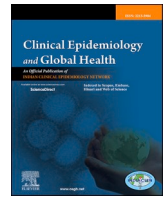




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Original article

Knowledge and perceptions about COVID-19 among the medical and allied health science students in India: An online cross-sectional survey

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ABSTRACT

Background: An infection (COVID-19) without any specific cure makes the people more vulnerable to get affected due to insufficient knowledge and unhealthy practices. In this scenario, healthcare students can act as reliable information providers. This study aimed to assess the knowledge and perception about COVID-19 among medical and allied health science students.

Methods: A web-based cross sectional survey was conducted during February and March 2020. A 24-item survey was developed and randomly distributed among the study population. Descriptive statistics was applied to represent participant characteristics and Chi-square test was used to evaluate the level of association among variables with a significance level of $p < 0.01$.

Results: Total, 97.95% (715/730) participants completed the survey. High proportion of students were from pharmacy (45.73%) followed by medical (22.52%), physiotherapy, nursing and dental background. Majority of participants were having adequate knowledge while about 18% had partial knowledge about the symptoms of severe COVID-19 cases. Students have shown a positive perception of COVID-19 prevention and control while few invalid responses related to the use of herbal medicines or garlic were noted. About 50% had rightly stated that, the antibiotics and vaccine are not effective in COVID-19 infection at present.

Conclusion: As the COVID-19 cases are rapidly increasing worldwide, it is essential to improve the knowledge and beliefs among general public to prevent its spread. Health care students with their education background and basic understanding about COVID-19 can play a significant role by making community people aware about the seriousness of this pandemic situation.

1. Introduction

Coronaviruses (CoV) are a broad family of viruses that are known to cause serious and sometimes fatal pulmonary diseases such as, Severe Acute Respiratory Syndrome (SARS-) and Middle East Respiratory Syndrome (MERS-).¹ In 2002–03, SARS-CoV first identified as a pneumonia in Guangdong, China, which later turned into life-threatening respiratory failure. Initially, it was only animal-human interspecies transmission that further progressed into human to human transmission. The virus infected about 8500 people with fatality rate of 10%.^{2,3} Similarly in 2012, the MERS-CoV epidemic appeared in Saudi Arabia where people experienced symptoms similar to SARS-CoV but dying at a

much higher rate of 36%. It was mainly transmitted to humans from dromedary camels.⁴

In December 2019, similar cases were reported in Wuhan city, China. The virus was identified as a new form of Coronavirus (novel Coronavirus-2019) and also the illness it causes was named as COVID-19.⁵ The World Health Organization (WHO) on January 30, 2020, declared COVID-19 a public health emergency and later on March 11, 2020, the outbreak was declared pandemic. According to the WHO situation report, globally approximately 3349786 confirmed cases of COVID-19 caused by the SARS-CoV-2 were reported, including an estimated 238,628 deaths as on May 03, 2020.^{6,7}

Preliminary scientific reports revealed that, COVID-19 would be

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possibly spread via animals to humans but the current findings states that human to human transmission could also occur through direct contact, and respiratory droplets.^{8,9} The incubation period of COVID-19 is 2–14 days^{10,11} and the initial symptoms would appear as fever, cough, shortness of breath, trouble breathing, pain or pressure in the chest, fatigue, myalgia or arthralgia, confusion, bluish lips or face.^{12,13}

Standard recommendations to prevent infection spread includes, maintaining hand hygiene, covering mouth and nose when coughing or sneezing, avoid close contact with anyone showing symptoms of respiratory illness as well as to prevent unprotected contact with farm or wild animals.^{1,14} Till date, no vaccine or an antiviral treatment has been launched into the market for the prevention or management of COVID-19. Current treatment guidelines of Center for Disease Control and Prevention (CDC) as well as WHO majorly focus on symptomatic management and application of infection prevention measures. However, medications such as, chloroquine, hydroxychloroquine, remdesivir and lopinavir/ritonavir are presently being tested in clinical trials.¹⁵

As the risk of COVID-19 becomes more widespread, people should take steps to safeguard themselves from infection and limit its spread to others. Though the students from medical and allied health sciences are not directly involved in managing COVID-19 patients, they can serve as an information provider. They can sensitize community people about maintaining personal hygiene, symptoms of COVID-19 and how to prevent its spread. Students must possess the basic knowledge about novel Coronavirus and be able to clear the myths pertaining to COVID-19. With this background, our study is aimed to assess the knowledge and perceptions about COVID-19 among medical and allied health science students.

