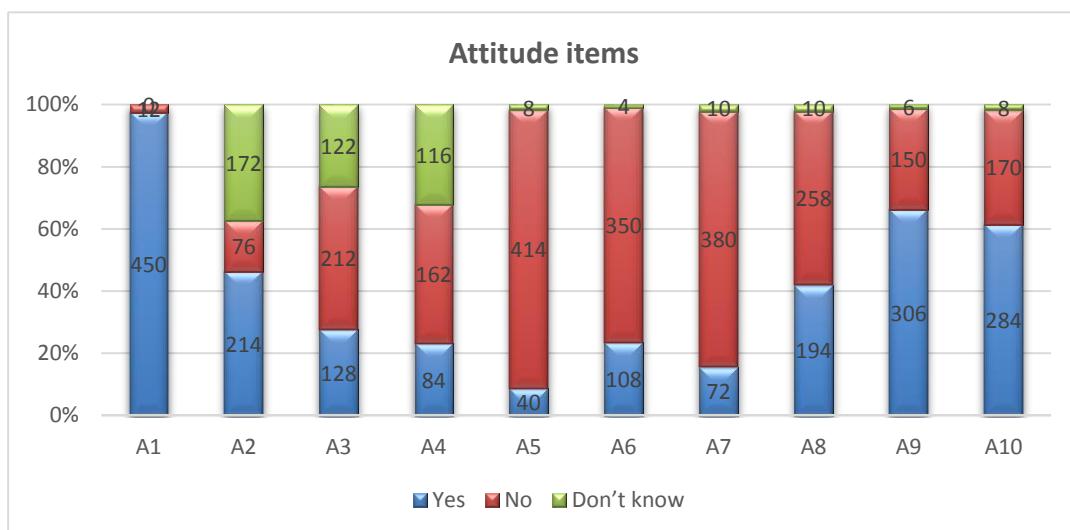


Fig. 2. Frequency of responses to the attitude questions by study participants(Iran, 2020; N = 462).

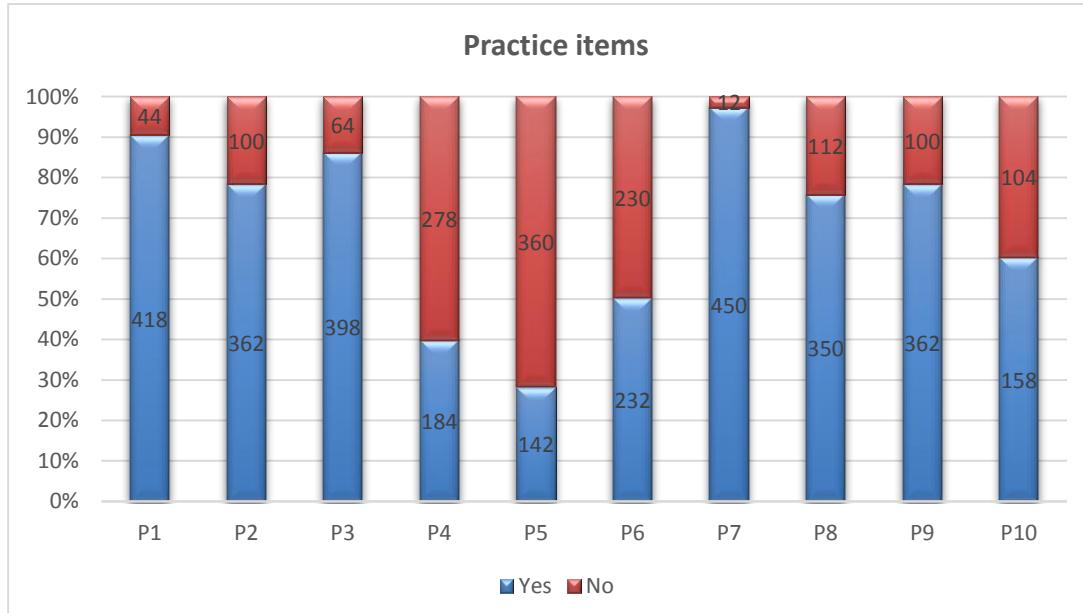


Fig. 3. Frequency of responses to the practice questions by study participants (Iran, 2020; N = 462).

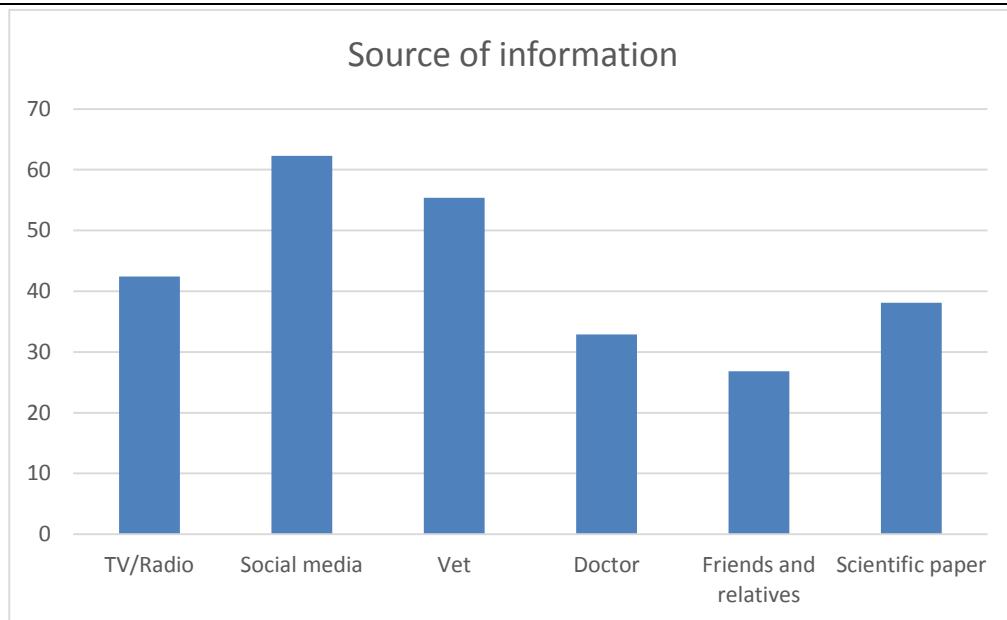


Fig. 4. Frequency of awareness sources of study participants to the knowledge questions (Iran, 2020; N = 462).

Conclusion

Our study showed that a higher knowledge score regarding COVID-19 was significantly associated with a higher likelihood of having a positive attitude and good practice at the time of the COVID-19 pandemic. Moreover, our study showed that the majority of participants (62.3%) obtained their information from social media. Thus, it seems that providing correct and useful information in social media can improve the knowledge of our target society in this study.

Acknowledgments

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Conflict of interest

The authors declare that they have no competing interest.

Ethical approval

Not applicable.

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