Assessing the Knowledge, Attitude, and Practices of College Students in Manila, Philippines Regarding COVID-19 Preventive Measures

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Abstract: - The COVID-19 pandemic brought about changes in the education sector throughout the world, pushing all schools to transition to online and modular learning. The return to face-to-face classes is inevitable; thus, measures must be taken to ensure each individual's safety. This study aimed to determine the knowledge, attitude, and practices of college students enrolled in any of three health science programs in a private HEI in Manila regarding COVID-19, and assess whether there were significant differences or associations across the demographic profile. Data were collected using a validated self-administered questionnaire. The questionnaire, adapted from different COVID-19 KAP studies and guidelines from CDC and FDA, comprised of questions on demographics (5), knowledge (23), attitudes (4), practices (8), and sources of information (6). Out of the 350 students in the study, 259 (74%) were female and 91 (26%) were male. The majority of the college students enrolled in any of the three health science programs in a private HEI in Manila had sufficient knowledge (58.9%), positive attitudes (60.28%), and good practices (57.43%). Despite the sufficiency of knowledge, three misconceptions about COVID-19 were identified. Participants were also found to rely on news platforms as their top source of information on COVID-19. Demographically, females, students from program 2, and third-year students were found to be more knowledgeable about COVID-19 among the participants. The results generated by this KAP study may help in creating effective preventive measures to ensure the safety of the school community.

Key Words — *COVID-19, KAP study, Philippines, Prevention.*

I. INTRODUCTION

Coronavirus disease 2019 (COVID-19) is an infectious disease caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) [1]. It was first identified in Wuhan, China in late December 2019 [2], and was declared a pandemic in March 2020 [3]. COVID-19 has affected not only the health sector but has also made an impact on education [4]. In response to the pandemic, the Philippines chose to adopt an online learning approach to education, but the Commission on Higher Education (CHED) is beginning to consider limited face-to-face classes, especially for clinical internship in health-allied programs [5].

Since perception is a major factor in the protective behaviors people adopt [6], questionnaire-based studies have been performed worldwide to evaluate public knowledge on COVID-19 and improve responses to the pandemic [7].
Thus, with the inevitable return to face-to-face classes, it is important to survey students regarding COVID-19 preventive measures for the overall safety of both students and the whole community.

This study follows the knowledge, attitude, and practices or the "KAP theory." Focusing on disease prevention, the KAP theory states that increasing personal knowledge combined with the proper attitude will allow a person to adopt a

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healthier behavior to avoid the acquisition of disease. Thus, using a survey tool that is guided by the KAP theory, the results generated can be used to identify gaps in knowledge, personal beliefs, and behavioral patterns to help in administrative decisions such as prioritizing and creating interventions. [8, 9]

With this, the main objective of the study is to determine the knowledge, attitude, and practices of college students enrolled in any of the three health science programs in a private higher education institution (HEI) in Manila regarding COVID-19, as well as assess whether the mean scores are significantly different across or if the classifications are significantly associated with the demographic profile. Additionally, common misconceptions regarding COVID-19 and the sources of information from which the students acquire knowledge were also identified.

II. METHODS

A. Study design and participants

A descriptive cross-sectional design was adopted by the study using a survey tool targeting the college students enrolled in any of the three health science programs in a private HEI in Manila in academic year 2020 to 2021. The survey was performed electronically via Google Forms and conducted from March to May 2021. Respondents were recruited by e-mailing the students who met the inclusion criteria which are as follows: a) male or female, b) first to fourth-year students, c) aged 18 and above, d) enrolled in academic year 2020 to 2021, e) in any of the three health science programs, f) in a certain private HEI in Manila, and had g) a working university Google mail. The survey was performed online due to restrictions in face-to-face distribution amidst the pandemic.

To proportionally represent all three programs, the sample size for each year level of each program was computed at 95% confidence interval. The total target sample size was 350 students comprising of 113 students from program 1, 215 students from program 2, and 22 students from program 3. After conducting the survey, a total of 798 respondents provided informed consent and completed the survey. Since the number of respondents exceeded the target sample size, the responses were assigned a random number in Microsoft Excel and 350 respondents were randomly selected to meet the target sample size in terms of department and year level and to avoid any biases.

