



AN ONLINE SURVEY TO ASSESS THE KNOWLEDGE OF COVID 19 AND ITS VACCINATION AMONG NURSING STUDENTS

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ABSTRACT

The COVID 19 pandemic has impacted all our lives. It has been on our minds and is part of our daily conversations ever since it emerged in its various forms affecting individuals irrespective of nation, caste, creed, color or religion. What began in Wuhan city of China has now spread far and wide. One wave after another it strikes, as the COVID virus mutates and lingers. The frontline workers of the health care setting are at higher risk of exposure to the illness and also developing the disease. They are forced to risk their lives taking care of these patients in their times of crisis and ensuring that their lives are saved. The present study assessed the knowledge of the undergraduate nursing students on COVID 19 and its vaccination. An online survey questionnaire was sent to all the students at the same time on a chosen day. The form had a demographic profile and a set of knowledge questions on COVID 19 and its vaccination. A total of 15 questions were sent to the students. A total of 673 students answered the survey. Majority of the students who answered the survey (48.27%) were within the age limit of 18-20 years. A total of 90 students (13.37%) had symptoms of the disease but did not evaluate themselves for the same. Only 19.97% of the students were tested positive for COVID. Among the group 15.16% of the family members developed COVID. There was a significant association between knowledge and a family member having COVID. The p value was < 0.001 when comparing the knowledge score with age and year of study was also noted that there was a significant association between the knowledge score and those tested positive with COVID.

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INTRODUCTION

On March 11, 2020 the World Health Organization (WHO) declared the novel coronavirus (COVID-19) outbreak as a global pandemic. Ever since then the number of patients infected with the virus began to increase rapidly. By May 25, 2020, the WHO Director General declared COVID-19 cases to reach 5,500,607 with 346,721 deaths.



The causative organism is the SARS – COV- 2 which presents with symptoms like fever, dry cough, and fatigue which lead to complications like difficulty in breathing, chest pain, difficulty in talking, and moving. This SARS-CoV-2 is a highly infectious virus that spreads through direct human-to-human contact and indirect contact with contaminated objects. The WHO also says that SARS-CoV-2 can be transmitted through droplets from body fluid, from the nose and mouth, which can spread when a person with COVID-19 coughs, sneezes, and talks. Human to human transmission was confirmed by WHO by end of January 2020. WHO also studied the signs and symptoms of the patients who presented with the illness and identified it as fever, sore throat, and mild to moderate respiratory difficulty. Most of them experienced only mild symptoms without treatment.

The best way to prevent transmission and slow down the spread as reported by WHO is keeping the public well informed about the nature of the virus, its mode of transmission, and also sensitize people about washing their hands with soap and water or using hand sanitizers frequently, avoid touching the eyes, face, mouth and nose without washing or sanitizing the hands, to maintain social distance as much as possible and staying home. WHO also instructs individuals to practice respiratory etiquette such as coughing and sneezing into a flexed elbow, covering the mouth and nose with handkerchiefs or tissue paper, and wearing masks. UNICEF highlights that touching contaminated surfaces is also a possible mode of transmission, since the virus may survive for several hours and days in these areas. Hence it is essential to follow all the guidelines put forth by WHO.

Knowing that nurses play a pivotal role in the health care setting and also keeping in mind professional roles nursing students will take up in future, their role in health care teams, this study aims to assess their knowledge towards the COVID 19 illness and need for vaccination. Students have to get vaccinated before entering the clinical practice areas so that they can be protected and their behaviour in turn can protect others contributing to the break in the chain of infection. The researcher feels that a change in their knowledge towards the pandemic can influence their family, friends and the patients they meet in the community and hospital. This in turn can influence the society at large bringing about the desired attitude, practice and behaviour towards the existing pandemic.



MATERIALS AND METHODS

This descriptive study was conducted in 2023 in a private college in Tamil Nadu, India among 673 undergraduate students after getting approval from the institutional research board. The study was conducted using google forms questionnaire distributed to Whatsapp official groups used by the students to communicate any official information.