2. Methodology

A web-based cross sectional survey study was conducted using a “Google Form” to obtain responses from medical and allied health science students during February and March 2020.

2.1. Ethical consideration

The study was carried out in accordance with the Checklist for Reporting Results of Internet E-Surveys (CHERRIES) guidelines.¹⁶ The ethical approval was obtained from the institutional ethics committee (Sumandeep Vidyapeeth Institutional Ethics Committee, Ref. No. SVIEC/ON/Phar/SRP/20002, March 11, 2020). The ethics committee has reviewed and approved study protocol, participant information sheet (PIS), informed consent form and the survey questionnaire. A PIS (in English language) was provided and an informed consent was obtained from each participant prior to answering survey questions as well as they were requested to confirm their willingness to participate by answering Yes/No question. Confidentiality of all study participants was maintained by making their information anonymous and they were requested to provide authentic answers.

2.2. Development, validation and distribution of survey questionnaire

A survey with 24 Questions (in English language) was formulated using reference material, fact sheets and information leaflets on COVID-19 developed by WHO, CDC and National Health Services (NHS). The survey covered the domains of student demographics, general awareness, information sources, knowledge and perceptions related to COVID-19. The developed draft questionnaire was validated by face and content validation method by the five selected physicians and faculty members to assess its readability and validity before pretesting among ten randomly selected medical and allied health science students for clarity, significance, and acceptability. Modifications and refinements were made as per the comments received to enable better understanding and to organize the sequence of questions. The final survey link was distributed among the students in the form of “Google Form” via various

media platforms such as, WhatsApp, Gmail, and Facebook.

2.3. Sampling method

As this is a knowledge and perception assessment study, we have considered the total population size of 10,000, and at 99% CI with 5% margin of error the calculated sample size using Morgan’s Table was 622 but the study received enormous response from the students across India and we have collected the data of about 730 participants.

2.4. Content of the survey questionnaire

The survey comprised 24 closed-ended questions which takes about 5–10 min to complete. The survey was divided into three parts, including participant information sheet, informed consent form and questionnaire. In total, 7 participant demographics questions and 24 knowledge-perception assessment questions were included comprising the core information such as, general knowledge about novel Coronavirus (11 items), source of information (1 item), precautions and risk prevention (1 item) and perceptions of COVID-19 (11 items) (Appendix 1).

2.5. Data analysis

All the collected data were entered into Microsoft Excel and cross checked for presence of any error to maintain its accuracy. Descriptive statistics was applied to calculate proportions and frequencies. The chi-square test was used to investigate the level of association among study variables. A *p*-value of less than 0.01 was considered statistically significant. Statistical analysis was performed using IBM SPSS software for Windows version 27 (NY, USA).

3. Results

Out of 730 participants that filled out the web based survey, 715 participants have given their consent of voluntary participation and completed the questionnaire with a response rate of 97.95%. The mean age of the study participants was 21.81 ± 2.6 years. The majority students were from pharmacy ($n = 327$, 45.73%) and medical ($n = 161$, 22.52%) field, followed by physiotherapy, nursing, dental, and other allied health science background. Demographic characteristics of participants are detailed in Table 1.

3.1. Sources of information

Participants were also inquired about the source of valid and reliable

Table 1
Demographic characteristics of study participants ($n = 715$, 97.95%).

Characteristics	Participants(n)	Percentage (%)
Gender		
Male	272	38.04
Female	443	61.96
Age (Mean age \pm S.D 21.81 \pm 2.6)		
17-20	234	32.73
21-24	427	59.72
25-28	43	6.01
29-32	6	0.84
<33	5	0.70
Course of study		
Medical	161	22.52
Dental	56	7.83
Pharmacy	327	45.73
Physiotherapy	82	11.47
Nursing	67	9.37
Other allied health sciences	22	3.08

information about COVID-19. The main sources of information was social media (Facebook, WhatsApp, YouTube, Instagram) (n = 466, 65.17%) followed by news media (TV/video) (n = 149, 20.84%). Remaining participants reported that they got the information through print media (magazines, newspapers), and other sources. Few students obtained information from their college resources such as newsletters, posters and guest lectures. Details of above mentioned sources of information are represented in Fig. 1.

