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COVID-19 TRANSMISSION AND PREVENTION: KNOWLEDGE AND AWARENESS AMONG DIPLOMA IN PHARMACY STUDENTS

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Abstract:

COVID-19 is a contagious disease caused by a novel coronavirus known as SARS-CoV-2, discovered in Wuhan City, China. It is a disease characterised by symptoms such as fever, dry cough, fatigue, headache and breathlessness. COVID-19 renders an immense impact on the daily lives of people around the world as the disease exponentially emerged into a global pandemic. With the spread of the disease, comes the spread of information or misinformation amongst the public. Thus, objectives of this study are to assess the students' preferred sources for information regarding COVID-19 and to evaluate their level of knowledge and awareness about the disease. A total of 189 students participated in the online cross-sectional survey conducted from April until May 2021. The survey consisted of two sections which were structured to assess students' knowledge, awareness and their preferred sources of information on COVID-19. The obtained data were analysed and displayed as frequencies and percentages. Our data revealed that the electronic media is the medium of choice as almost all respondents (98.9%) gained information regarding COVID-19 through social media and the television (91.5%) whereas first-hand information *i.e.* from community leaders and healthcare workers were the least chosen as an information provider or source with 9.0% and 31.2% respectively. Findings concerning the level of knowledge on COVID-19 showed that all the respondents are well-informed of the global pandemic

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with 58.2% and 41.8% scored excellent and good marks, respectively. In line with the respondents' great knowledge level score, this study also revealed that the subjects possess good awareness of precautionary measures and good practices to prevent the transmission of the COVID-19 disease. Data also showed that all respondents were aware of the significance of hand washing and avoiding crowded places to break the transmission chain of COVID-19. Our study indicated that these students possess high levels of knowledge and awareness about the transmission and prevention of COVID-19. Acquiring, applying and practising the right knowledge and understanding about the disease is crucial to ensure better containment of the on-going pandemic.

Keywords:

Awareness, Covid-19, Knowledge, Prevention, Transmission

Introduction

COVID-19 is caused by a coronavirus known as the novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) that emerged from the Huanan Seafood Wholesale Market in Wuhan City, Hubei Province, China. COVID-19 had sacrificed over eighteen hundred people and infected over seventy thousand people in Wuhan within the first fifty days of the epidemic (Shereen et al., 2020). Fever, dry cough and tiredness are the most noticeable COVID-19 symptoms. On the other hand, asymptomatic infected people do not develop any symptoms and do not feel ill (Elengoe, 2020). The diversity mode of transmission COVID-19 mainly depends on the type and duration of exposure, with prolonged close contact in closed and indoor, crowded, or poorly ventilated settings (WHO, 2020b). The predominant methods of evolution and transmission of the SARS-CoV-2 virus are by person-to-person. The infected patients may be efficacious within two days before the onset of symptoms and at the early stage of the disease (WHO, 2021). Hence, the virus can spread by small liquid particles or droplets from the host's mouth and nose (Lake, 2020; Fenner et al, 1987). It diffuses in the airways with the combination of larger respiratory droplets and small aerosols during physical interaction with the infected person; for instance, talking, coughing, sneezing, exhale and handshakes (WHO, 2021). Precisely, such transmission is thought to take place through respiratory droplets larger than five micrometers in diameter in close range (less than 6 feet, or 2 m) (Monica et al., 2021). It is proven in Hong Kong's COVID-19 cases that 77.6% of the transmission occurred in social and household settings (Martin-Sanchez et al., 2021).