The questionnaire consisted of three main parts. The first was the information sheet including the consent for the study. The second section had the demographic variables and the third section had 20 questions which had 15 questions on COVID disease and 5 questions on vaccination. Content validation was done by experts in the field and the CVI index for the questionnaire was 0.88.

Socio-demographic data in the questionnaire consisted of gender, age in years, year of study, type of family, location, if individual was tested COVID positive, had symptoms but not tested positive and if any family member was tested positive with COVID.

Knowledge part of the questionnaire include data on expansion of COVID, cause of COVID 19, structure of the virus and the reason it is named so, reason why it became a pandemic, signs and symptoms of COVID-19, how to care for a patient with COVID 19, CT scan finding and diagnosis of patient with COVID 19. Questions on vaccine included the purpose of the vaccine, the available form for use, the type of vaccine available in the country and contraindication of the vaccine.

All students were met on the same day in the evening with their mobiles. A time slot was given for each class and they were met one after the other after making them sit in different rooms. This was done to avoid contamination. The google forms was sent in the Whatsapp group for all the students. After the responses were received the form was deleted from the Whatsapp messages before the next group of students were met. Students were informed to fill the survey if they had read the consent form and agreed to be study participants. Students who failed to complete the form or were absent were excluded from the study. Confidentiality of the participants was maintained. The data was analyzed using descriptive and inferential statistics.

Data collection

The questionnaire was in English. After content validation it was uploaded in google forms and the link was distributed in the official Whatsapp groups. The students who clicked the link were directed to a Google form which had the information page and the questionnaire. A consent was obtained at the end of the information page as yes or no. If they chose "yes" as the option the page moved on to the next section if they chose "No" the link closed. To avoid



missing data the form was designed in such a way that every question was mandatory to be answered. When the participants had completed the questionnaire the submit option appears and when they click the option the questionnaire was stored in the google drive for retrieving for analysis.

Sample size calculation and Statistical analysis

Total enumerative sampling technique was used. A total of 686 samples were available. Considering the fact that some may not be willing to participate, some may be less than 18 years of age and some may not be available on the particular date, the sample size was estimated as 650. However, all those who were 18 years and above and completed the survey being available on that day were 673.

Statistical Package for Social Sciences (SPSS) version 25 was used for analysis. The demographic data was presented as simple frequency (n) and percentage (%), level of outcome measures expressed as mean and standard deviation (SD). Chi square test was done to find the association between demographic variables and knowledge. A p-value of 0.05 or less was considered statistically significant.

RESULTS

The responses of the students were analyzed. Demographic data and the knowledge of all the 673 participants were assessed. The association of knowledge with the demographic variables were also assessed. The demographic data is shown in Table 1. About 646 (96%) participants were females, and 27 (4%) were males as shown in Fig.1. In this study students from different batches participated. This included batches from 2019 to 2022 (undergraduate students). The batch of 2019 were the COVID batch of students, which consisted of 97 students (14.41%) who were the final years. The first years were a total of 198 students (29.42%), second years were 193 (28.68%), the third years were 185 (27.49%). With regards to the age distribution of students in this study, majority of the students (48.27%) were between the age groups of 18-20 years and 3.92% were >22 years as shown in Fig.2 The study also revealed that a majority i.e., 89.9% lived in nuclear families and the remaining 10.1% lived in joint families. The number of students who were tested COVID positive were 129 (19.2%), the remaining 80.8% remained healthy. Only 13.4% of these students had symptoms of COVID but they were not tested for the same. A total of 102 students (15.2%) reported that their family members suffered from symptoms of COVID but were not tested for the same.



