Original Article

Knowledge, Attitude, and Preventive Behavior Related to Covid-19, Associated Factors And Impact of Information Exposure and Beliefs among College Students: A Review

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DOI: 10.47750/pnr.2022.13.S05.46

Abstract

Background:- The highly contagious zoonotic coronavirus (SARS-COV-2) spread to most parts of the world and created a public health emergency in almost 200 countries. Many sources of information and suggestions were developed to guide the public about its transmission and prevent infection. The pathogen responsible for the infection is acute respiratory syndrome coronavirus-2 (SARS-CoV-2). The World Health Organization (WHO) made a collaborative effort to tackle the situation and declared it a global pandemic on March 12, 2020. The regularly updated COVID-19 dashboard reported 40, 49, 10,528 confirmed cases and 57, 83,776 deaths globally by this deadly virus by February 12, 2022 (World Health Organization, 2022).

In India, COVID-19's first case was reported in Trissur, Kerala, on January 27. A 20-year lady had a history of traveling to China (Andrews MA et al., 2020). Rapid migration of people from the global perspective and between the cities increased the spread of transmission all over the major cities of India. Evidenced-based strategies like social distancing and personal and respiratory hygiene with sustained public cooperation in different countries were mandated to prevent the spread of diseases. The WHO has also issued recommendations for the prevention and control of infection among the general population and healthcare facilities, including hand cleanliness, face masks, social distancing, avoidance of crowds, self-isolation, and immediate medical attention for the person with symptoms of fever, cough, and headache (WHO, 2020).

Methods: - An online or web literature review or articles related to Covid-19 and knowledge, attitude, practices, and compliance were conducted through PubMed/Google scholar and BMJ and NIH databases published between Jan 2019 to Jan 2022.

Results: - The present review revealed that students' knowledge levels varied from appropriate to high. A positive attitude and acceptable preventive behavior among college students toward Covid-19 were demonstrated. Education level, nationality, habitat, psychological factors, risk perception, health literacy, and early disease awareness were positively associated with knowledge, attitude, and preventive behavior. Those who received most of the information from the World Health Organization, government sources, social media, and TV news channels had good knowledge, positive attitude, and adherence to acceptable preventive behavior. The students with false beliefs and misinformation depicted common knowledge and negative attitude towards COVID-19.

Conclusion: - There is a need to convey relevant and updated information through different media access by the student community. Myths and tackling misinformation are substantial as the correct information correlates with increased knowledge, a positive attitude, and more adherence to COVID preventive measures.

Key words: - COVID-19 pandemic, knowledge, perception, compliance, and college students.

INTRODUCTION:

The world health organization declared the outbreak of severe acute respiratory syndrome, the virus responsible for COVID-19, on March 12, 2020. It had reached a global pandemic; within one week, over 107 nations worldwide affected the lives of more than 862 million students.

COVID-19 is caused by a previously unreported strain of coronavirus, officially named Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2). It often spreads via tiny infected droplets through coughing, sneezing, or talking, from close contact from an infected person to person, and on contaminated surfaces (CDC, 2020a; WHO, 2020c). COVID-19 is most contagious immediately after the onset of symptoms, although the spread through asymptomatic cases has been reported (Bi et al., 2020). The incubation period is around five days (range, 2–14 days), and common symptoms include fever, cough, and shortness of breath (CDC, 2020b, 2020c; Chen et al., 2020; Elsevier, 2020). There was no known vaccine or effective antiviral treatment for COVID-19 (WHO, 2020c), only symptomatic management and

supportive therapy (CDC, 2020d). Therefore, it is essential to empower people by educating them and effectively communicating accurate information about preventive measures (e.g., handwashing, covering one's mouth while coughing or sneezing, maintaining social distancing, and self-isolation). As researchers continue to study COVID-19 pathogenesis, new information is being generated daily. However, the pandemic-induced panic has rapidly spread myths and misinformation. Therefore, governments have urged citizens to confirm the authenticity of information before sharing it with others.

University students represent a unique subset of the student population that has more autonomy and pressing needs to live independently but lacks life experience. They are the most active on social media platforms. Their perceptions and behaviors could have a massive impact on the spread of a pandemic (Peng et al., 2020). Therefore, it is essential to evaluate their understanding of the COVID-19 pandemic. to assess the knowledge, attitude, and compliance associated with COVID-19 among college students.

