

Knowledge, Attitude and Practice on COVID During the COVID-19 Pandemic: A Systematic Review

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ABSTRACT

Introduction: Corona virus disease (COVID-19) is an infectious disease caused by a newly discovered coronavirus. The World Health Organization (WHO) declared the novel corona virus outbreak a global pandemic on March 11 2020 due to its rapid spread on a global scale. Now the world is in the midst of COVID-19 pandemic. More than 157289118 cases have been reported in 222 countries and mortality has reached a total of 3277272. The best way to prevent and slow down transmission is to be well informed about COVID-19 virus, the disease its causes and how it spreads. Adequate knowledge, positive attitude and good practice are the only key to control the pandemic. This review aims to study the present level of knowledge, attitude and practice done among respondents in various countries.

Methods: The review presents a summary of studies done on knowledge, attitude and practice during COVID-19 pandemic among the primary level students, graduate and post graduate students and the general population. Research articles were accessed through online search from November 2020 to April 2021. Collected articles were reviewed and conclusions were drawn in terms of knowledge score, attitude score and the level of practice.

Results: The study population were from China, Nepal, India, Iraq, Bangladesh, Palestine, Nigeria, and Egypt. The population of study varies from primary level students to post graduate university level students and most of the studies were done on general population. Among the studies knowledge score ranged from minimum 48.3% in Bangladesh to highest 99.5% in Nigeria where knowledge was gained mainly through social media and television. The attitude score ranged from minimum 4.54 + 1.76 (Range 0 - 8) in Wuhan, China to maximum 79.5% in Nigeria. Similarly, the practice score ranged from 51.6% in Bangladesh to 87.9% in China.

Conclusions: Analysis reveals that the level of knowledge was average, have positive attitude and good practices. Utility of knowledge and positive attitudes and application of knowledge into practice will hopefully can control the spread of COVID-19.

Key Words: Attitude; Knowledge; Practice; Review

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INTRODUCTION

Since the first reported case of coronavirus disease in 2019 December in Whuan, China it has quickly spread globally, prompting the WHO to declare it a pandemic on 12 March 2020.¹ As of 10th May 2021, the WHO reported 157289118 COVID-19 cases including 3277272 deaths in more than 222 countries and regions.² As WHO and partners work together on the response tracking the pandemic, advising on critical interventions, distributing vital medical supplies to those in need they are racing to develop and deploy safe and effective vaccines. As of 18th February 2021, seven different vaccines across three platforms have been rolled out in different countries.^{1,3}

Nepal reported the first case on 23rd January 2020 and has reported 359610 confirmed cases including 3417 deaths till May 5th 2021.⁴ Till as of 27th April 2021, a total 303,561 COVID-19 cases were confirmed in the country through polymerase chain reaction (RT-PCR); 2,417,417 RT-PCR tests have been performed nationwide by designated functional COVID-19 laboratories.⁵ All seven provinces in the country are now experiencing transmission via clusters of cases to contain the disease, a province wise lockdown was declared for the second time on 29 April 2021. The citizens were advised to stay at home and maintain social distancing.^{5,6}

COVID-19 is caused by previously unreported strain of coronavirus, officially named Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-COV-2). It primarily spreads from person to person through close contact and contaminated surfaces, often through small droplets produced by the infected person through coughing, sneezing and talking.^{7,8} COVID-19 is most contagious immediately after the onset of symptoms, although the spread through asymptomatic cases has been reported.⁹ The incubation period is around five days ranging from two to 14 days and common symptoms include fever, cough and shortness of breath.¹⁰ There is no known effective antiviral treatment for COVID-19, only symptomatic management and supportive therapy exist.¹¹ Therefore, it is important to empower people by educating them and effectively communicating accurate information about preventive measures such as handwashing, covering ones mouth while coughing or sneezing, maintaining social distancing and self isolating.¹² In this time of crisis, research on knowledge, attitude and practice (KAP) is vital for understanding the public's level of awareness about the knowledge, attitude and practice toward COVID-19. Surveys of knowledge,

attitude and practice can collect information on what is known, believed and done by specific population. So this article aimed to study the present status of KAP regarding COVID-19 among the population.