Table.1
Frequency and percentage of demographic variables

DEMOGRAPHIC VARIABLE		FREQUENCY	PERCENTAGE
Batch of study	2022	198	29.42
	2021	193	28.68
	2020	185	27.49
	2019	97	14.41
Type of family	Nuclear	605	89.9
	Joint	68	10.1
Have you had symptoms of COVID	No	583	86.6
	Yes	90	13.4
Have any of your family members staying with you had symptoms of COVID 19 but not tested?	No	571	84.8
	Yes	102	15.2
Have you had symptoms of COVID 19 but not tested?	No	583	86.6
	Yes	90	13.4
Have you been tested COVID positive	No	544	80.8
	Yes	129	19.2

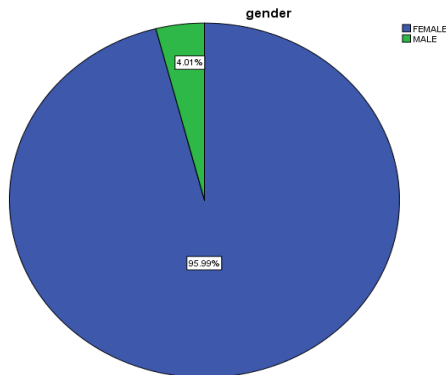


Figure.1 Distribution of Gender

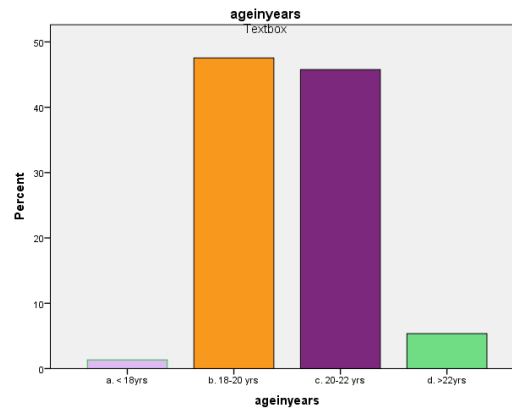


Figure.2 Distribution of age in years

The distribution of knowledge among the participants is shown in Figure.3. The results indicate that the mean score for overall knowledge (mean $\pm$ SD) was 10.36 ± 2.01 . On assessing the mean score for knowledge on COVID 19 disease, the minimum score was 3 and the maximum score was 11. The mean and SD was 7.56 ± 1.49 . The study findings also revealed a maximum score of 4 for the 4 items assessed on knowledge of COVID 19 vaccine. The mean and SD was 2.79 ± 0.93 .

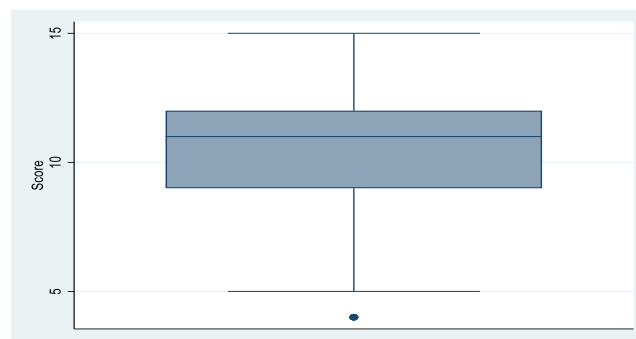


Figure.3 Distribution of knowledge mean score

Majority of the students (93.61%) were able to identify the causative organism for COVID 19. The reason of COVID 19 being declared as pandemic was rationalized by 96.88% of the students. Frequently reported signs and symptoms of COVID 19 was thought to be fever, cough, loss of smell, fatigue and myalgia, by 82.47% of the students. The emergency warning signs requiring medical attention when on home isolation was identified correctly by 89% of the



students. The question on complications of COVID being severe in a 75year old with DM was recognized by 94.35% of the students. More than half (51.87%) of the students were able to expand COVID 19 and 68.5% were able to recognize why the COVID virus is named so. The first action to be taken for a patient who is suspected to have COVID 19 was identified as “Isolate patient and follow contact and air borne precautions” by 64.04% of the students. Only 30.67% of the students were able to point out that ground glass opacities were the CT findings of the lungs in COVID 19 patients or victims. The position helping in improving oxygenation in COVID 19 was recognized by only 3.86% of the students.