B. Measurements

The questionnaire that was utilized and distributed to the participants was composed of 41 questions which were adopted from the survey tools of Al-Hanawi et al. (2020) [10], Azlan et al. (2020) [11], Ferdous et al. (2020) [12], Lee et al. (2021) [13], and Modi et al. (2020) [7], and were also based on the interim guidelines and information regarding COVID-19 of the CDC [14, 15] and warnings from the FDA [16]. Cronbach's alpha was performed to test the validity and reliability of the study's instrument. A pilot study was performed wherein the survey tool was administered to 30 students. The survey was divided into four sections: Knowledge, Attitude, Practices, and Sources of Information. Results showed that the Cronbach's alpha coefficient of the whole questionnaire is .858. The knowledge section obtained a Cronbach's alpha of .834, the attitude section had .771, the practices section had .928, while the sources of information had .846. As the entirety of the questionnaire and each section obtained a Cronbach's alpha value of 0.7 or higher, this indicates good reliability.

The participants' knowledge, attitudes, and practices regarding COVID-19 preventive measures were measured using the mean score and by using a categorization following the KAP study by Kassahun and Mekonen (2017) [17] wherein the mean was used as a cut-off to determine whether the participants had sufficient knowledge, positive attitude, and good practices.

The survey included 23 questions that were designed to assess the knowledge of college students regarding COVID-19: its causative agent, transmission, and prevention as well as questions about the use of personal protective equipment (PPE). A correct answer was given a score of 1 while an incorrect answer was given a score of 0. Respondents who scored greater than or equal to the mean score were considered to have "sufficient" knowledge, while respondents who scored less were considered to have "insufficient" knowledge.

The attitudes of the participants were assessed through four (4) questions designed to evaluate their perceived risk of COVID-19 infection and how effective they believe certain precautionary behaviors are to reduce the risk of COVID-19 infection. A 5-point Likert scale was used in all 4 questions, making the maximum attainable score as 20. The respondents were considered to have a "positive" attitude if they scored

equal to or higher than the mean, and "negative" if they scored lower than the mean.

To identify common misconceptions of the participants regarding COVID-19, the same set of questions used to assess knowledge was used. After analysis of the mean knowledge scores, items with a correct percentage rate of <50% were interpreted as misconceptions.

Practices were evaluated through eight (8) questions concerning the frequency by which they practice COVID-19 preventive behavior. A 5-point Likert scale was also used for these questions, making the maximum attainable score as 40. The respondents' total practice scores were classified as "good" if they scored more than or equal to the mean, and "poor" if they scored less.

For the respondents' sources of information, six (6) different sources were given, and the respondents were asked concerning the frequency by which they use this source to obtain news regarding COVID-19. A 5-point Likert scale was also used to measure the frequency by which they access the six (6) given sources of information.

The participants were also asked for basic demographic data, such as age, sex, the health science program they belong to, year level, as well as the address where they stayed for the majority of the pandemic.

C. Statistical analysis

After the data had been anonymized, it was transferred to IBM SPSS Statistics (Version 25). Descriptive statistics were employed to determine the count, relative percentage including measures of central tendency and dispersion. The data was then analyzed using inferential statistics using the demographic profile of the participants as factors. To determine if there was a significant difference between continuous data, an independent t-test and ANOVA or Kruskal-Wallis test were used, while the chi-square or Fisher's exact test was used to determine if there was a significant association between categorical data. To determine which groups were significantly higher than the other groups, multiple comparison post-hoc tests: Scheffe test or Fisher's Least Significant Difference (LSD), were performed. Statistical significance was determined if the p-value is less than 0.05.

III. RESULTS AND DISCUSSION

A. Demographic profile of the participants

Among the 350 respondents surveyed, 259 (74%) were female and 91 (26%) were male as seen in Table 1. The majority of the respondents were 21 years old (35.2%), followed by 20 years old (29.7%), with an average age of 20.13 ± 1.067. As per the stratification, there were 113 (32.3%) students from program 1, 215 (61.4%) students from program 2, and 22 (6.3%) students from program 3. The students were distributed across all levels with 87 (24.9%) first years, 89 (25.4%) second years, 141 (40.3%) third years, and 33 (9.4%) fourth years. More than half (52.3%) of the respondents reside in Luzon, followed by 143 (40.9%) in NCR.