One of the most fundamental steps to avert the transmission of COVID-19 is by practicing social or physical distancing (WHO, 2020b). Social or physical distancing means maintaining a safe distance of at least two meters between each person (Lotfi et al., 2020). It is crucial to abide by a preventive guideline as COVID-19 is spread mainly among those in close contact through air droplets produced by sneezing, coughing or talking (WHO, 2020c). People are advised to avoid crowded, confined places, and social gatherings (WHO, 2020d). Hence, governments worldwide have compelled precautionary measures such as temperature checks before entering shops, hand sanitization at entry points, and limitations on the number of people allowed in a premise (Vasishta et al., 2020). The COVID-19 issue has brought new difficulties to the adequate worldwide provision of health information (Zhao et al., 2020) and healthcare services (Nunez et al., 2021). During this COVID-19 pandemic, the government and health authorities are more focused on dealing with the issue to significantly to alleviate and manage

this outbreak by implementing stringent measures (Umair et al., 2021). Therefore, the need of providing consistent, accurate, and trustworthy information on the COVID-19 pandemic is critical to the public (Mohamad et al., 2020). For that reason, several nations have taken the initiative to utilise various resources to promote and raise public awareness via telecommunication channels, such as conventional media, digital media platforms, and social media. First-hand information i.e. directly from community leaders and healthcare workers is also seen as a legitimate information outlet as this method curbs misinformation from leaking to the public.

Promotions on public awareness via the telecommunication channels typically targets the teens and young adult. In Malaysia, this demographic are typically university students, whereby in 2019, there were more than 500,000 students enrolled in public universities in Malaysia (MOE, 2020). The number of tertiary education students, therefore, contributes to a significant statistic of the total population in the country. Thus, it is important for these students to obtain enough understanding as well as reliable and current knowledge regarding COVID-19 (Chesser et al., 2020). The current and future pandemics can be better managed if students are engaged in community and family health protection measures. They would be able to disseminate proper knowledge and awareness to the community, especially the elderly about COVID-19 (Meganathan et al., 2021). Thus, they should be seen as emerging developmental agents who have the capability to influence the health of peoples (Alves et al., 2020; Chesser et al., 2020). According to Khasawneh et al. (2020), the pandemic resulted in a significant increase in the number of cases and deaths all around the world. Limiting the spread of COVID-19 will require a high level of knowledge and awareness. Consequently, the purpose of this study was to evaluate and assess knowledge and awareness of COVID-19 among Diploma in Pharmacy students, which is critical to note because they would be the future healthcare professionals in Malaysia. In fact, they must be well-versed in the current state of the pandemic to ensure that they are well-prepared in the event of a similar catastrophe in the future. The findings of this study will help in identifying factors and strategies to promote knowledge and efficacy belief towards COVID-19 intervention.

Literature Review

Pathophysiology and Transmission of COVID-19

To date there are seven types of coronaviruses including 2019 Novel Coronavirus (COVID-19), also known as SARS-CoV-2 (Kothai and Arul, 2020). SARS-CoV and COVID-19 share 79 percent gene expression homology and uses angiotensin-converting enzyme 2 (ACE-2) receptors. The viruses bind to the cell's spike-protein receptors, allowing them to permeate into the cells causing virulent infection and demise. COVID-19 has a tenfold greater affinity for ACE-2 receptors than SARS-CoV, thus exceeding the required threshold to initiate viral illness (Sudan et al., 2020).

Aerosolized viruses (Monica, et al., 2021) can travel farther as the smaller droplets remain airborne and are likely to move with the airflow circulation. There was a case of one infected member of a choir group who had affected 87% of attendees at choir practice in Washington via aerosol transmission (CDC, 2020f). Vehicle-borne transmission is a mode of transmission that spreads the COVID-19 through indirect contact with the infected person and it may happen unintentionally whereby the infected person unknowingly releases respiratory droplets (Jayaweera et al., 2020). Blood-borne or non-mucous membrane transmission may be the

source of the development of the SARS-CoV-2 (WHO, 2020e) whereby the virus may invade through the circulatory system as well as the faecal route. Studies conducted in three hospitals in China have reported the appearance of live viruses in the faeces and a small percentage of blood samples tested positive with the polymerase chain reaction (PCR) test (Wang et al., 2020). Although the virus has been detected in patients' biological specimens, this kind of transmission has a low probability of spreading the virus and remains uncertain (WHO, 2020e).