3.2. Knowledge about novel coronavirus

The subsequent table (Table 2) illustrates the knowledge about novel Coronavirus among the students. Majority of the study participants (70.91%) correctly identified novel Coronavirus i.e. COVID-19. A high proportion of study participants (85.31%) provided the correct response while 11.47% did not have any idea whether COVID-19 is contagious or not. Further, more than half of the participants were not aware about the origin of COVID-19, as many of them gave incorrect answer or had no knowledge about it. More than two-thirds of the participants know about the incubation period of COVID-19. Additionally, more than one third of study participants knew that the elderly persons or people with comorbidities are more prone to acquire COVID-19. More than one third of students knew that the person infected with COVID-19 can remain asymptomatic while 37% of them had given incorrect response. Majority of participants had partial knowledge (those who have selected either respiratory symptoms or neurological symptoms) regarding the symptoms of severe COVID-19 cases while only 3.36% had no knowledge about the symptoms. About half of the participants (53.71%) rightly identified the modes of COVID-19 transmission. About 44.90% participants correctly identified that RT-PCR (Reverse Transcriptase Polymerase Chain Reaction) and Immunofluorescent antigen detection assay are the diagnostic tests for COVID-19 while 25% had partial knowledge (selected either RT-PCR or Immunofluorescent antigen detection assay).

Table 2
Knowledge about novel Coronavirus among study participants (n = 715).

Question	Correct Response (%)	Incorrect Response (%)	No Knowledge (%)
1. Which of the following is novel Coronavirus?	70.91	29.09	-
2. Is COVID-19 contagious?	85.31	3.22	11.47
3. What is the origin of COVID-19?	43.22	34.13	22.66
4. What is the incubation period of COVID-19?	70.77	29.23	-
5. Is there any similarity between COVID-19, SARS-CoV and MERS-CoV?	10.91	52.31	36.78
6. Who are more prone to COVID-19?	40.98	54.69	4.34
7. Do you know the fatality rate of a person infected with COVID-19?	38.32	30.49	31.19
8. Do you think a person infected with COVID-19 can remain asymptomatic?	39.72	37.76	22.52

Question	Correct Response (%)	Partial Knowledge (%)	No Knowledge (%)
9. What are the symptoms of Severe COVID-19?	18.04	78.60	3.36
10. How does the COVID-19 spread?	53.71	44.20	2.10
11. What are the diagnostic tests for COVID-19?	44.90	25.59	29.51

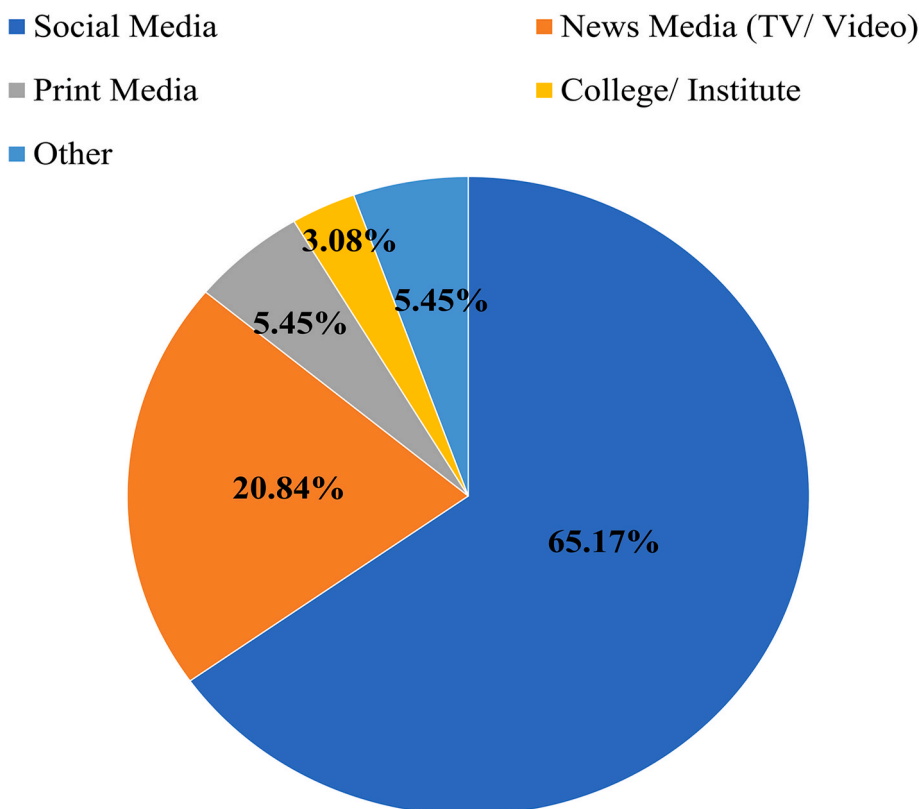


Fig. 1. Sources of information about COVID-19.