During the closure of institutes, worldwide online learning was adopted to ensure the continuation of education without interruption. They have quickly initiated at all academic levels without any time limits. Not only exacerbated the socio-economic healthcare gaps in many parts of the world. In due course, many studies are being conducted to understand SARS CoV-2 adolescents and college students who were infected were asymptomatic or pre-symptomatic

SEARCH STRATEGY:

The online literature from PubMed/Google Scholar, BMJ, and NIH databases from Jan 2019 to Jan 2022 were searched using key terms such as Covid-19 and knowledge, attitude, compliance, or practices among college students. During the initial stages of the search, titles, abstracts, and full articles were screened to segregate the eligible literature reviews. All the reviewed literature was reassessed for its appropriateness and relevance, and the needed data were drawn out.

The core questions included are:

1. What are the levels of knowledge, attitude, and preventive behaviour related to COVID-19 among college students?
2. What factors are associated with the knowledge, attitude, and preventive behaviour related to COVID-19 among college students?
3. How do information exposure and beliefs impact the knowledge, attitude, and preventive behavior related to COVID-19?

Inclusion and exclusion criteria:

After identifying the related articles, the inclusion and exclusion criteria were decided and applied by the researchers. Articles including titles, abstracts, and full text published in English between Jan 2019 to April 2022 were included in the initial literature review process. These were screened as per the relevance of the current review. The irrelevant literature to the scope of this current study was excluded. Studies focussed on knowledge, attitude, and practices among healthcare workers, families, and the elderly were also excluded. The articles included knowledge, attitude, and practices related to Covid-19 among students. The students of different disciplines include arts and science, medical, nursing, paramedics, physiotherapy, dental, and allied health sciences.

Levels of knowledge, attitude, and practices related to COVID-19

Hamed Alzoubi et al. (2020) assessed the knowledge, attitude, and practice among medical and non-medical students in Jordan using a structured questionnaire among 592 students. The students' responses showed that the overall knowledge related to the symptoms was more than 90%. Nearly 99.7% of the students agreed on the importance of handwashing, and 68.4% believed wearing a mask would prevent the infection. The primary sources of knowledge were social media, the Internet, and television. A significant difference was noticed between medical and non-medical colleges. Study results recommended more detailed and directed measures and awareness campaigns to improve knowledge, attitude, and practice in some critical respects.[1]

Nawar Sahib Khalil et al. (2020), in a cross-sectional study among 1380 medical students, used an online questionnaire for two weeks to assess the association between the student's knowledge, attitudes, practices, and satisfaction with their demographic characteristics. The overall knowledge score of the students was 91.8%; more than 90% have a positive attitude and practice preventive measures toward COVID-19. was a significant difference in the KAP with the satisfaction with most of the demographic characteristics? The study concluded that medical students in Baghdad city had a generally higher level of knowledge, a positive attitude, and good practice and proactive behaviors toward COVID-19.[2]

Muhammad Saefi et al. (2020) examined Indonesian undergraduate students' knowledge, attitude, and practice. Data were collected during the first month of college or university closure due to COVID-19 through an online questionnaire using purposive and snowball sampling. The study's results may be used to assist in preventing and curbing the spread of CO VID-19 in the university. They can assist with planning educational interventions for the student's awareness**.**[3]

Maheshwari S, Gupta PK, Sinha R, and Rawat P (2020) assessed the knowledge, attitude, and practice of medical students towards COVID-19 by using a self-designed questionnaire. of the total participants (n=354), 50.3% were male,

and 54.5% were 21-23 years. Almost 96.6% of participants increased the frequency of washing their hands due to COVID-19. There was no significant relationship between age with knowledge and practices. The study concluded that most participants had good knowledge, positive attitudes, and acceptable practices. Practices were different for males and females. The study recommended that people should continue to strengthen their attitude and practice toward COVID-19. [4]