Preventive Measures of COVID-19

Due to the widespread COVID-19 disease, the WHO has declared the commencement of preventive measures to be executed across the globe (WHO, 2020b). These measures act as an effort to contain the transmission of COVID-19 hence controlling the mortality rate worldwide. Physical or social distancing (Lotfi et al., 2020) is one of the crucial measures to contain the spread of COVID-19 among people. Additionally, lockdowns and curfews have been enforced by various countries while isolation and self-quarantine were initiatives taken by infected individuals to break the COVID-19 transmission chain. Working from home was also imposed to avoid possible transmission from fellow colleagues at the workplace (Elengoe, 2020; De Vos, 2020). Furthermore, people were obligated to wear medical face masks or N-95 masks, either infected or healthy, as those who appear healthy may be possible asymptomatic patients (Lotfi et al., 2020). Two recommended methods on wearing face mask include double masking by wearing a cloth mask over a medical mask and knotted and tucked mask by knotting the ear loops of a medical mask where the mask's edges are joined and then tucking in the extra material under the edges (Brooks et al., 2021).

Handwashing is the other utmost critical step to prevent the spread of COVID-19. The WHO strongly urges the population to practice washing their hands regularly with soap and water for at least 20 seconds (WHO, 2020b). Handwashing with water and soap must be performed, especially after using the toilet, before eating, and coughing or sneezing. Touching the eyes, nose, and mouth should be avoided with unwashed hands. Moreover, applying hand sanitizers with at least 60% alcohol is also recommended when water and soap are not available (CDC, 2020a). Hand sanitizers as preventive measure in COVID-19 (Prajapati et al., 2022) are made portable for the convenience of the end-users, especially after touching common surfaces which may be contaminated.

On the contrary, the usage of gloves in public is a weak defense against COVID-19. Wearing gloves can give people a false sense of security on having less exposure to the virus. However, gloves can be easily contaminated as the virus adheres to the latex or other glove materials, giving the exact effects of being bare-handed (Lotfi et al., 2020).

Knowledge and Awareness of COVID-19 among Public and Pharmacy Students

Transmission from person to person (community spread) is the mode of transmission of COVID-19, including those who are asymptomatic (Johansson et al., 2021). The compliance of individuals with preventative and control measures is vital to ensure the effectiveness of disease control. This adherence to COVID-19 is strongly reliant on the population's knowledge, attitudes and practices (Ngwewondo et al., 2020).

Malaysians relied heavily on television for information during the period of the Movement Control Order (MCO). The Ministry of Health Malaysia (MOH) and the Malaysian National Security Council (NSC) are the official sources in giving information on COVID-19 (Ali

Salman, 2021) and its control in the country. These agencies provided daily briefings and news conferences to keep the public informed and updated about COVID-19. The public was reassured those necessary precautions were being taken through reliable spokespersons, public service announcements, clear language uses and visuals like informative graphics. Besides, local media had a critical role in conveying messages to the public during the MCO, particularly encouraging people to remain at home, maintain personal hygiene, and keep social distance while in public places (Mohamad et al., 2020). These are frequently complemented by news conferences featuring public health experts who discuss the outbreak's epidemiological status and severity. Furthermore, newspapers and magazines are commonly used to provide health advice and to provide up-to-date news about current events (Weitzel and Middleton, 2020).

Moreover, the Government of Malaysian has created an application called MySejahtera with the intention to help manage the country's COVID-19 epidemic (Karam et al., 2020). It enables users to self-assess their health and their family members, track their health progress during the COVID-19 epidemic, help users obtain treatment if they are infected and find nearby healthcare facilities for them to get COVID-19 screening and treatment. Additionally, it also allows MOH to monitor users' health status and perform contact tracing for COVID-19, allowing them to take immediate action in delivering necessary treatments. MySejahtera is the official channel for Malaysia's National COVID-19 Immunisation Program, which facilitates vaccine registration, appointment scheduling, and the issuing of COVID-19 immunisation digital certificates (MySejahtera, 2021).