3.3. Association of education background and knowledge about COVID-19

On the basis of statistical analysis, significance with the participant background was observed in areas of identification of novel Coronavirus, its origin, asymptomatic behaviour and the modes of transmission. Majority of students with medical and dental background agreed that the patient with COVID-19 could remain asymptomatic ($p < 0.01$) while considering the transmission route, the students from pharmacy background were found more conscious ($p < 0.01$) that infection could spread through personal contact, respiratory droplets and possibly by faeces. The association was estimated using chi-square test and represented in Table 3.

3.4. Prevention of COVID-19

Students were further inquired to assess their beliefs towards prevention of COVID-19. Majority of all the students (91.61%) positively agreed to the ways of preventing COVID-19 as prescribed by WHO. These precautionary measures are, cleaning hands with alcohol based sanitizer, avoid personal contact and maintaining at least 1 m distance (Social distancing). The results are further illustrated in Fig. 2.

3.5. Perception about novel coronavirus

A high majority of the participants (73.15%) believe that wearing a surgical mask is a considerable approach to prevent COVID-19 while some (21.26%) of the participants do not agree with the statement. A large number of the participants (65.45%) incorrectly believe that it is not safe to receive a package from areas where a case of COVID-19 has been reported. About half of the students (53.29%) were found to have a

correct perception that antibiotics are not effective in COVID-19 treatment as well as 50.77% rightly agreed that vaccines are not sufficient to prevent COVID-19 transmission at present. Notably, one third of participants did not know that thermal scanner could help to detect fever in a person infected with COVID-19. Few participants (27.13%) rightly believed that COVID-19 can primarily occur round the year and the infection is not bound to any specific climatic condition. The rest of the information about the perception of students about COVID-19 is detailed in Table 4.

4. Discussion

Focusing the global burden and the mass media attention on the virus, the present study has been designed to assess the knowledge and perceptions about COVID-19 among the medical and allied health science students in India. Our study discovered that, the majority of students obtained knowledge about COVID-19 from social media 65.17%. Similarly, a study carried out by Bhagavathula AS et al. revealed that the participants' main source of information was official government websites (33%) followed by social media (30%).¹⁷ Another survey conducted in Pakistan reported that the Social Media (87.68%) remained the primary source of information among healthcare professionals.¹⁸ Presently, wide range of information is available on the internet, including unverified biased deceptive information, which can easily misguide the public. Focus should be put on to educate and provide authentic information to the health science students so that the right information could be conveyed to the community.

Large proportion of study participants were aware and had general knowledge about COVID-19 except for symptoms of severe condition and category of people more prone to COVID-19. About 70% of participants correctly identified novel Coronavirus and gave the correct

Table 3
Association of education background and knowledge about COVID-19 (n = 715).

Que No.	Options	1	2	3	4	5	6	p-Value
Q-1	Correct	124	49	230	52	35	17	<0.01
	Incorrect	37	7	97	30	32	5	
	No Knowledge	-	-	-	-	-	-	
Q-2	Correct	151	52	274	75	42	16	<0.01
	Incorrect	3	1	13	-	4	2	
	No Knowledge	7	3	40	7	21	4	
Q-3	Correct	68	26	150	38	14	13	<0.01
	Incorrect	58	23	100	25	32	6	
	No Knowledge	35	7	77	19	21	3	
Q-4	Correct	103	44	236	64	44	15	>0.01
	Incorrect	58	12	91	18	23	7	
	No Knowledge	-	-	-	-	-	-	
Q-5	Correct	18	7	33	5	9	6	>0.01
	Incorrect	98	28	165	40	35	8	
	No Knowledge	45	21	129	37	23	8	
Q-6	Correct	96	22	114	35	13	13	>0.01
	Incorrect	61	32	195	43	51	9	
	No Knowledge	4	2	18	4	3	-	
Que No.	Options	1	2	3	4	5	6	p-Value
Q-7	Correct	97	19	112	23	9	14	<0.01
	Incorrect	31	19	100	31	34	3	
	No Knowledge	33	18	115	28	24	5	
Q-8	Correct	78	27	128	24	21	6	<0.01
	Incorrect	63	23	123	35	22	4	
	No Knowledge	20	6	76	23	24	12	
Q-9	Correct	24	9	61	13	21	1	>0.01
	Partial Knowledge	134	45	253	66	44	20	
	No Knowledge	3	2	13	3	2	1	
Q-10	Correct	67	29	177	53	48	10	<0.01
	Partial Knowledge	92	24	144	29	16	11	
	No Knowledge	2	3	6	-	3	1	
Q-11	Correct	74	21	134	43	40	9	>0.01
	Partial Knowledge	46	16	85	12	15	9	
	No Knowledge	41	19	108	27	12	4	