METHODS

Search strategies to identify studies regarding knowledge attitude and practice regarding COVID-19 included searching google, google scholar, pubmed and health inter network access to research initiative (HINARI) was done till April 2021. The search was done using the keywords "Knowledge", "Attitude" "Practice" AND "COVID -19". The review yielded 14 eligible articles; articles having content relevance to the sources and available with full text were included and article that do not have full text access and studies that do not included all the three dimensions; the knowledge, attitude and practice (KAP) on COVID-19 were excluded. It only included the reports published in various journals in the year 2020 and 2021. This study obtained total of 10 articles for further discussion.

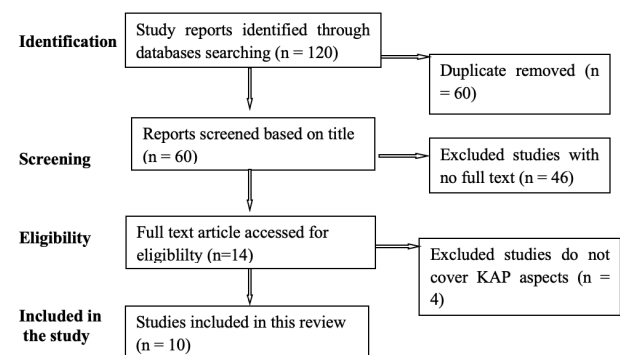


Figure 1. Flow Diagram for selecting study reports

STUDIES ON KAP TOWARD COVID-19

Table 1 presents the 10 selected articles on KAP on COVID-19 during COVID-19 pandemic. All the articles used online questionnaire as an instrument to collect information which was made accessible through google document (8), monkey survey (1) and kobotool app. (1) with response rate ranging from 43.7% minimum in India to 100% in other countries. The lowest response rate was in India and highest is in China. All the studies were descriptive cross sectional and sample size ranged from 231 to

Table 1. Studies on KAP toward COVID-19

S. No	Authors	Type of Study	Country	Participants	Number of participants	Instruments
1	Singh ¹⁴	Cross Sectional Study	India	Post Graduate Students	231 (43.7%) Response rate	Online Questionnaire (google form)
2	Hussein ¹⁵	Cross Sectional Study	Iraq	University Students	1959	Online Questionnaire (google form)
3	Peng ¹⁶	Cross Sectional Survey	China	Under-Graduate Students	872	Online Questionnaire (google form)
4	QiXue ²²	Cross Sectional Study	China, Wuhan	School Based Survey	1650	Online Questionnaire (google form)
5	Marwa ²³	Cross Sectional Study	Egypt	Pharmacy Students	238	Online Questionnaire (Survey monkey)
6	Fedrous ¹⁷	Cross Sectional Study	Bangladesh	Population Based	2017 (97.5%) Response rate	Online Questionnaire (google form)
7	Qutob ¹⁸	Cross Sectional Study	Palestine	Population Based	1731	Computer assisted (kobotool)
8	Poudel ¹⁹	Cross Sectional Study	Nepal	Population Based	766	Web based questionnaire (google form)
9	Banik ²⁰	Cross Sectional Study	Bangladesh	Youth of Age 18-35 Years	707 (97.3%) Response rate	Online Questionnaire (google form)
10	Rine Christopher ²¹	Cross Sectional Study	Nigeria	Population Based	589	Online Questionnaire (google form)

2017 for a total of 10,760. The respondents consisted of students from the level of primary to post graduate university students, pharmacy students and the general population. The population were from Nepal, India, China, Bangladesh, Iraq, Palestine, Nigeria and Egypt. Among 10 studies, five of them were studied among the students and remaining five studies were done among the general population with the age group above 18 years of age and among them also most of the respondents were found to be students.