Questions on vaccination included the vaccine not available in India which was identified as Moderna by 89.30% of the students. The reason for administration of vaccine was recognized by only 39.97% of the students. The form of vaccine availability was answered correctly by 95.54% of the students. more than half of the students (55.13%) were able to pick out the contraindication for vaccine administration as an individual with active or suspected COVID 19 infection.

The association between knowledge and demographic variables shows statistical significance of a p value less than 0.01 in some variables as shown in Table.2

Table.2 Comparison between demographic variable and knowledge mean score

Demographic variable	Knowledge	
	Mean (SD)	p-value
Gender		
Male	10.26 (0.79)	0.786
Female	10.37 (0.49)	
Type of family		
Nuclear	10.33 (0.83)	0.227
Joint	10.65 (0.22)	
Location		
Urban	10.40 (0.99)	0.657
Rural	10.33 (0.13)	
Family member		
No	10.29 (0.09)	0.025
Yes	10.77 (0.18)	
Symptoms of covid		
No	10.31 (0.83)	0.111



Yes	10.68 (0.22)	
Tested covid		
No	10.24 (0.09)	
Yes	10.90 (0.16)	* <0.001
Age in years		
<18yrs	8.33 (1.87)	
18-20yrs	9.98 (1.10)	
20-22yrs	10.79 (1.90)	
>22yrs	10.81 (2.04)	* <0.001
Batch of study		
2022	9.78 (2.08)	
2021	10.55 (1.90)	
2020	10.31 (1.87)	
2019	11.36 (1.90)	* <0.001

SD: standard Deviation * p-value is statistically significant

DISCUSSION

The panorama to infectious diseases has taken a turn ever since COVID 19 was declared a pandemic. The main focus during the pandemic was to provide health care services in order to reduce mortality from the disease and also prevent the spread of the infection among the health care workers. To ease the burden of health care and curtail the spread of the disease, education about the disease, its severity was shared to the general public, globally through social media, at colleges, schools, work places etc. This kept the general population well informed about the disease and means to prevent it. In comparison to the knowledge of the general public, knowledge of health care professionals was vital. Since they are in the frontline treating COVID patients and simultaneously are required to protect themselves from acquiring the disease. Students who are training themselves to become health care professionals tomorrow, will in future bridge the gap between health and diseases like COVID. Hence this study focused on students.

Globally, there is a wide distribution of studies on assessment of knowledge and perception of COVID 19 among students. During the initial period of the COVID-19 pandemic in China, undergraduate students were found to have satisfactory knowledge, a positive attitude, and a proactive perception of the disease 2. Medical students in Iran and Pakistan demonstrated a high level of knowledge, a positive attitude and adequate preventive behavior towards COVID 19 infection.3,4. However, studies in India and Peru detected a high level of misconceptions on the disease, although most people have a high level of knowledge on the disease 5,6.



This study aimed to assess the knowledge of nursing students regarding the COVID 19 disease and its vaccination.

These findings will aid in improving the knowledge of the students to enable them to confidently and efficiently care for patients with COVID 19 or similar infectious diseases. The overall knowledge of students was satisfactorily dispersed among the various age groups and years of study with a mean score of 10.36 for a total score of 15. Among the questions on COVID 19 disease, majority of the students (93.61%) were able to identify the causative organism for COVID 19, the reason why COVID was declared a pandemic (96.88%) and the signs and symptoms of COVID (82.47%). The emergency warning signs which requires medical attention during isolation and the complication of COVID 19 was identified by 89% and 94.35% of the students respectively. These results can be explained by the fact that students of the various age groups have been influenced by social media. The updates on the graveness of the pandemic has been circulated via social media, literature and various government health care activities. Information regarding quarantine and care of individuals during quarantine via teleconsultations have all been a source of input for influencing the health practices during pandemic. Analogous to the present study was a study done in Italy on secondary level students which showed a satisfactory level of knowledge on the clinical manifestation and transmission of COVID-19 and its prevention⁷. Another study done among both medical and non-medical students showed a high level of knowledge, good practice, and a positive attitude towards COVID-19 explaining that the knowledge of students was reflected because of a good relationship between their understanding and availability of information in literature and media⁸.