Where, educational background (1 – Medical, 2 – Dental, 3 – Pharmacy, 4 – Physiotherapy, 5 – Nursing, 6 – other allied health sciences).

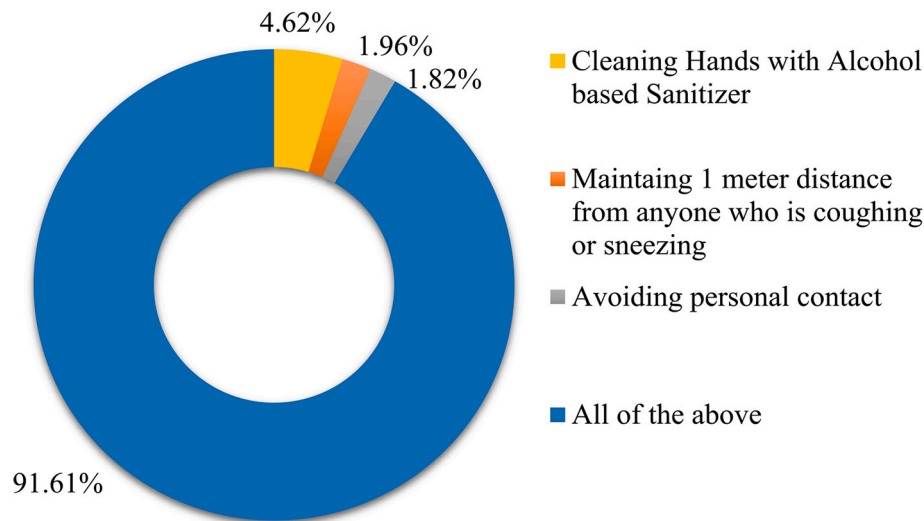


Fig. 2. Participants beliefs towards prevention of COVID-19.

Table 4
Perception about novel Coronavirus among study participants (n = 715).

Question	Correct Response (%)	Incorrect Response (%)	No Knowledge (%)
1. Do you think wearing a Surgical mask can protect people from COVID-19?	73.15	21.26	5.59
2. Is it safe to receive a package from any areas where a case of COVID-19 has been reported?	23.08	65.45	11.47
3. At present, do you think antibiotics are effective in preventing or treating COVID-19?	53.29	25.87	20.84
4. At present, do you think vaccines are effective in preventing COVID-19?	50.77	22.80	26.43
5. Are traditional herbal medicines effective for COVID-19?	37.76	19.72	42.52
6. Are hand dryers effective in killing new Coronavirus?	44.06	21.12	34.83
7. Can an Ultraviolet (UV) disinfection lamp kill the new Coronavirus?	21.68	37.06	41.26
8. Are thermal scanners helpful in detecting FEVER in people infected with new Coronavirus?	51.33	13.29	35.38
9. Can spraying Alcohol or Chlorine all over your body kill the new Coronavirus?	34.97	35.94	29.09
10. In your opinion, can eating garlic help prevent infection with the new Coronavirus?	33.57	26.43	40.00
11. In which climatic condition COVID-19 infection can PRIMARILY occur?	27.13	58.32	14.55

answer about its incubation period. Whereas, a study conducted among health care workers showed that only 36.4% correctly identified the incubation period of COVID-19 i.e. 2-14 days.¹⁷ Other cross-sectional surveys conducted in Pakistan, China and Iran reported 96.38%, 66.40% and 85.4% correct responses about the incubation period respectively.^{18–20} Information about the incubation period would be useful to identify the suspected cases and to provide medical care at an early stage. In this study, more than half (53.71%) of the students knew

about the modes of transmission of COVID-19. In contrast to that, studies carried out by Zhong BL et al., Abdelhafiz AS et al. and Bhagavathula AS et al. stated that 98.85%, 95.9% and only 39% respondents correctly recognized the transmission modes of novel Coronavirus.^{17,19,21} Nearly 40% participants in our study believed that old/geriatric or person with co-morbidities are more prone to COVID-19. Similarly, study conducted among Egyptian public also demonstrated that around 95% of study participants believe that COVID-19 is more dangerous for the elderly and patients with chronic diseases.²¹ A brief research report of a large survey carried out among general public of the United States (US) and United Kingdom (UK) showed that 96.3% and 97.5% people believe that older adults are most likely to die from the novel Coronavirus infection.²²