COVID-19 pandemic requires the cooperation of all healthcare providers, including pharmacists, who played an essential role in pandemics and worked on the front lines of combating the COVID-19 epidemic (Jarab et al., 2020). Pharmacists are accountable for giving knowledge, ensuring good quality management, and protecting people against diseases throughout epidemic outbreaks. Since pharmacy students represent future practitioners, they must be well-versed in and aware of pandemic health issues such as COVID-19. Hamza et al. (2021) suggested that education for pharmacy students in preventative, efficient treatment and follow-up should be included in the curriculum of study.

Methodology

Study Design

A cross-sectional questionnaire survey was carried out among UiTM Diploma in Pharmacy students from April until May 2021. Participants were chosen based on their availability and willingness to participate in this research among the Diploma in Pharmacy, Universiti Teknologi MARA Cawangan Pulau Pinang, Kampus Bertam. Total population of students was 305 and sample size determined using Krejcie and Morgan (1970) Table indicated 169 respondents. A purposive sampling was used for this study whereby a total of 189 students responded.

Data Collection

A qualitative survey with both closed and open-ended questions was designed and data were collected assess the knowledge and awareness of the students on COVID-19 transmission and prevention. The survey questionnaire was adapted from Hamza et al. (2021), Meganathan et al. (2021), Azlan et al. (2020), Khasawneh et al. (2020) and Jarab et al. (2020). All respondents

were requested to complete the survey through a questionnaire that was sent through email and WhatsApp with request letters for their responses.

The survey questionnaire consisted of basic demographic, knowledge and awareness questions about COVID-19. The demographic data consisted of gender, age, area of residence, semester of studying and sources of information regarding COVID-19. Eleven close-ended questions using a 2-point rate (where scores of 0 or 1 were used to indicate levels of agreement with the statements) about knowledge of COVID-19 whereby respondents were required to choose either agree or disagree for each statement. Each correct answer was allocated one mark. Each respondent could obtain a maximum of 11 marks. The range of marks were determined as poor (0 - 2 marks), moderate (3 - 5 marks), good (6 - 8 marks) and excellent (9 to 11 marks). As for awareness of COVID-19, there were 18 questions which need to be answered by the respondents by choosing either agree or disagree.

Data Analysis

The collected data were analysed by frequency of common students' responses and were stated in percentages. Mean and standard deviation (SD) were presented for numerical data, while frequency and percentage were presented for the categorical data. Descriptive statistics were performed to determine the demographic factors (gender and semester of studying) and knowledge scores. Independent t-test and one-way ANOVA were used to assess the association between the demographic factors and overall knowledge scoring. The Statistical Package for Social Sciences (SPSS) version 26 was used for extracting the data from the excel file and performing the analysis.

Results and Discussion

Students' Demographic and Sources of Information

A total of 189 students have responded to the survey with the age range between 19 to 23 years old (mean, 19.2 ± 1.0). Majority of the respondents were females i.e. 152 (80.4%), whilst 37 (19.6%) were males. The respondents were from semester 1 (36.0%), semester 3 (33.9%) and semester 5 (30.1%). A total of 100 (52.9%) of the students resided in sub-urban areas compared to 48 (25.4%) and 41 (21.7%) students from rural and urban areas, respectively. As shown in Table 1, social media such as Facebook, WhatsApp, Twitter etc. (98.9%) were the main source of information. Other sources were television, friends/families, digital sources, radio, health unit/ frontliners, printed media and community leaders.