Table.1. Demographic characteristics of the participants

Characteristics	**N = 350 (%)**
Average age, years (±SD)	20.13 (±1.067)
Sex	
Female	259 (74.0)
Male	91 (26.0)
Department	
Program 1	113 (32.3)
Program 2	215 (61.4)
Program 3	22 (6.3)
Year Level	
1st Year	87 (24.9)
2nd Year	89 (25.4)
3rd Year	141 (40.3)
4th Year	33 (9.4)
Region	
National Capital Region (NCR)	143 (40.9)
Luzon	183 (52.3)
Visayas	7 (2.0)
Mindanao	13 (3.7)
Out of the country	4 (1.1)

B. Knowledge

The mean knowledge score (±SD) of the 23 items was 18.07 (± 2.304). The overall correct percentage for the knowledge questions was 78.57%. This finding is higher than the results from the knowledge of COVID-19 in university students from India (66%) [18] and undergraduate students from Ethiopia (73.8%) [19]. However, this is lower compared to those reported by Alrasheedy et al. (2021) [20] wherein 82% of pharmacy students from Saudi Arabia are knowledgeable

about COVID-19 and Peng et al. (2020) [21] wherein the overall correct percentage was 82.34% among undergraduate students from China. An item breakdown of the knowledge questions is presented in Table 2.

Table.2. Descriptive statistics of knowledge statements

Knowledge Item		Mean	SD
K1	The main clinical symptoms of COVID-19 are fever, fatigue, dry cough, and body aches.	0.97	0.182
K2	Unlike the common cold, stuffy nose, runny nose, and sneezing are less common in persons infected with SARS-CoV-2.	0.69	0.461
K3	The SARS-CoV-2 virus can be transmitted via: [Respiratory droplets]	0.99	0.075

Table.2. Descriptive statistics of knowledge statements (Cont.)

Knowledge Item		Mean	SD
K4	The SARS-CoV-2 virus can be transmitted via: [Contact with contaminated surfaces or objects]	0.91	0.289
K5	The SARS-CoV-2 virus can be transmitted via: [Ingestion of contaminated food or water]	0.48	0.5
K6	The SARS-CoV-2 virus can be transmitted via: [Airborne transmission in high-risk areas (i.e., hospitals) and aerosol-generating procedures]	0.88	0.325
K7	The SARS-CoV-2 virus can be transmitted via: [Sexual intercourse (i.e., penetration / contact with vaginal fluid or semen)]	0.73	0.445
K8	Persons with COVID-19 cannot transmit the virus to others if they do not have a fever (i.e., asymptomatic).	0.94	0.232
K9	Which of the following is considered as “close contact”?	0.62	0.487
K10	Reported illnesses have ranged from mild to severe symptoms of cough, fever, breathlessness which can appear 2-14 days after exposure. For which of the following situations is medical advice indicated?	0.78	0.413
K11	Preferred method of hand hygiene for visibly soiled hands is:	0.96	0.189
K12	Ordinary people (i.e., persons not in the medical field) can wear face masks to prevent infection by the COVID-19 virus.	0.98	0.13
K13	Which of the following face masks are recommended for regular use (i.e., in common areas such as malls, schools, etc.) by ordinary people according to the FDA and CDC? Kindly use the pictures below as your guide. [3-Layered Medical Mask (e.g., Surgical, KN95)]	0.98	0.15
K14	Which of the following face masks are recommended for regular use (i.e., in common areas such as malls, schools, etc.) by ordinary people according to the FDA and CDC? Kindly use the pictures below as your guide. [N95 Respirator]	0.42	0.494
K15	Which of the following face masks are recommended for regular use (i.e., in common areas such as malls, schools, etc.) by ordinary people according to the FDA and CDC? Kindly use the pictures below as your guide. [2-Layered Disposable Mask]	0.73	0.447
K16	Which of the following face masks are recommended for regular use (i.e., in common areas such as malls, schools, etc.) by ordinary people according to the FDA and CDC? Kindly use the pictures below as your guide. [Masks made from vinyl, plastic, or leather]	0.83	0.372
K17	Which of the following face masks are recommended for regular use (i.e., in common areas such as malls, schools, etc.) by ordinary people according to the FDA and CDC? Kindly use the pictures below as your guide. [2-Layered Cloth Masks with breathable and tightly woven fabric (i.e., fabrics that do not let light pass through when held up to a light source)]	0.58	0.494
K18	Which of the following face masks are recommended for regular use (i.e., in common areas such as malls, schools, etc.) by ordinary people according to the FDA and CDC? Kindly use the pictures below as your guide. [Masks made from loosely woven fabric or that are knitted (i.e., fabrics that let light pass through)]	0.97	0.159

Table.2. Descriptive statistics of knowledge statements (Cont.)