Majority of participants (78.60%) in our study had partial knowledge (either selected only respiratory, enteric or neurological symptoms) about the symptoms of severe COVID-19 cases. On the other hand, 98.63% and around 90% of respondents of a Chinese and Egyptian survey accurately identified the symptoms of COVID-19 which is higher than our study results.^{19,21} It is very necessary that people should be informed about the most common as well as severe symptoms of COVID-19 infection through validated sources to avoid the misconception.

At present there is no clear evidence about the origin of COVID-19. Recently, a study conducted in Bangladesh reported that 37.22% of participants gave an incorrect response about the COVID-19 origin.²³ In contrast to that, 43.22% of participants from our study gave correct responses and are found to have a good knowledge about the origin which is yet unknown as stated by WHO. Considering the asymptomatic behaviour of COVID-19, about 40% of students in our study rightly believed that a person infected with novel Coronavirus can remain asymptomatic. Also, 81.8% participants of a survey conducted in Egypt correctly responded that COVID-19 could be transmitted from asymptomatic person as well.²¹

Almost all of our study participants (91.61%) knew about the measures that should be adopted for the prevention of COVID-19 such as, maintaining 1 m distance, cleaning hands with soap water, use of alcohol based sanitizer and avoiding personal contact. This finding is in line with the reported rate in studies conducted among healthcare workers (85.6% and 98.31%)^{17,18} and students (98.6% and 93.8%).^{19,20}

Majority of participants (73.15%) believe that wearing a surgical/face mask can protect people from getting infected with COVID-19. Opposite to our results, only 37.8% and 29.7% of people from the US and UK agree with the statement.²² About half of the students rightly stated that, at present the antibiotics (53.29%) and vaccines (50.77%)

are not effective in preventing or treating COVID-19 but roughly 25% respondents also thought that antibiotics or vaccines might be useful which is a wrong perception. Likewise, in a survey conducted among healthcare workers, around 90% believed that flu vaccination is not sufficient in preventing COVID-19.¹⁷ A cross-sectional study conducted among medical and non-medical students in Jordan reported that, 89% and 78.9% respondents knew that there is no vaccine or specific treatment available for COVID-19.²⁴ Few discrepancies were also noted in the perception of our study participants. As an example, around 30% of students believed that the use of herbal medicines and eating garlic can protect against COVID-19 infection. Similarly, 33.1% Egyptian public also incorrectly stated that eating garlic could prevent spread of disease.²¹ Considering the association of climatic condition and COVID-19 infection, more than half of participants (58.32%) believe that it either occurs in winter or spring/fall which is an incorrect perception as it could occur round the year as per available evidence.

4.1. Conclusion

Current global pandemic situation demands substantial awareness about the clinical presentation, spread, preventive measures and management of COVID-19. We discovered that the students from different institutions are having adequate awareness about COVID-19. Also, it has been observed that majority of participants acquired the information from social media which is an unauthentic resource of obtaining evidence about diseases. Students should be informed about the authentic sources of information as provided by global health authorities and health ministry of respective countries. Our study finding also highlights the specific aspects of knowledge and perception where the partial or incorrect responses were noted and these areas should be addressed in future through webinars, leaflets and educational campaigns to improve understanding and to correct the myths about COVID-19.

4.2. Limitations of the study

In present study, the questionnaire was developed based on the information available on WHO, CDC and NHS websites as well as a dual validation was performed which increases the reliability of our study results.

Besides highlighting the facts about the knowledge and perception about COVID-19, this study has few limitations which should not be ignored. Firstly, as this is an online cross-sectional survey, there are chances of recall bias in information as well as it is possible that the students may have looked up the answers to some of the questions before answering. Secondly, the survey was conducted among the students from health science background so the findings cannot be extrapolated to the health care professionals. Lastly, as this is an internet-based online survey, responses from the regions without internet access may not be captured which may lead to demographic selection bias.

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Declaration of competing interest

The authors declare that they have no conflict of interest.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.cegh.2020.07.008>.

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