It is notable during the movement control order (MCO), the respondents gained greater accessibility to surfing social media, watching television and communicating with family and friends while at home. Previous research performed among Jordanian parents showed that they rely primarily upon the WHO website for current COVID-19 information (Abuhammad, 2021). Indeed, the mass media provided constant and timely information on the pandemic's progress during this period. It should be noted that the mass media have a substantial impact on people's knowledge and attitudes, along with their risk perception (Gallè et al., 2020). Additionally, MOH Malaysia and WHO have gathered comprehensive and up-to-date information via their social media and websites which include infographics, current updates and vaccination. MOH also collaborated closely with the Malaysian National Security Council (NSC) through our television channels and radio stations in educating the public on COVID-19 prevention, up-to-date information on the COVID-19 situation and encourages people to adapt to the new norms

in their life (Azlan et al., 2020). Likewise, to curb the spread of fake news, health care personnel should serve as the major source of information to the public, particularly in rural areas with limited internet access and resources (Swire-Thompson and Lazer, 2020).

Table 1: Demographic Characteristics and Students' Sources of COVID-19 Information

Description	N (%)
Gender	
Male	37 (19.6)
Female	152 (80.4)
Semester of study	
1	68 (36.0)
3	64 (33.9)
5	57 (30.1)
Area of residence	
Urban	41 (21.7)
Sub-urban	100 (52.9)
Rural	48 (25.4)
Source of information*	
Social media (e.g. Facebook, WhatsApp, Twitter etc.)	187 (98.9)
Television	173 (91.5)
Friends/ family	149 (78.8)
Digital resources	97 (51.3)
Radio	70 (37.0)
Health unit/ Healthcare worker/ Outreach Front line workers	59 (31.2)
Print media (Newspaper article/ brochure)	55 (29.1)
Community leaders	17 (9.0)

Notes: *Multiple responses possible. Total percentage may exceed 100%.

Students' Knowledge

Figure 1 shows total knowledge scores of attained by all respondents. The range of marks are determined as poor (0 to 2 marks), moderate (3 to 5 marks), good (6 to 8 marks) and excellent (9 to 11 marks). To calculate the overall knowledge scores, the correct answer was coded as "1" and the wrong answer was coded as "0" for all 11 questions under knowledge. The correct answers were calculated to determine the total score for each question. The average knowledge-level score was 8.70 (± 1.060) with the range knowledge score between 6 to 11. Results revealed that students' knowledge regarding COVID-19 ranged from good (41.8%) to excellent (58.2%). Our findings are in line with Hamza et.al, (2021) who found that 72.5% of the pharmacy students attained excellent level of knowledge regarding COVID-19.