A patient who is suspected to have COVID 19 needs to be isolated and the nurse caring for these patients must practice

contact and air borne precautions. This was picked up by more than half the students (64.04%). Students are taught infection control practices that have to be followed when handling patients with different kinds of infections including those in isolation. Having a knowledge about the spread of the infection, students were able to relate and apply that knowledge when asked how to care for COVID patients. Ground glass opacities are the CT findings of the lungs in COVID 19 patients which was identified by 30.67% of students. A higher level of learning was needed for students to analyze the CT findings of COVID patients which was seen among the senior students (Batch of 2019). Prone position is proven effective in improving oxygenation in COVID 19 patients. Proning was adopted for patients with ARDS and found to be effective in improving the saturation levels. During COVID prone position was practiced and similar effects were observed. Students were unable to appreciate this evidence-based practice since, most of their education happened online during COVID, they did not have much practical exposure or even seen patients who were prone.

Majority of the students (95.54%) knew that the vaccinations are available in the form of injections and 89.30%



Knew

that Moderna vaccine was not available in India. Only 39.97% recognized the reason for administration of vaccine. Contraindications for vaccine were identified by more than half of the students (55.13%). The students had their vaccinations and had to be certified before they could join the professional course. In order to receive their vaccination they would have gathered information and ensured their safety before being vaccinated. This gathered information would have been useful while filling the questionnaire. Vaccination intention studies among nursing students is scarce. A study in the US by Manning, M.L. et al identified that only 45% nursing students intended to be vaccinated against COVID-19 9. A study published by Chesser, et al. identified low level of knowledge among university graduates and highlighted the need to share additional disease specific information through accessible ways 10.

There are some demographic variables that are statistically significant in association with the knowledge score. The number of females were more in this study as nursing is a profession dominated by females. The mean score for knowledge was higher than that of males. This was congruent to the findings in a study done on Italian undergraduate students by Gallè, et al 2020 and another study done in China among Chinese residents by Zhong, B.L., et al (2020)11,12. The mean knowledge score was greater (10.77 ± 0.18) in students who had a family member with COVID in comparison with a family member without the disease. This was statistically significant with a p value of 0.025. Having a family member with COVID would have given more exposure to the disease, its signs and symptoms, complication of the disease and prevention of its spread. This was similar to the findings in a study by Gallè, et al 11 which mentioned that not knowing anyone affected with COVID was associated with lower knowledge score. Similar findings in a study by Laddu, D.R., et al stated that having relatives or friends infected with COVID will increase the anxiety of students compelling them to increase their knowledge about the disease and its control 13.

There was a significant association between the knowledge score and personal experience of being COVID positive.

Students who were tested positive had a mean knowledge score of (10.90 ± 0.16) and those not tested positive had a mean score of (10.24 ± 0.09). The association was significant with a p value of < 0.001 . When an individual acquires a disease, they begin to follow disease specific behaviours which may involve improving the knowledge base and also identifying themselves with the book picture. A systematic review and meta-analysis of studies on knowledge, attitude, perception and practice towards COVID 19 says that the knowledge, attitude, perception and practice about COVID 19 are predictors that decide if individuals are engaged in disease specific behaviours, people's knowledge, attitude, perceptions, and practices about COVID-19 14. Prue CE, et al., (2017), Lunn PD, et al (2020) in their studies have shown



that higher knowledge about infectious diseases is positively associated with increased engagement in appropriate protective behaviour during an outbreak of that disease^{15,16}.