Olaimat AN (2020) assessed the attitudes, anxiety, and behavior practices of University students in Jordan regarding COVID-19 during the early infection period by using a validated self-administered questionnaire. The university students showed positive attitudes and low-risk practices toward COVID-19 prevention, averaging 81.1% and 84.3%, respectively. Two-thirds (69.1%) of the students showed a positive attitude toward COVID-19 seriousness, a concern about contracting the virus, appropriate prevention measures, and low-risk practices (67.6%) toward preventing COVID-19, including implementation of social distancing and good hygiene. More than two-thirds (69.2%) of the students were anxious that they might become infected with COVID-19. The study results would help the health authorities to develop appropriate educational programs and protective health measures to prevent disease transmission**.** [5]

Yaling Peng et al. (2020) conducted a cross-sectional survey to gather information related to the knowledge, attitude, and practices on COVID-19 among undergraduate medical and non-medical students during the home isolation during the outbreak and were recruited from 10 universities in Shannxi Province, China. Of 872 participants, 534 were females. Results showed appropriate knowledge among 82.34% of participants. Levels were significantly higher among undergraduates from public universities and significant among medical and non-medical. A positive attitude was reported among 73.81%, and comparatively, females showed a higher positive attitude than males. The majority of the subjects showed good practices. The data showed a positive correlation between attitude and practice. The study concluded that most undergraduates revealed necessary knowledge, positive attitude, and proactive practices**.** [6]

Noreen K, Rubab Z-e-, Umar M, et al. (2020) conducted a cross-sectional survey regarding knowledge, attitudes, and practices among the medical students of Pakistan regarding COVID-19 using a self-administered questionnaire on knowledge, attitude, and practices. Of 1474 medical students, 576(39.1% percent were males, andn898 (60.1%) were females. Two-thirds of participants had adequate knowledge, almost all the students had positive attitudes (92.5%), and 95.4% had good practices in COVID-19. Two-thirds of the medical students believed that the COVID-19 outbreak had affected their social, mental, and psychological well-being. As compared to male students, female medical students had more than two times ($p<.001$) and four times ($p<0.001$) positive attitudes and acceptable practices toward COVID-19.[7]

Alian A Alrasheedy et al. (2021) conducted a web-based survey in May 2020 among Unaizah College of Pharmacy, Qassim University pharmacy students. A total of 232 students were included in the study. The mean knowledge score was 9.87 $\pm$ 2.04. The participants believed that COVID-19 was a health threat to their community in the early months of the pandemic. Most students did not go to crowded places, and the majority were females following the strategies the authorities recommended to prevent the spread of the virus. They always felt or frequently felt nervous or anxious during the pandemic. The authors recommended the need for proactive addressing of the critical issues that could cause stress and anxiety among the students during emergency disaster situations**.** [8]

Sandro Provenzano et al.(2020),"evaluated the knowledge, attitude, and practices toward SARS-CoV-2 among the nursing students of the University of Palermo during the rapid rise period of the COVID-19 pandemic. The overall score indicates good practices among the three courses of study ($p=0.025$). Practice poor score" is statistically significant with the following independent variables: Another country of birth, "second" and "third" year of study, low perceived health status, and "Knowledge poor score. The study results suggested that health education programs aimed at improving COVID-19 knowledge are helpful for nursing students to hold optimistic attitudes and maintain appropriate practices.[9]

Dr. Farzana Begum (2020) assessed KAP towards COVID-19 among the B.Sc. nursing students of Saudi Arabia by an online KAP questionnaire. Overall, 72% of students gave the correct answer to the knowledge questionnaire. About 64% of them obtained scores above 10. In the current study, most participants reported that taking precautions such as avoiding crowded places, maintaining social distancing, and practicing proper hand hygiene indicates a general willingness to make behavioral changes towards the COVID-19 pandemic. This current survey indicated the need for more comprehensive education programs and a focus on misinformation in the form of conflicting opinions**.** [10]

Ataş O, and Talo Yildirim T(2020), assessed the Knowledge and attitude of 355 preclinical and clinical dental students at Fırat University Dentistry through an online questionnaire. The clinical and preclinical students were afraid of infecting themselves and their environment with COVID-19, and the difference between them was statistically significant. The students were aware of the standard measures to protect against the transmission of COVID-19. There was a need to provide psychological services for students affected by fears associated with the disease**.** [11]