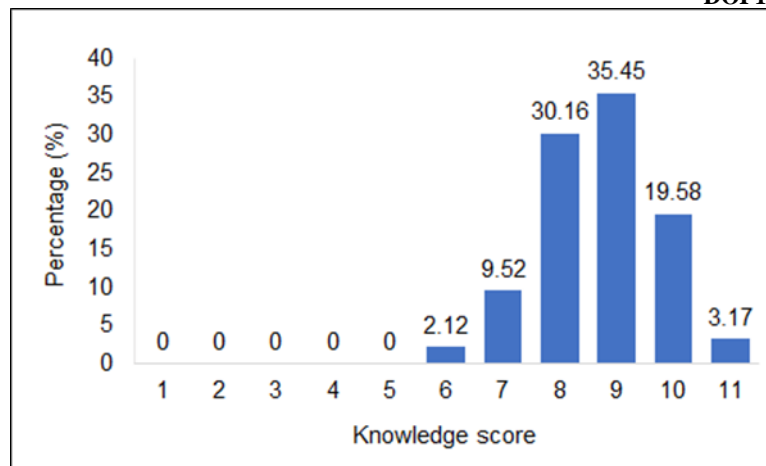


Figure 1: Total Knowledge Scores of Respondents

Table 2 summarises the analysis of students' knowledge regarding COVID-19 transmission and prevention. A total of 168 (88.9%) respondents agreed that COVID-19 can spread between people who are near one another, particularly within 1-2 metres. COVID-19 has been reported to transmit from person to person within 1-2 metres whereby infected droplets may infiltrate the eyes, nose, or mouth of people within these distances, causing infection (WHO, 2020b). A study found that a droplet can traverse more than 6 to 8 metres, signifying that a concentrated cough and sneeze carrying the COVID-19 virus can be communicated over 1 to 2 metres. Multiple laboratory data suggest that COVID-19 is detectable in air samples lasting up to 16 hours (Jones et al., 2020). Therefore, individuals must maintain a minimum of one metre of separation from others, regularly clean their hands, and cover their mouths with tissues or bend their elbows inwards while sneezing or coughing to prevent respiratory droplets from spreading around them (WHO, 2020a).

Additionally, 187 respondents (98.9%) agreed that COVID-19 can be transmitted via respiratory droplets, primarily the infected person's cough and sneezes. Research showed that COVID-19 virus can spread in two ways: directly, via human-to-human contact, or indirectly, via polluted objects and airborne transmission (Lotfi et al., 2020). Thus, people may be infected with the virus unless they clean their hands before touching their facial features (WHO, 2020b). Likewise, 188 respondents (99.5%) agreed that COVID-19 can be contracted by touching a virus-infected surface or object and then touching one's mouth, nose, or possibly eyes. Those with viruses in their throats and noses may leave virulent droplets in these areas. As a result, it is imperative for individuals to properly clean their hands with soap and water or an alcohol-based hand sanitiser and disinfect surfaces with alcohol or diluted bleach on a frequent basis (WHO 2019, 2020b).

Moreover, 160 respondents (84.7%) respondents objected that individuals with normal body temperature could not transmit the virus. The thermal scanner can be used to identify individuals who have a higher body temperature than normal, which may indicate a fever but is not capable of diagnosing COVID-19 infection (WHO, 2019). According to WHO (2020b), people can transmit the virus whether they have symptoms or not including having a normal body temperature. Furthermore, 188 respondents (99.5%) acknowledged the major clinical symptoms of COVID-19 may include fever, fatigue, dry cough, myalgia, and shortness of breath. In fact, COVID-19 can induce symptoms such as fever, dyspnea, dry cough, diarrhoea,

nausea, myalgia, headache, exhaustion, and lack of sense of smell and taste, some of which are uncommon in individuals with common colds (Huizen, 2021).

Next, 103 (54.5%) respondents are aware that congestion, runny noses, and sneezing are less prevalent in people infected with COVID-19 as the illness itself is distinct from the common cold. Other COVID-19 symptoms comprise sneezing, discolouration of fingers or toes, sputum production, nasal congestion, and sore throat, according to some research (Lotfi et al., 2020). Hence, this shows that most respondents recognised the primary symptoms of COVID-19 and the differences between COVID-19 and the common cold. Surprisingly, nearly a quarter of the respondents (23.8%) agreed that antibiotics are effective in treating COVID-19 disease. COVID-19 infection is caused by the SARS-CoV-2 whereby antibiotics are only effective against bacteria. It can be demonstrated that more than three quarter of respondents understood the purpose of antibiotics. However, persons infected with the virus may develop bacterial infection, thus they can be treated with antibiotics as needed and indicated by healthcare professionals (WHO, 2019).

Besides, 180 respondents (95.2%) agreed that COVID-19 has no effective cure, but early symptomatic and supportive treatment are proved to help most patients recover from the infection. To date, many countries have already started vaccination programmes to curb COVID-19 transmission (Aljazeera, 2020). Different types of COVID-19 vaccines have been manufactured including inactivated and mRNA vaccines. Examples of currently available vaccines in the international market include Pfizer BioNTech, AstraZeneca-Oxford, Moderna, Johnson & Johnson, Sputnik V, Sinovac and Sinopharm (Craven, 2021). Moreover, WHO is involved in the regulation of large-scale clinical studies involving more than 100 countries worldwide (Lotfi et al. 2020).