DISCUSSION

KNOWLEDGE TOWARDS COVID-19

Table 2 shows that the knowledge score ranged from 48.3% in Bangladesh¹⁷ to 99.5% in Nigeria.²¹ The literacy rate of Bangladesh in 2020 was 76.67% for male and 71.18 % for female. With this relatively good literacy rate, the knowledge score appears to be very low in Bangladesh. Studies in Bangladesh and Palestine that younger population had significantly higher score

than that of old population and people from rural area scored higher than that of urban population.^{17,18} This discrepancy might be due to the different study population, as in this study, mostly students were included and there was minimal participation of adult population. The highest knowledge score was 99.5% in Nigeria where knowledge was gained mainly through social media and television.²¹ Despite literacy rate of 62.02%, the knowledge score is very high in Nigeria. This might be reflected due to massive implementation of behavioural change in communication practices in Nigeria. 86.2% of participants have better knowledge on infection prevention and 67.7% knew about mode of transmission.¹⁵ Female students had significantly higher score than that of male students.¹⁶ It may be due to the disease pattern and also that by nature males are less accustomed to cleanliness than females. In Palestine, 79.3% of respondents have correct knowledge on transmission of disease, 55.6% knew about symptoms and 82% had knowledge on identifying risk groups.¹⁸ Despite the unstable environment in it, the knowledge regarding COVID-19 seems quite good. In Nepal,

knowledge among higher secondary level students was found to be lower than that of bachelor level students and 30.6% knew about modes of transmission of the virus.¹⁹ It is well known that higher the degree of the education, greater is the knowledge. Another study done in Bangladesh showed 91.4% identified common clinical symptoms. 89.4% knew transmission can be decreased by wearing masks.²⁰ This probably means that the youth of Bangladesh have more knowledge than other population. In earlier population based study the knowledge score was minimal. School based survey done in China found lower awareness level in the terms of the suspected host in 70.1%. 80.6% have knowledge regarding eating fully cooked food and 2.1%

still thought of visiting relatives and friends during outbreak.²² It may be due to the age of the respondents. This study was conducted among the children in a school and may not represent the actual scenario. Study done in Egypt among pharmacy students showed that 72.5% possessed good knowledge and only 37% knew about coagulation dysfunction as one of the major cause of death with severe COVID-19.²³ This finding is not satisfactory as we assume that medical students must have good knowledge regarding COVID-19.

Table 2. Knowledge towards COVID-19

S.No	Authors	Knowledge Score	Knowledge Results
1	Singh ¹⁴	66% (9.97 ± 2.27 range 0 - 12)	60% have poor and 40% have good knowledge level.
2	Hussein ¹⁵	75.8% (9.1 ± 2.1 range 0 - 12)	86.2% of participants have better knowledge on infection prevention, 67.7% knew about mode of transmission.
3	Peng ¹⁶	82.34%	The female students had significantly higher score than that of male students, similarly public school students scored higher than private school students.
4	QiXue ²²	11.05 + 1.13 (range 0 - 12)	Students have lower awareness levels in terms of the suspected host (70.1%), using separate cutting board and cooked food (80.6%) and fully cook meat, eggs and milk, 2.1% thought visiting relatives and friends during the outbreak was right.
5	Marwa ²³	83% (10 + 1.2 range 4 - 12)	72.5% of the students possessed a good knowledge level. 37% knew about coagulation dysfunction as one of the major cause for death with severe COVID-19, 12% did not know the features of COVID-19, 88% knew about transmission route.
6	Fedrous ¹⁷	48.3%	The younger population had significantly higher score than that of old population, similarly people from rural area scored higher than that from urban area.
7	Qutob ¹⁸	NA	79.3% of respondents have correct knowledge on transmission of disease, 55.6% have known about symptoms and 81% had knowledge on preventive measures and 82% had knowledge on identifying risk groups. Younger participants demonstrated more knowledge than that of older population.
8	Poudel ¹⁹	84.25% (10.11 + 1.26, range 0 - 12)	Knowledge among higher secondary level students was found to be lower than that of Bachelor level students, only 30.6% knew about modes of transmission of the virus.
9	Banik ²⁰	94.6% 8.5 (2.6 range 0 - 13)	61.2% had adequate knowledge, 91.4% identified common clinical symptoms, 89.4% knew transmission can be decreased by wearing mask, 51.5% knew that virus is the cause of the disease.
10	RineChristopher ²¹	99.5%	Knowledge is gained mainly through social media and television.