Hamza MS. (2021) assessed pharmacy senior students' knowledge, attitudes, and practices towards the COVID-19 pandemic using an online survey. % were females, and 63% were living in greater Cairo. Their primary source of information included social media (70%), published articles (48%), and television (48%). The overall correct knowledge score was 83%. Most students displayed a good knowledge level (72.5%). The students were least informed about the timings of the necessity to wear masks. 72% of students agreed that COVID-19 would be controlled successfully. Good

behavioral practice toward COVID-19 control was confirmed among 87% of students. Females avoided going out 3.6 times more than males. 50% of students admitted that they did not wear masks when they left their houses**.** [12]

Leonardus Yodi Giovanni (2021) conducted an online cross-sectional study among 1,390 participating students; 51.4, 55.7, and 56.3% had sufficient knowledge, positive attitude, and positive practice, respectively. There were associations between knowledge and gender ($p = 0.005$), year of study ($p = 0.000$), location ($p=0.000$), and source of information ($p = 0.000$); between attitude and gender ($p = 0.022$), year of study ($p = 0.004$), and source of information ($p = 0.015$); and between practice and gender ($p = 0.000$) and source of information ($p = 0.000$). There were weak correlations between knowledge and attitude ($r = 0.246$, $p<0.001$); and between attitude and practice ($r = 0.272$, $p < 0.001$). Half of Indonesian medical students showed sufficient knowledge, positive attitude, and positive practice in COVID-19 prevention. Hence, improvement in COVID-19 prevention is required**.**[13]

Factors associated with the knowledge, attitude, and preventive behaviors related to COVID-19 among college students

Hatabu A, Mao X, Zhou Y, Kawashita N, Wen Z, Ueda M, et al. (2020) evaluated the KAP toward COVID-19 among university students in Japan between May 22 and July 16, 2020, through an online questionnaire. The study further also investigated the associated determining factors related to KAP factors. Out of the eligible respondents (n=362), 52.8% were female and 79% were undergraduate students. All respondents showed knowledge of avoiding enclosed spaces, crowded areas, and intimate situations. Respondents showed a moderate or higher frequency of washing their hands or wearing masks. Gender, major subjects, educational level, nationality, residence, and psychological factors were associated with the knowledge or attitude toward COVID-19.[14]

Singh JP, Sewda A, and Shiva DG (2020) explored the data about the knowledge, attitudes, and practices and the behavioral determinants of clinical outcomes among the university students of IIHMR through purposive sampling. Study results showed that more than 70 % of students had good knowledge of COVID-19 symptoms, mode of transmission, and preventive measures, and 66% knew about the treatment approaches. Media and TV were the primary sources of information; most students were willing to follow social distancing and lockdown guidelines. All students reported compliance with government health advisories. The study concluded that COVID-19 awareness and the impacts of various information sources on effective outbreak containment, improved community engagement activities, and effective communication are needed during widespread disease outbreaks**.** [15]

Wang Y (2020) explored the determinants of the Covid-19 outbreak using a network-based survey among 17,876 participants. The study revealed that education, health literacy on communicable diseases, measures for epidemic prevention and control risk of infection, impact on daily life, sleep duration, and frequency of hand washing were positively associated with knowledge, attitude, and practices related to Covid-19. The lack of usage of masks and their frequency was the negative determinant. The study concluded that the Outbreak of COVID-19 was detrimental to university and college students and their daily life. The study recommended that guidance and regulation for the negative effect and the improving the positive effect among college students should be mandated to control the spread of infection**.**[16]

Ding Y et al. (2020) surveyed through the Internet in a province in China. A total of 1461 students participated. The study results showed a higher risk perception of COVID-19. Higher risk perception was found among female college students ($p<0.01$), non-medical students ($p<0.01$), college students whose schools were in Hubei ($p = 0.01$), and college students with higher knowledge levels ($p<0.01$). The study concluded that with the strong infectivity and mysterious nature of COVID-19, it is essential to improve the risk perception of college students through health education through various means, and attention should be paid to some students with low-risk perceptions**.**[17]