A total of 188 participants (99.5%) acknowledged the severity of COVID-19 complications in the elderlies and those with serious chronic diseases. In fact, more than 80% of COVID-19 deaths occurred in adults above 65 years whilst more than 95% of COVID-19 fatalities happened in people beyond 45 years of age (NCIRD, 2020). According to Khademi et al. (2021), the elderly is more sensitive to severe COVID-19 complications because their immune systems deteriorate over time. Those with severe chronic disease are at a greater risk of contracting COVID-19 because of health facility exposure caused by frequent visits to healthcare institutions for medical consultations (Xia et al., 2020). The similarities between chronic disease and COVID-19 are that they both elicit pro-inflammatory effects, altered innate immune systems, and endothelial dysfunction (Liu et al., 2020).

Likewise, 133 (70.4%) participants agreed that pregnant women are highly susceptible to the infection compared to non-pregnant women. There was a significant risk of preterm birth in pregnant women with novel coronavirus pneumonia (NCP) seen in 10 of 18 pregnant women who delivered prematurely before 37 weeks of pregnancy. More research is needed to clarify whether pregnant women had obstetrical issues such as preterm membrane rupture, preeclampsia, and irregular contractions because of COVID-19 (Liu, et al., 2020). However, pregnant women infected with COVID-19 should be aware of the possible hazards associated with pregnancy-related immune responses and cytokine storms generated by COVID-19 infection, which increase severe morbidity and possibly caused death (Liu, et al., 2020). Finally, 154 respondents (81.5%) disagreed that children do not appear to be at higher risk for COVID-19 than adults. Compared to adults, most children had weaker COVID-19 symptoms,

which may imply a lower ability of viral transmission (Ludvigsson, 2020a). Nonetheless, children may have had recurrent viral episodes when they were young, and their immune systems may have been boosted because of previous ailment, which leads to an improved immune system against COVID-19 (Ludvigsson, 2020b).

Table 2: Students' Correct Knowledge and Mean Scores Regarding of COVID-19

Questions	N (%)
COVID-19 spreads from person-to-person within close distance of each other (within 1-2 meters).	168 (88.9)
COVID-19 spreads through respiratory droplets, which occur when infected people cough and sneeze.	187 (98.9)
COVID-19 can be contracted by touching a surface or object, on which the virus is attached, and then touching one's mouth, nose, or, perhaps, eyes.	188 (99.5)
People with normal body temperature cannot transmit the virus to others.	160 (84.7)
The main clinical symptoms of COVID-19 include fever, fatigue, dry cough, myalgia and shortness of breath.	188 (99.5)
Unlike the common cold, congestion, runny nose, and sneezing are less common in people infected with COVID-19	103 (54.5)
Antibiotics are effective to treat COVID-19	144 (76.2)
Currently, there is no effective cure for COVID-19, but early symptomatic and supportive treatment can help most patients recover from the diseases.	180 (95.2)
The elderlies (old people) and those with serious chronic illnesses, such as heart or lung disease and diabetes, are at increased risk of developing more serious complications from COVID-19.	188 (99.5)
Pregnant women are more susceptible to infections than non-pregnant women	133 (70.4)
Children do not appear to be at higher risk for COVID-19 than adults	154 (81.5)

To determine the association between total knowledge score with demographic factors (gender and semester of studying), Independent sample t-test and one-way ANOVA were performed. It was revealed that there was no significant association between the total knowledge score with gender and semester of studying ($P > 0.05$) (Table 3). This shows that all respondents possessed similar knowledge about COVID-19 regardless of their gender or their semester of study.