Knowledge Item		Mean	SD
K19	Which of the following face masks are recommended for regular use (i.e., in common areas such as malls, schools,	0.63	0.483

	etc.) by ordinary people according to the FDA and CDC? Kindly use the pictures below as your guide. [Masks with replaceable filters]		
K20	Which of the following face masks are recommended for regular use (i.e., in common areas such as malls, schools, etc.) by ordinary people according to the FDA and CDC? Kindly use the pictures below as your guide. [Masks with exhalation valves, vents, or openings]	0.84	0.367
K21	Not all persons with COVID-19 will develop severe cases. Only those who are elderly and have chronic illnesses are more likely to have severe cases.	0.74	0.441
K22	COVID-19 has a high fatality rate (i.e., higher than that of SARS-CoV and MERS-CoV).	0.47	0.5
K23	There is currently no effective cure for COVID-19, but early symptomatic and supportive treatment can help most patients recover from the infection.	0.94	0.232

The majority (338, 96.6%) of the respondents were knowledgeable about the symptoms of COVID-19 such as fever, fatigue, dry cough, and body aches, while 243 (69.4%) were aware of the less common symptoms such as common cold, stuffy nose, runny nose, and sneezing.

To evaluate the participants' knowledge on the mode of transmission of COVID-19, respondents were asked 5 questions. The following are the correct responses that the majority of the participants were able to answer correctly: respiratory droplets (99.4%), contact with contaminated surfaces or objects (90.9%), and airborne transmission in high-risk areas (i.e., hospitals) and aerosol-generating procedures (88.0%). Among the respondents, 330 (94.3%) were aware that individuals infected with COVID-19 are still able to transmit the disease despite being asymptomatic.

Out of the total respondents, 216 (61.7%) respondents were able to correctly define "close contact", and 273 (78.3%) were able to correctly identify situations of COVID-19 exposure that requires medical advice or attention. Approximately 96% of the respondents were also aware of the preferred hand hygiene method for visibly soiled hands.

Regarding face masks, 98% knew that wearing face masks, specifically, medical-approved masks can prevent acquiring or transmitting the virus and are recommended to wear for regular use by ordinary citizens during the pandemic. In terms of the type of face masks that are recommended for regular use, the following are the correct responses which majority of the participants were able to correctly answer: 3-layered medical mask (97.7%), 2-layered disposable mask (72.6%), 2-layered cloth masks with breathable and tightly woven fabric (58.0%), and masks with replaceable filters (63.1%). However, the majority of the participants (54.3%) answered that N95 respirators are recommended for regular use which was an incorrect response.

Regarding the severity of COVID-19, 73.7% of the participants were aware that those who are immunocompromised such as the elderly or those who have chronic diseases are more likely to progress into a severe form of the disease. Regarding its fatality rate, only 47.4% of the participants answered correctly that COVID-19 does not have a fatality rate that is higher than that of SARS-CoV and MERS-CoV.

Lastly, 94.3% of the participants knew that there is currently no definite cure for COVID-19 and that early supportive treatment, wherein the signs and symptoms of the disease are the ones being treated, can help most COVID-19 patients recover.

The mean knowledge score shows significant differences in terms of sex (p=.040), department (p=.008), and year level (p=.000).

Females had a higher mean knowledge score (18.22 ± 2.19) compared to that of males. This is similar to reports from a study conducted in Pakistan [22], Palestine [23], and the USA. [24] Studies have shown that women are more knowledgeable about infectious diseases (e.g., H1N1, SARS, MERS, etc.) than men. [25, 26, 27, 28] This gender difference can be explained by the differences in activities and roles. According to a study by Frederiksen et al. (2020) [29], females are more likely to worry about the negative consequences of the COVID-19 pandemic, as well as report mental health effects, than men.

Also, students from program 2 obtained a statistically higher mean knowledge score (18.35 ± 2.19) than students from program 3. Program 2 is focused on a career path that performs important laboratory tests that will aid in the diagnosis and treatment of diseases [30]. On the other hand, program 3 is dedicated to the area of science concerning

biology, chemistry, and specialized subjects such as cell biology and genetics and its incorporation into certain lab techniques [31]. In terms of their curriculum (obtained from the official website of the private HEI), program 2 has specialized subjects such as Virology, which is the scientific study of viruses [32], as well as Immunology and Serology, which may greatly contribute to their knowledge about COVID-19 and its causative viral agent, SARS-CoV-2.