Jia Y et al. (2021) assessed the knowledge, attitude, and practice toward COVID-19 of Chinese college students during the COVID-19 outbreak and identified the associated determinants via an online questionnaire in February 2020 using a self-administered questionnaire. Average scores were 32.16 ± 4.09, 16.84 ± 3.18, and 15.36 ± 1.83, respectively. The correct response rate was 84.62%. Many participants believed that the pandemic could be controlled through proper measures. Most respondents were wearing a mask when they went out. Multiple linear regression showed that female students had higher knowledge than males ($\beta = 0.79$, $P = 0.01$). A significantly positive correlation was found between the scores of COVID-19-related KAP among the students.[18]

Li S et al. (2021) assessed the sociodemographic information, self-reported Coronavirus knowledge, health literacy, eHealth literacy, and COVID-19-related health behaviors of 1873 college students, out of which 781(41.7%) had adequate health literacy: The mean score of COVID-19 related health behaviors was 53.77(SD-8.03), and the scores were different significantly about the residence, year of the study and primary academic, socio-economic level, self-reported health status and a family member infected with COVID-19. Regression analysis showed that health literacy and eHealth literacy were positively associated with COVID-19-specific precautionary behaviors and conventional health behaviors.[19]

Angelo AT (2021) conducted a cross-sectional study using a structured questionnaire of 402 randomly selected participants. The study results showed that 47%, 54%, and 42.8% had good knowledge, positive attitude, and practice

toward COVID-19. Rural residents, positive knowledge, and a positive attitude were positively associated with the practices of the students.[20]

Abat Woday Tadesse et al. (2021) conducted a cross-sectional study among 422 students by using a randomized sampling technique among students from four selected colleges. The response rate was 96.6%. Good knowledge, Positive attitude, and good practices were among 69.6%, 56.6%, and 65%, respectively. The students in the age group 16-20, living with a family size of fewer than five members, and being single were predictors of the level of knowledge. Besides, being single, attending diploma (TVET) level training, and being year-two students were predictors of attitude levels. Urban residents, regular students, and year-one students were the independent predictors of the practice level of students. In this study, only two third of the students had good preventive practice levels for COVID-19. [21]

Geddawy A (2021) evaluated health sciences students' knowledge, attitude, and learning satisfaction (HSS) regarding the COVID-19 pandemic using a cross-sectional study. The students were taken from the college of medicine, dentistry, pharmacy, and applied medical sciences. The mean knowledge score was 5.63 ± 0.65 out of 6, the attitude score was 4.22 ± 1.01 out of 5, and learning satisfaction was 11.28 ± 2.9 out of 19, attained by students. Study results are strongly associated with students' knowledge score, age group, and Specialty College. Students with chronic diseases reported lower attitude scores and a rate of COVID-19 vaccine-willingness. Younger HSS had a higher learning satisfaction score than older participants. The study concluded with the recommendation that Further studies are needed to improve the learning satisfaction and attitude of HSS in the future.[22]

Impact of information exposure and beliefs on knowledge, attitude, and preventive behavior among college students

Malik Sallam et al. (2020) evaluated the mutual effects of the belief that the pandemic resulted from a conspiracy on knowledge and anxiety levels among students at the University of Jordan by using an electronic survey questionnaire among students from the health, scientific, and humanities disciplines. A total of 1540 students enrolled in the study. Most participants perceived the disease as moderately dangerous (n = 1079, 70.1%). The data revealed a low level of knowledge and a higher level of anxiety about COVID-19. It was associated with believing that the disease was part of a conspiracy. Most students (n = 1018) received information from the Ministry of Health. The false belief that COVID-19 resulted from a global conspiracy could result from a lower level of knowledge about the virus..[23]

Ibrahim Alkaabi et al. (2020) assessed the source of information related to the knowledge, attitude, and practices of the QATAR university's National and non-national students by using a cross-sectional web-based questionnaire. Knowledge scores, on average, were 66.4%, with only significant differences between nationals and non-nationals. Scores were 69.72%, with a significant difference noted in safe COVID-19 practice scores related to the educational level of the participants. % of the participants adhered to COVID-19 policies and rules. In addition, the population reported relying on governmental press conferences (76.0%) as their primary source of gaining details concerning COVID-19, followed by social media (64.4%). The least popular resources were information gained from family, relatives, friends, and coworkers (47.4%) and the news channels on TV (46.7%). [24]