ATTITUDE TOWARDS COVID-19

Table 3 shows that the attitude score ranged from 4.54 + 1.76 (range 0 - 8) in Wuhan, China where 50.7% were optimistic towards the COVID-19 epidemic and 37.2% participants were quite worried about being infected with COVID-19.²² In contrast to other study done in China this study showed low attitude regarding COVID-19 in Wuhan, it may be the reason behind the origin of the infectious disease there. The highest attitude score is shown to be 79.5% in Nigeria where 52.1% of respondents perceived that the government is not doing enough to curtail COVID-19, 61.8% have no confidence in the present intervention by Chinese doctors and 29% would accept COVID-19 vaccine when available,²¹ even though the overall literacy rate in Nigeria is 62.02% this study which was done in Northern Nigeria which has the literacy rate of 72.9% which may be the reflection of the positive attitude towards COVID-19. In India 27% believed to be at risk, 97.8% accepted social distancing and 99.9% have positive attitude on lockdown as a good strategy.¹⁴ Another study done in Iraq showed 69.8% agreed that the local authority can control the infection, 86.7% showed confidence that the battle against the virus will be won by the government.¹⁵ The population in Iraq have strong belief in their Government to combat COVID-19 pandemic. Another studies done in China and Bangladesh showed female have scored significantly higher scores than that of males.^{16,17} This could have resulted as females are more prone to practice hygienic habits and have good attitude in comparison to males. Similarly, in Palestine 62.4% agreed that strict measures have to be enforced by Government, 94% believed that Government is capable to stop and spread corona virus.¹⁸ Palestine people also have strong belief that government is doing good and will also do good in future. In Nepal, 71.5% agree that COVID will be controlled and 80% had full confident that we will win the battle against COVID-19.⁹ This proves that Nepalese people are very confident about control of COVID -19. Another study in Bangladesh showed that 87% agreed that COVID-19 will be controlled, 55.3% believed that COVID-19 is a deadly disease and 80.1% were optimistic in self awareness as necessary to remain free from COVID-19.²⁰ Similar study in Wuhan, China showed 50.7% were optimistic towards the COVID-19 epidemic, 37.2% of the participants were quite worried about being infected with COVID-19²² as Wuhan is the origin of this pandemic. The respondents were very much terrified with the consequences of COVID-19. Another study done in Egypt showed 87% were confident that the health care team and scientists can win the fight against COVID-19 virus. 72% have positive attitude on successful

control of COVID-19.²³ This showed that people from Egypt have strong belief in their Government.

PRACTICE TOWARDS COVID-19

Table 4 shows the practice scores; The lowest score is in Bangladesh, where it was found to be 51.6% where 75.2% washed their hands and 70.6% always wear masks and 62.1% avoided going to any crowded places. However, it differs in terms of gender, educational level and place of residence.¹⁴ Females have good practice and respondents with higher education and respondents living in urban area have good practices regarding COVID-19. Despite literacy rate of 76.67% in males and 71.18% in females, practice regarding COVID-19 is low in Bangladesh. The study done in Shaanxi province, China showed a very good practice; 87.9% having proactive practices where females had higher scores than that of males and students in higher grades had higher scores.¹⁶ The participants of the study were mostly young population and it also included the medical students which might be the reason that respondents had good practice regarding COVID-19. Similar study in India showed 98.7% have practiced hand washing, 97.4% covered mouth and nose while coughing, sneezing, 97% maintained social distance with person that has fever, 21.2% cooked meat and egg well, 97.8% stayed at home, 87% would go to hospital if infected, 58.4% were willing to stay in quarantine if infected.¹⁴ Regarding knowledge, the respondents from India had poor scores but viewing the score of practice it was found to be very good. It might be due to our culture and practice of cleaning habits like washing, cleaning etc. Similarly in Iraq, 93% had not been in any area with crowd which was a very good practice and 57.3% used mask when going out.¹⁵ Another study conducted in Bangladesh showed that older population scored higher than that of the younger population and those with higher education, housewives, students and respondents from urban had higher scores.¹⁷ Regarding knowledge, young population scored higher but when it came into practice the older population scored higher. It might be due to the experience that they earned through life time. In Palestine, 77% were complied with preventive measures, and women were more complying than men; scores relating to practice is good among people in Palestine. In Nepal, 92.4% wore masks while going outside, 85.7% washed their hands regularly and 93.73% covered their mouth and nose while sneezing.¹⁹ Regarding practice, Nepal