Third-year students had a statistically higher mean knowledge score when compared to first-year and second-year students but remain insignificant to fourth-year students. In a study made by Noreen et al. (2020) in Pakistan [22], the third-year medical students also have higher knowledge based on the percentage of the respondents classified as having adequate knowledge (70.8%) compared to the first (61.1%) and second (61.5%) years. In terms of curriculum, third years have more technical subjects and are more specialized.

Meanwhile, there were no significant differences between knowledge and age, and between knowledge and location.

Upon classification, sufficient knowledge was found in 206 (58.9%) respondents and insufficient in 144 (41.1%) respondents. With this, the majority of the participants had sufficient knowledge regarding COVID-19. The chi-square test showed that the two factors most affecting the classification of knowledge were department ($p=.029$) and year level ($p=.007$). There were no associations found in age, sex, and location ($p>.05$).

C. Misconceptions

Using the same set of questions as the knowledge section, three misconceptions were identified. Only 48% answered correctly that the virus is not transmitted via contaminated food and drink (K5), only 42% of participants were aware that the N95 respirator is not recommended by the CDC for regular use outside hospitals (K14), and only 47% of respondents knew that COVID-19 has a lower fatality rate compared to that of SARS-CoV and MERS-CoV (K22).

Multiple comparison post-hoc tests showed that third-year students achieved higher scores than first- and second-year students in all three misconceptions and that older students tend to have higher scores than their younger counterparts for questions K5 and K22. This is similar to a study conducted by Noreen et al. (2020) [22], wherein third years had a greater percentage of participants with adequate knowledge than lower years. The results suggest that older students have more access to information regarding COVID-19, its transmission, and its fatality rate compared to younger students. This also shows that the average third year student has more knowledge regarding the virus, which may mean that their curriculum includes more information regarding the virus.

The first misconception involves the transmission of the SARS-CoV-2 virus via the ingestion of contaminated food or water (K5). Despite SARS-CoV-2 being a respiratory virus, a study by Byrd et al. (2020) [33] states that misconceptions of consumers about the possibility of COVID-19 being contracted from food, as well as food packaging, do exist. The CDC provides an ambiguous statement that despite the ability of the virus to survive on different surfaces, this is not believed to be the main mode of transmission of the virus. While the ambiguity may have been due to currently available scientific evidence, this may cause individuals to rely on "availability heuristics", which leads them to make judgments based on previous memories. The study outlines three possible availability heuristics: the spread of COVID-19 began at a wet market in China, the closure of in-person dining establishments, and the gastrointestinal symptoms of COVID-19 are similar to those caused by the norovirus. Furthermore, the Philippines has recently experienced an outbreak of African Swine Fever, with the Department of Agriculture confirming that the first outbreak started in July 2019 [34]. This may also be an added factor to some individuals' availability heuristics.

The second misconception concerns the use of N95 respirators by ordinary individuals, which are defined as non-medical professionals, for regular use (K14). According to CDC [35], N95 respirators are recommended for airborne diseases. Its use in the hospital, a place that handles COVID-19 patients directly, is seen as the safest option. Thus, this notion can contribute to the misconception that N95 respirators can be used even in a regular setting and by ordinary people. However, in non-aerosol-generating areas such as common areas outside of the hospital, a study by Bartoszko et al. (2020) [36] suggests that both surgical masks and N95 respirators offer similar protection.

The third and final misconception concerns the fatality rate of COVID-19 in comparison to that of SARS-CoV and MERS-CoV (K22). While still controversial, SARS-CoV-2 has been estimated by the WHO to have a reproductive number (R_0)

between 2 to 2.5, higher than both the R_0 of SARS-CoV and MERS-CoV at 1.7-1.9 and <1, respectively. In other studies, the R_0 of SARS-CoV-2 is higher, depending on the estimation methods used and the data available to them. This suggests that COVID-19 has a higher pandemic potential than either SARS-CoV or MERS-CoV. Despite the higher transmission rate of the virus, the fatality rate of SARS-CoV 2 has been estimated to be lower than that of SARS, which has a fatality rate of 9.5%, and MERS, a fatality rate of 34.4% [37]. COVID-19, however, has a case fatality rate ranging from 2.8 to 5.0% from low-, lower-middle-, upper-middle-, and high-income-countries. Despite the fatality rate, COVID-19 has infected more countries than SARS or MERS, as well as caused a higher number of deaths [38], which may contribute to the idea that it has a higher fatality rate than either SARS- or MERS-CoV.