Students who were the senior most ie, who joined the course of study in 2019 and were above the age of 22 years had a mean knowledge score greater than their juniors with a significant p value of <0.001 . The mean score for students > 22 years is 10.81 ± 2.04 and the mean knowledge score for the batch of 2019 was 11.36 ± 1.90 . These students were present during the time of the actual pandemic and their exposure to the disease, social media and awareness programs was more in comparison to the others. This implies that knowledge, attitudes and practices are more appropriate and disease specific in the season of the pandemic in comparison to off season. Behaviours are learnt, knowledge is acquired when there is a need and more exposure to the actual situation. Students were also taught in the classrooms on disease specific behaviours. However, in several instances, knowledge can also influence perceptions due to past experiences and beliefs (Hogg R, et al., (2017)), Oppenheim B, et al., (2019), Vinck P, et al., (2019)). AlBaqawi, H.M., et al (2020) and Gohel, K.H., et al (2020) in their studies on nursing students have identified that the preventive behaviours during time of the COVID 19 pandemic revealed their high level of adherence to preventive measures^{17,18,19,20}. This was similar to the present study findings.

This study had limitations of a wide range of variant responses and technology usage which some students were not oriented to. The study done during the time of the pandemic may have had significant results in comparison to this study.

CONCLUSION

COVID 19 after being announced as a pandemic has had its effects on the health and economy of the world. It has also impacted the results of this study which unveiled age specific satisfactory knowledge among the study population. Students had learnt about the disease by responding to the various efforts taken by the government to curtail the spread of the disease and sensitize the public to the illness about the COVID-19. The participants in the study who showed unsatisfactory knowledge require an awareness about the illness which may benefit them in the near future as they care for patients with similar illnesses, taking up the roles and responsibilities as health care professionals. If in the near future a need arises, this study can also be extended to the allied health group and general public. The findings of the study can be used to plan educational programs and awareness among the general public and health professionals. The university that these students belong to has also made a module on this disease which should be made mandate as it will enable the students to update their knowledge base on the disease. The need for including this in the curriculum at various levels can be given a thought due to the uncertainty of the disease itself.



REFERENCES

- World Health Organization. Q&a on coronaviruses (COVID-19). 2020. URL: <https://www.who.int/news-room/qa-detail/qa-coronaviruses>. 2020 Oct.
- Peng Y, Pei C, Zheng Y, Wang J, Zhang K, Zheng Z, Zhu P. A cross-sectional survey of knowledge, attitude and practice associated with COVID-19 among undergraduate students in China. *BMC public health*. 2020 Dec 20;1-8.
- Taghrir MH, Borazjani R, Shiraly R. COVID-19 and Iranian medical students; a survey on their related-knowledge, preventive behaviors and risk perception. *Archives of Iranian medicine*. 2020 Apr 1;23(4):249-54.
- Zegarra-Valdivia JA, Chino-Vilca BN, Tairo-Cerron T, Munive V, Lastarria-Perez C, Ames-Guerrero RJ. Neurological components in coronavirus induced disease: a review of the literature related to SARS, MERS, and COVID-19. *Neurology Research International*. 2020 Sep 18;2020:1-7.
- Ikhlaq A, Hunniya BE, Bashir I, Ijaz F. Awareness and attitude of undergraduate medical students towards 2019-novel corona virus. *Pakistan Journal of Medical Sciences*. 2020 May;36(COVID19-S4):S32.
- Nazli T, Raheem A, Kishore J. Perceptions and practices of the adult population in response to SARS-CoV-2 pandemic in India. *Epidemiology International* (E-ISSN: 2455-7048). 2020 Apr 25;5(2):10-6.
- Souli D, Dilucca M. Knowledge, attitude and practice of secondary school students toward COVID-19 epidemic in Italy: a cross selectional study. *BioRxiv*. 2020 May 9:2020-05.
- Alzoubi H, Alnawaiseh N, Al-Mnayyis AA, Abu-Lubad M, Aqel A, Al-Shagahin H. COVID-19-knowledge, attitude and practice among medical and non-medical University Students in Jordan. *J Pure Appl Microbiol*. 2020 Mar 31;14(1):17-24.
- Manning ML, Gerolamo AM, Marino MA, Hanson-Zalot ME, Pogorzelska-Maziarz M. COVID-19 vaccination readiness among nurse faculty and student nurses. *Nursing Outlook*. 2021 Jul 1;69(4):565-73.
- Chesser A, Drassen Ham A, Keene Woods N. Assessment of COVID-19 knowledge among university students: implications for future risk communication strategies. *Health Education & Behavior*. 2020 Aug;47(4):540-3.
- Gallè F, Sabella EA, Da Molin G, De Giglio O, Caggiano G, Di Onofrio V, Ferracuti S, Montagna MT, Liguori G, Orsi GB, Napoli C. Understanding knowledge and behaviors related to CoViD-19 epidemic in Italian undergraduate students: the EPICO study. *International journal of environmental research and public health*. 2020 May;17(10):3481.