has also shown good results. It might be the result of public awareness delivered by the Government from the beginning of the pandemic. Another study done in Bangladesh showed 75.2% washed their hands with soap and hand sanitizers, 70.6% always wore masks while going outside, 62.1% avoided going to any crowded place, it showed good practice among the respondents. Practice scores differed in terms of gender, that is female practiced better than males. Respondents with higher education level and respondents residing in urban areas have better practice regarding COVID-19.²⁰ In Nigeria, 92.7% practiced social distancing and self isolation, 96.4% maintained personal hygiene, 82.3% used face masks which was an outstanding score.²¹ Despite low literacy rate in comparison to China and other countries, all good practices regarding COVID-19 is very well practiced in Nigeria. In Wuhan, China 93.7% washed

their hands frequently during COVID-19 outbreak, 85.6% choose to wash hands after coughing or sneezing, 4.7% of them did nothing during the epidemic, 52% of students used to share information about COVID-19 with others.²² This might be due to the awareness of the disease that devastated Wuhan at the very beginning. Similarly, in Egypt 87% were not going to any crowded places, 50.5% did not wear masks while going outside and female displayed lower tendency to go out than males.²³ The practice of not going out was good among the respondents and as the trend or the culture, females stay inside home most of the time and males go outside as bread winners, the finding also supported the fact. The major limitation of this review is that it has included only the studies published before April 2021 and we just reviewed and presented the study reports.

Table 3. Attitude towards COVID-19

SN	Authors	Attitude Score	Attitude Result
1	Singh ¹⁴	NA	Risk perception, prevention, intention was analysed, 27% believed to be at risk, 97.8% accepted social distancing, 99.9% have positive attitude on lockdown as a good strategy.
2	Hussein ¹⁵	NA	69.8% agreed that the local authority can control the infection successfully, 86.7% showed confidence that the battle against the virus will be won by the government.
3	Peng ¹⁶	73.81% had positive attitude	The female students had significantly higher score than that of male, similarly public school students scored higher than that of private school students.
4	QiXue ²²	4.54 + 1.76 (range 0 - 8)	50.7% were optimistic towards the COVID-19 epidemic, 37.2% of the participants were quite worried about being infected with COVID-19
5	Marwa ²³	NA	87% were confident that the health care team and scientists can win the fight against COVID-19 virus and 72% have positive attitude on successful control of COVID-19.
6	Fedrous ¹⁷	62.3%	The female had significantly higher score than that of male, older population scored higher than the younger population, and those with higher education, married and housewives had higher scores.
7	Qutob ¹⁸	NA	62.4% agreed that strict measures have to be enforced by the Government to limit the spread of virus, 94% believed that the Government is capable to stop the spread of virus, majority were optimistic that COVID-19 infection can be controlled. Women showed more optimism than men and respondents with higher education were less optimistic than those with lower educational level.
8	Poudel ¹⁹	NA	71.5 % agreed that COVID-19 will be controlled and 80% had full confident that we will win the battle against COVID-19.
9	Banik ²⁰	78.9% positive score	87% agreed that COVID-19 will be controlled, 55.3% believed that COVID-19 is a deadly disease. 80.1% were optimistic in self awareness is necessary to remain free from COVID-19.
10	Rine Christopher ²¹	79.5%	52.1% of the respondents perceived that the government is not doing enough to curtail COVID-19, 61.8% have no confidence in the present intervention by Chinese doctors and 29% would accept COVID-19 vaccine when available.