D. Attitude

The mean attitude score (±SD) of the 4 questions was 17.33 (±2.914). Using the mean score, the attitude of the participants regarding COVID-19 per demographic variable such as age, sex, department, and year level shows no significant difference in all demographic variables (p>.05).

To assess the attitudes of the respondents, a total of 4 questions were asked: 1 for perceived risk and 3 for efficacy beliefs. An item breakdown of the attitude questions is presented in Table 3.

Table 3. Descriptive statistics of attitude statements

Questions	**Mean ± SD**
A1. Perceived Risk: What do you think is the possibility that you will be infected with COVID-19?	3.16 ± .938
A2. Efficacy Beliefs: To what extent do you think the precautionary behavior is an effective way to reduce the risk of COVID-19 infection? [Practicing personal hygiene such as wearing face masks and proper hand hygiene.]	4.75 ± .688
A3. Efficacy Beliefs: To what extent do you think the precautionary behavior is an effective way to reduce the risk of COVID-19 infection? [Social distancing such as avoiding crowded places and public transportations.]	4.70 ± .721
A4. Efficacy Beliefs: To what extent do you think the precautionary behavior is an effective way to reduce the risk of COVID-19 infection? [Staying at home to protect myself from COVID-19 exposure.]	4.72 ± .762

For the question concerning perceived risk, the mean score was 3.16 (±.938) which is a neutral perception to risk meaning the participants are neither paranoid of catching the disease nor confident that they will not. Risk perception is determined by "the way a person subjectively estimates and feels about a risk" [39]. Studies conducted in Iran and Saudi Arabia reported an average or moderate risk perception level among medical students [40, 41]. A research done in Korea also reported that most of their respondents' concerns were "neither high nor low" when it came to risk perception [13]. Possible reasons why the respondents are not paranoid of catching the disease could be their education level as well as the availability of vaccines. In a study by Kim and Choi (2016) [42], results showed that the level of education affects risk perception. On the other hand, according to CDC [43], COVID-19 vaccines are effective in preventing infections, which can alleviate the worries of those who are already vaccinated and can alter risk perception. Moreover, reasons why they are not fully confident that they will not contract the disease could be public health competency or certain cultural aspects [40].

For all three questions under efficacy beliefs, the majority answered positively leading to very high mean scores: 4.75 (±.688) for the first question under efficacy beliefs, 4.70 (±.721) for the second question, and 4.72 (±.762) for the third question.

Upon classification, 211 respondents (60.28%) were identified as having a positive attitude, while 139 respondents (39.72%) were classified as having a negative attitude. This indicates that the majority of the participants had a positive attitude regarding COVID-19, meaning they perceive their risk to be low or neutral and that they believe that the given precautionary measures are effective in reducing the risk of infection. The chi-square test shows no associations between the classification of attitude and demographic variables (p>.05).

E. Practices

The mean practice score (±SD) of the 8 questions was 37.20 (±2.914). Across all of the questions, the mean scores were very high meaning the participants were always practicing the

mentioned preventive behaviors. An item breakdown of the practice questions is presented in Table 4.

Table 4. Descriptive statistics of practice statements

Questions [Practices of preventive behavior: How often do you practice the following?]	**Mean ± SD**
P1. Wearing face masks when going outside (i.e., malls, schools, etc.)	4.99 ± 0.141
P2. Wearing face masks when meeting with family members and friends	4.40 ± 0.765
P3. Wear a face shield with a face mask when going outside	4.69 ± 0.654
P4. Wash hands frequently and use hand sanitizer or 70% alcohol after going to a public place, or after nose-blowing, coughing or sneezing	4.86 ± 0.384
P5. Use tissues or handkerchiefs when coughing or sneezing	4.54 ± 0.763
P6. Avoid touching the face and eyes	4.31 ± 0.809

Table 4. Descriptive statistics of practice statements (Cont.)