Nyeko R, Amanya S, Aleni M, et al. (2021) examined the COVID-19-related knowledge, attitude, and practices among undergraduate students in Uganda through an online cross-sectional survey using Google Forms sent via WhatsApp Messenger. Of 161 respondents, 102 (63.4%) were males, with a mean age of 24.2 (5.0), and 121 (75.2%) were pursuing health-related programs. The data revealed that overall, 110 (68.3%) had good knowledge, 76 (47.2%) had a positive attitude, and good practice. The practices were significantly associated with the male gender. The most 147 (91.3%) were receiving information about COVID-19 from news media, 134 (83.2%) from the Ministry of Health, and 125 (77.6%) from social media. 139 (86.3%) considered the ministry of health the most trustworthy source, and 21 (13.0%) minor social media. The overall KAP among the study group was low. [25]

Israa Baker et al. (2021) conducted a cross-sectional study to evaluate the KAP of Palestinian university students and their commonly used information sources. The results found that students' most trusted information was given by the World Health Organization (WHO), the Ministry of Health (MoH), and healthcare workers. However, they mostly got information from social media. The participants had a high level of knowledge about Covid-19, having an average score of 8.65. total, 76% avoided going to crowded places, and only 33% wore a mask while being outdoors. The vast majority (93%) checked the accuracy of COVID-19-related information before publishing it, 56% used the WHO and MoH briefings for fact-checking, and only 8% relied on healthcare workers. This study provided insight into the information sources used by Palestinian university students, the sources they trust, and the information formats they prefer. These results recommended that the public health authorities locate the information sources through which university students should be targeted. Also, efforts were recommended to healthcare workers as credible information sources. In this way, they will prevent the spread of misleading information and provide high-quality information, especially within unconventional settings such as refugee camps.[26]

Lincango-Naranjo et al. (2021) conducted a cross-sectional study to describe Ecuadorian final-year medical students' knowledge, attitudes, and practices that could potentially guide the design of better medical education curricula regarding

COVID-19. Email, Facebook, and WhatsApp sent the questionnaire. Of 390 students, more than 70% of students' scores were above the average, and the majority were pessimistic about possible government actions; 91% of students claimed that they did not have adequate protective equipment. The findings were significantly associated with negative attitudes. The study concluded that providing the necessary tools and creating a national curriculum may be one of the most effective ways to ensure all students are trained while simultaneously focusing on the students' most pressing concerns.[27]

Dangui Z and William Ba-Thein (2022) investigated the experience of Chinese medical college students from March-April 2020 by using a cross-sectional, self-administered, anonymous online survey. 61.7% were aware of the outbreak via the Internet, 57.8% via WeChat, and 49% via Weibo. Nearly all students were aware of COVID-19 manifestations, incubation period, and transmission modes. Nearly half of the population considered wearing facemasks and hand hygiene effective in epidemic interventions. 83.4% to 99.4% had positive attitudes and good compliance toward home quarantine and adhering to preventive measures. Hand hygiene practices were significantly better among female students than males. The students from educated families had significantly more positive attitudes and compliance than those not educated. This current study explored the multichannel risk communication, early awareness, positive attitudes, and conformity of medical college students that might have contributed to the favorable outcome of the COVID-19 epidemic in China.[28]

CONCLUSION:

The present review revealed that students' knowledge levels varied from appropriate to high. A positive attitude and acceptable preventive behavior among college students toward Covid-19 were demonstrated. Many sociodemographic factors, such as education level, nationality, habitat, psychological factors, risk perception, health literacy, and early disease awareness, were positively associated with knowledge, attitude, and preventive behavior. It is also observed that students who received most information from the World Health Organization, government sources, social media, and TV news channels had good knowledge, positive attitude, and adherence to acceptable preventive behavior. The students with false beliefs and misinformation depicted common knowledge and negative attitude towards COVID-19.

Based on the findings, it is recommended that knowledge and attitude be directed toward strict preventive behaviors to prevent the spread of the disease. Awareness about COVID-19 and adherence to prevention as per recommendations play a significant role in managing the disease, primarily affected by knowledge, attitudes, and practices (KAP). Clear, accurate, consistent, early risk communication by authentic sources; local, national, and international public health authorities is critical to promote public understanding and correct risk perception and psychological factors and attitudes, leading to optimal conformity.

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