Table 4. Practice towards COVID-19

SN	Authors	Practice Score	Practice Result
1	Singh ¹⁴	NA	98.7% have practiced hand washing, 97.4% covered mouth and nose while coughing, sneezing. 97% maintained social distance with person that has fever, 21.2% cooked meat and egg well. 97.8% stayed at home, 87% will go to hospital if infected, and 58.4% are willing to stay in quarantine if infected.
2	Hussein ¹⁵	NA	93% had not been to any area with crowd and 57.3% used masks when going out.
3	Peng ¹⁶	87.9% had proactive practices.	Females had higher scores than that of males and students in higher grades had higher scores.
4	QiXue ²²	8.76 + 1.65 (range 0 - 10)	93.7% washed their hands frequently during the COVID-19 outbreak, 85.6% chose to wash hands after coughing or sneezing, 4.7% of them did nothing during the epidemic including hand washing and 52% of students used to share information about COVID-19 with others.
5	Marwa ²³	NA	87% were not going to any crowded places, 50.5% did not wear masks while going outside, female displayed a lower tendency to go out than females.
6	Fedrous ¹⁷	55.2% had proactive practices.	Females had significantly higher scores than that of males, older population scored higher than the younger population, and those with higher education, housewives, students and respondents from urban had higher scores.
7	Qutob ¹⁸	81%	77% were complied with preventive measures, women were complying more than men, there showed no significant differences in behaviours across different age group and educational level.
8	Poudel ¹⁹	NA	92.4% wore masks while going outside, male participants were more likely to go outside in crowded places, female participants wore masks more compared to males. 85.7% washed their hands regularly and 93.73% covered their mouth and nose while sneezing.
9	Banik ²⁰	51.6%	75.2% washed their hands with soap and hand sanitizers, 70.6% always wore masks while going outside, 62.1% avoided going to any crowded places. Practice score differed in terms of gender, educational level and place of residence.
10	Rine Christopher ²¹	NA	92.7% practiced social distancing and self isolation, 96.4% maintained personal hygiene and 82.3% used face masks.

CONCLUSIONS

This review study reveals that among 10 studies on knowledge, attitude and practice during pandemic six studies showed that respondents have good knowledge on COVID-19, four studies have found a good and optimistic attitude among respondents and seven studies indicated the respondents have good practices. The findings also indicated that participants have better knowledge on infection prevention, identifying common clinical symptoms and modes of transmission. Female respondents have higher scores in knowledge; attitude and practice scores and younger respondents have significantly higher knowledge scores but are poor in attitude and practice. Knowledge among higher secondary level students was found to be lower than that of bachelor level students and knowledge is gained mainly

through social media and television. Good knowledge, attitude and practice are tools that can hopefully be used to control the spread of COVID-19. So knowledge, practice and attitudes must be upgraded through online methods, social media, television etc so that the optimum scores can be obtained in order to combat COVID-19. Maintaining social distance, wearing masks, frequent handwashing, isolating, covering nose and mouth while coughing and sneezing and applying infection prevention measures are the basics for controlling COVID-19 which cannot be accomplished until and unless each and every human kind are equipped with it.