Questions [Practices of preventive behavior: How often do you practice the following?]	**Mean ± SD**
P7. Avoid visiting crowded places or going to social events involving a large number of people	4.72 ± 0.607
P8. Practice social distancing (i.e., at least 2 meters distance from others) when in public places	4.70 ± 0.546

The majority of the respondents said that they are always practicing preventive behaviors, such as wearing face masks when going outside and meeting other people, washing hands and using hand sanitizer or 70% alcohol, and practicing social distancing. These findings may be attributed to the strict lockdown measures implemented in the Philippines and to the medical subjects being taken by college students. These results are consistent with other COVID-19 KAP studies conducted among undergraduate medical students and health sciences students in the United Arab Emirates [44], China [21], and Pakistan [22].

In the first two questions, which focus on how often they wear face masks, the majority of the respondents answered that they are always wearing face masks when going outside and meeting other people. According to CDC (2021) [45], face masks should be worn any time when in a public setting, when traveling on public transportation, and when around people who do not live alongside the wearer. Abboah-Offei et al. (2021) [46] mentioned that studies that compared the effectiveness of wearing and not wearing face masks showed that there is a significantly higher rate of infection among those who did not wear face masks. Quantitatively, according to the study conducted by Wang et al. (2020) [47], there was no SARS-CoV-2 infection among those that wore face masks, while 10 participants were infected among those that did not wear face masks.

In the third question, which focuses on how often they wear face shields, the majority of the respondents answered that they are always wearing face shields with their face masks when going outside. Face shields are another type of face protection, however, the CDC (2021) [45] does not recommend using them as a substitute for wearing face masks. According to CDC (2021) [45], face shields are not as effective at protecting the wearer and those around them from respiratory droplets because these have large gaps below and alongside the face, where droplets may escape. This is supported by a study by Lindsley (2021) [48] where they found that face shields only blocked 2% of the total aerosol and were not able to reduce the aerosol emitted into the environment. While face shields should not be used alone to protect one's self from SARS-CoV-2 infection, it can be used in addition to wearing face masks to further reduce the transmission of the virus, aiding in blocking the possible routes of transmission, including the mouth, nose, and eyes [49].

In the fourth to the sixth questions, which focus on proper hand hygiene, the majority of the respondents answered that they are always washing their hands and using hand sanitizer or 70% alcohol, using tissues or handkerchiefs when coughing or sneezing, and avoiding touching their face and eyes. Proper hand hygiene is still one of the most effective ways to reduce healthcare-associated infections and cross-infection between patients [50]. Frequent handwashing with soap and water for 20 seconds and use of hand sanitizer that contains at least 60% alcohol is recommended by the CDC (2020) [51] to protect the individual from getting COVID-19. The CDC (2020) [51] also recommends covering the mouth and nose when sneezing or coughing. If the individual is wearing a mask, they can cough or sneeze directly into their mask. However, if they are not wearing a mask, they are recommended to use a tissue or the inside of their elbow. Following these preventive measures, touching of the eyes, nose, and mouth with unwashed hands must also be avoided as recommended by the CDC (2020) [51] since this is one of the modes of transmission of SARS-CoV-2, which deals with

fomites left by an infected person on surfaces around them [52].

In the seventh and eighth questions, which focus on social distancing, the majority of the respondents answered that they are always avoiding crowded places or social events and practicing social distancing when outside. According to Sun and Zhai (2020) [53], the minimum safe distance for regular social activities, which include breathing and talking, was 1.6 to 3 meters (5.2 to 9.8 feet). While the maximum transmission distance could be up to 8.2 meters (26 feet), especially when sneezing. Since COVID-19 is primarily transmitted through close contact for a prolonged period, the CDC (2020) [43] recommends maintaining social distancing when in public places and social events to prevent the acquisition of the disease.

Based on the results, no significant difference was found between the practice scores and demographic variables ($p>.05$). Thus, the practices and behavior of the respondents towards COVID-19 preventive measures were the same across and between the specified demographic variables in this study.

Upon classification, 201 (57.43%) respondents were identified as having good practices, while 149 (42.57%) respondents were classified as having poor ones. With this, the majority of the respondents are practicing the necessary preventive measures to avoid contracting COVID-19 infection. The chi-square test showed that there was an association between preventive practices and year level ($p=.041$). Similarly, a study by Noreen et al. (2020) [22] reported that fourth-year students had good practices of preventive measures toward COVID-19. A study conducted by Khasawneh et al. (2020) [54] reported that medical students from the last three years (clinical years) are more likely to practice preventive measures, such as the use of disinfectants and wearing of face masks, compared to medical students from the first three years (academic years). On the other hand, there were no associations between practices and age, sex, department, and location ($p>.05$).