Zhong BL, Luo W, Li HM, Zhang QQ, Liu XG, Li WT, Li Y. Knowledge, attitudes, and practices towards COVID-19 among Chinese residents during the rapid rise period of the COVID-19 outbreak: a quick online cross-sectional survey. *International journal of biological sciences*. 2020;16(10):1745.

Laddu DR, Biggs E, Kaar J, Khadanga S, Alman R, Arena R. The impact of the COVID-19 pandemic on cardiovascular health behaviors and risk factors: a new troubling normal that may be here to stay. *Progress in cardiovascular diseases*. 2023 Jan 1;76:38-43.

Bhagavathula AS, Aldhaleei WA, Rahmani J, Mahabadi MA, Bandari DK. Knowledge and perceptions of COVID-19 among health care workers: cross-sectional study. *JMIR public health and surveillance*. 2020 Apr 30;6(2):e19160.

Prue CE. Awareness, beliefs, and actions concerning Zika virus among pregnant women and community members US Virgin Islands, November–December 2016. *MMWR. Morbidity and mortality weekly report*. 2017;66.

Lunn PD, Timmons S, Belton CA, Barjaková M, Julianne H, Lavin C. Motivating social distancing during the COVID 19 pandemic: An online experiment. *Social Science & Medicine*. 2020 Nov 1;265:113478.

Hogg R, Nkala B, Dietrich J, Collins A, Closson K, Cui Z, Kanters S, Chia J, Barhafuma B, Palmer A, Kaida A. Conspiracy beliefs and knowledge about HIV origins among adolescents in Soweto, South Africa. *PLoS One*. 2017 Feb 2;12(2):e0165087.

Oppenheim B, Gallivan M, Madhav NK, Brown N, Serhiyenko V, Wolfe ND, Ayscue P. Assessing global preparedness for the next pandemic: development and application of an Epidemic Preparedness Index. *BMJ global health*. 2019 Jan 1;4(1):e001157.

Albaqawi HM, Alquwez N, Balay-Odao E, Bajet JB, Alabdulaziz H, Alsolami F, Tumala RB, Alsharari AF, Tork HM, Felemban EM, Cruz JP. Nursing students' perceptions, knowledge, and preventive behaviors toward COVID-19: multi-university study. *Frontiers in public health*. 2020 Dec 23;8:573390.

Gohel KH, Patel PB, Shah PM, Patel JR, Pandit N, Raut A. Knowledge and perceptions about COVID-19 among the medical and allied health science students in India: An online cross-sectional survey. *Clinical epidemiology and global health*. 2021 Jan 1;9:104-9.



Lincango-Naranjo E, Espinoza-Suarez N, Solis-Pazmino P, Vinueza-Moreano P, Rodriguez-Villafuerte S, Lincango-Naranjo J, Barberis-Barcia G, Ruiz-Sosa C, Rojas-Velasco G, Gravholt D, Golembiewski E. Paradigms about the COVID-19 pandemic: knowledge, attitudes and practices from medical students. BMC medical education. 2021 Dec;21:1-0.