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REFERENCES

1. World Health Organization. Rolling updates on coronavirus disease (COVID-19) <http://www.who.int/emergencies/diseases/novel-coronavirus-2-19/events-as-they-happen>
2. https://www.worldometers.info/coronavirus/?utm_campaign=homeAdvegas1 retrieved on May 10
3. <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports> retrieved on May 10
4. World Health Organization. Coronavirus disease (COVID-19) situation report-107 data http://www.who.int/docs/default-source/coronavirus/situation-report/20200506/covid-19-sitrep-107.pdf?sfvrsn=159c3dc_2
5. <https://www.worldometers.info/coronavirus/country/nepal/> retrieved on May 10
6. World Health Organization, Risk Communication and Community Engagement (RCCE) readiness and response to the 2019 novel. WHO 1-7 [http://www.who.int/publication-detail/risk-communication-and-community-engagement-\(rcce\)-action-plan-guidance](http://www.who.int/publication-detail/risk-communication-and-community-engagement-(rcce)-action-plan-guidance)
7. Centre for Disease Control and Prevention. Corona virus how COVID-19 spreads. CDC. <https://www.cdc.gov/coronavirus/2019-ncov/faq.html#How-COVID-19-Spreads>.
8. World Health Organization. Q&A on coronavirus disease (COVID-19). n.d. <http://www.who.int/emergencies/diseases/novel-coronavirus-2019/question-and-answers-hub/q-a-detail/q-a-coronaviruses>
9. Bi Q, Wu Y, Mei S, Ye C, Zou X, Zhang Z, et al. Epidemiology and transmission of COVID-19 in China a Retrospective cohort study. *LID*. 2020; DOI: [http://doi.org/10.1016/S1473-3099\(20\)30287-5](http://doi.org/10.1016/S1473-3099(20)30287-5)
10. Centre for Disease Control and Prevention. Symptoms of coronavirus. CDC. <http://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/symptoms.html>
11. Centre for Disease Control and Prevention. How to protect yourself and others CDC. <http://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/prevention.html>
12. Centre for Disease Control and Prevention. Interim clinical guidance for management of patients with confirmed Coronavirus disease COVID-19. CDC. <http://www.cdc.gov/coronavirus/2019-ncov/hcp/clinical-guidance-management-patient.html>
13. <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/covid-19-vaccines> retrieved on May 10
14. Singh JP, Sewda A, Gupta SD. Assessing the Knowledge, Attitude and Practice of Students Regarding the COVID-19 Pandemic. *JHM*. 2020; 22(2):281-290. DOI:10.1177/0972063420935669 journals.sagepub.com/home/jhm
15. Nawfal RHI, Naqid A, Karwan J, Basheer AA. Assessment of Knowledge, Attitudes and Practices towards COVID-19 virus among university students in Kurdistan region, Iraq: online cross-sectional study. *JFMPC*. 2020;9,(9) 4809-14 DOI: <http://login.research4life.org/tacsgr1doi.org/10.4103/jfmpe.jfmpe87020>
16. Peng Y, Pei C, Zheng Y, Wang J, Zhang K, Zheng X, et al. A Cross Sectional Survey of Knowledge, Attitude and Practice Associated With COVID-19 among Undergraduate Students in China. *BMCPH*. 2020;20(1):1-8. DOI: <https://doi.org/10.1186/s12889-020-09392-z>

17. Fedrous MZ, Islam S, Sikder T, Syed AM, Zegerra JA, Gozal VD. Knowledge, Attitude and Practice regarding COVID-19 outbreak in Bangladesh: An online- based cross sectional study JPO. 2020; 15(10):e0230254. DOI:10.1371/journal.pone.0239254
18. Qutob N, Awartani F. Knowledge, Attitude and Practice towards COVID-19 outbreak A cross sectional survey. JPO. 2021;16(1):e0244925. <https://doi.org/10.1371/Journal.pone.0244925>
19. Poudel S, Shrestha P, Karmacharya I, Pathak OK. Knowledge, Attitude and Practice toward COVID-19 among Nepalese residents during the COVID-19 outbreak: An online cross sectional study. RS. 2020; DOI: 10.21203/rs.3.rs-31044/V1
20. Banik R, Rahman M, Sikder T, Rahman QM, Ur M, Pranta R. Knowledge, Attitude and Practice to the COVID-19 Pandemic among Bangladesh Youth A Web Based Cross Sectional Analysis, JPH 2021; DOI: <http://doi.org/10.1007/s10389-020-01432-7>
21. Reuben RC, Danladi MMA, Saleh DA, Ejembi PE. Knowledge, Attitude and Practices towards COVID-19: An Epidemiological Survey in North Central Nigeria JCH. 2020;7:1-14 DOI: 10.1007/s10900-020-00881-1
22. Xue Q, Xie X, Liu Q, Zhou Y, Zhu K, Wu H, et al. Knowledge, attitude and practices towards COVID-19 among primary school students in Hubei Province. CCYS. 2020. DOI: <http://doi.org/10.1016/j.chilyouth2020.105735>
23. Marwa S, Hamza O, Badary A, Elmazar MM. Cross Sectional Study on Awareness and Knowledge of COVID-19 among Senior Pharmacy Students. JCH. 2020;15:1-8 DOI: 10.1007/s10900-020-00859-z