F. Sources of Information

There were six (6) main sources where the participants obtained information regarding COVID-19: the CDC, WHO, DOH, news platforms, social media, and family and friends. The top source of information was determined based on the mean score (mean ± SD) with the top source being news platforms such as Inquirer and Rappler (4.35 ± .819), followed by the WHO (4.33 ± .704), with the least being family and friends (3.68 ± 1.065) as seen in Table 5.

Table.5. Descriptive statistics of sources of information

Sources	**Mean ± SD**
Centers for Disease Control and Prevention (CDC)	3.97 ± .901
World Health Organization (WHO)	4.33 ± .704
Department of Health (DOH)	4.24 ± .819
News Platforms: Inquirer, Rappler, etc.	4.35 ± .819
Social Media: Facebook, Twitter, Instagram, Tiktok	4.27 ± .997
Family and Friends	3.68 ± 1.065

This may be attributed to the hoaxes and misinformation on COVID-19 passed down from person to person, whether or not the person carries credibility [55]. Thus, news platforms, generally considered as reliable information sources, are preferred, while family and friends – who may or may not be credible – rank last in the top sources of information. This is supported by Lennon et al.'s (2020) [56] study wherein news platforms are identified as a reliable source of information by most of the respondents, together with the CDC.

The chi-square test shows that the misconception regarding N95 respirator use (K14) was significantly associated ($p=.032$) with having family and friends as a source of information. No other significant relationships between the other identified misconceptions and the remaining sources of information ($p>.05$) were found. In an online global cross-sectional survey by Tariq et al. in 2020 [57] about COVID-19 among medical professionals, 89% of the participants replied that the N95 respirator was the best choice for PPE against COVID-19 in the health care field. As the programs included are involved in the field of science and medicines, both respondents' families and their friends from the same programs and field of work may impact their opinion on the use of the N95 respirator due to its predominant use in healthcare and medical facilities [58]. Furthermore, a study conducted by Shelus et al. (2020) [59] showed that peer pressure and familial trust influenced some to stop wearing their face masks altogether. This contributes to the idea that peers and family members greatly influence one's ideas and opinions regarding which their perception concerning face masks.

IV. CONCLUSION

The outcome of this study showed that the majority of the college students enrolled in any of the three health science programs in a private HEI in Manila have sufficient knowledge, positive attitudes, and good practices towards COVID-19 and the preventive measures. Demographically, females, students from program 2, and third-year students were found to have a statistically higher mean knowledge score while the mean attitude score and practice score were found to be the same across the demographic profile. In addition, a significant relation was found between knowledge and age, knowledge and year level, and practices and year level. Although there is sufficient knowledge among the participants, three misconceptions were identified: ingestion as a mode of transmission for COVID-19, use of N95 respirators in a non-medical setting, and the fatality rate of COVID-19. The top source of information was determined to be news platforms such as Inquirer and Rappler, while family and friends were the least likely sources students would obtain information from regarding COVID-19. In terms of misconceptions, a significant relation was found between the use of N95 respirators and having family and friends as the source of information.

As the study took place in only one private HEI in the Philippines and was limited to three (3) certain health science programs, the researchers suggest extending the study to other universities, as well as extending it to students of non-medical and non-science programs to further evaluate the KAP of the general undergraduate population. The study covered measuring the knowledge, attitude, and practices and relating each component to the demographic profile. The researchers thus propose performing logistic or multiple regression analysis to predict how a specific group under an associated demographic variable affects the dependent variables which are knowledge, attitude, and practices. Aside from relating the knowledge, attitude, and practices to the demographic variables, the researchers also suggest determining a significant difference between knowledge and attitude, knowledge and practices, and attitude and practices to discover the effect of one variable to another.

Ethical Considerations

There were no vulnerable populations (i.e., minors, individuals with medical or other conditions, or those otherwise deemed legally incapable) involved in the study. The participants were presented with an informed consent and were assured that all information were to remain confidential. This study has also been granted ethical approval by the University of Santo Tomas Faculty of Pharmacy Research Ethics Committee with the study protocol code FOP-REC-2021-01-024.

Conflict of Interest

The authors of this study declare that the research was conducted without any conflict of interest.

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