Table 3: Association of Gender and Semester of Study with Total Knowledge Scores Regarding COVID-19

Characteristics	Mean \pm SD	Test value	P value
Gender		4.702*	0.453
Male	8.51 \pm 1.07		
Female	8.75 \pm 1.05		
Semester of study		0.705**	0.495

1	8.59 ± 1.12
3	8.73 ± 0.95
5	8.81 ± 1.09

Students' Awareness

Table 4 shows all respondents agreed that washing hands and avoiding crowded places are the most effective measures to prevent the spread of COVID-19. This demonstrates that all respondents are mindful that hand washing is one of the primary measures to cease the transmission chain of COVID-19 (Lotfi et al., 2020). Our findings are in line with Ali et al. (2020) who showed that most of their respondents strongly agreed that washing hands with soap and water is an essential precautionary step to prevent COVID-19. Likewise, WHO advocated the whole population to practice good hand hygiene by washing their hands with water and soap regularly for at least 20 seconds and using alcohol-based hand sanitizers. However, Nadeeya et al. (2020) showed that the use of hand sanitizers is yet low compared to washing hands with soap and water. This may be due to recommendations by public health agencies such as the Center for Disease Control and Prevention (CDC), which emphasizes the public to wash their hands with soap and water instead of using hand sanitizers whenever possible (CDC, 2020a).

All except one respondent (99.5%) agreed with the proposed precautionary measures such to avoid spreading COVID-19 such as practicing physical distancing and immediate self-quarantine for a closed contact person to adhere for a period of 14 days. This showed that the respondents have good knowledge on self-isolation and self-quarantine for a duration of 14 days after being in contact with an infected patient to control the spread of COVID-19 (Vasishta et al., 2020).

A total of 187 (98.9%) respondents acknowledged the importance of avoiding crowded places, avoiding taking public transport and avoiding touching the eyes, nose, and mouth with unwashed hands as preventive measures to prevent COVID-19 transmission. Respondents agreed that avoiding crowded places such as train stations or shopping malls can prevent the infection of COVID-19. This finding was supported by a study whereby 99.1% of the respondents believed that avoiding crowded places can reduce the probability and risk of COVID-19 transmission (Mohd Hanafiah and Wan, 2020). Moreover, Ali et al. (2020) illustrated that most of their respondents were convinced that the main causes of the COVID-19 outbreak are due to overcrowding, going shopping and using public transportations.

Next, 181 (95.8%) and 154 (81.5%) participants agreed that avoiding the practice of eating outside in confined areas and avoiding contact with blood or body fluids of an infected person could prevent the disease transmission, respectively. A guideline on caring for infected COVID-19 patients stated that caregivers should wear gloves when needed to be in contact with the patients' blood, stool, and body fluids such as mucus, saliva, urine and vomit. They should dispose of the gloves and instantly wash their hands afterwards (CDC, 2020c). In addition, 184 (97.4%) and 178 (94.2%) respondents acknowledged that wearing a 3-layer medical masks could prevent COVID-19 spread and the needs to wash hands with soap and water or hand sanitizer after being in public places or after nose-blowing, coughing, or sneezing, respectively. Hand washing with water and soap is proven to completely eliminate and dislodge all forms of infectious pathogens from the hands, whilst hand sanitizers do help in killing germs but it cannot remove all types of viruses and bacteria (Berardi et al., 2020).

Nonetheless, the use of hand sanitizers becomes vital at times where soap and water are not readily available, acting as an alternative method to reduce the number of germs present on the hands (Golin et al., 2020).

However, only 42 respondents (22.2%) agreed that people should only wear a mask if they are infected with the virus, or if they are providing care for COVID-19 suspects. The CDC has urged for masks to be worn by the entire population, either infected or healthy as a shield against the infection (CDC, 2020b). Studies have found that people who were infected with COVID-19 but show no common signs or symptoms contribute to the disease's widespread among the community (Johansson et al., 2021). Other findings regarding COVID-19 awareness from this study show that respondents agreed with compliance to standard operating procedures (SOP) i.e. 185 (97.5%), isolation and treatment of people infected with COVID-19 i.e. 186 (98.4%) and to stay at home when feeling ill i.e. 179 (97.4%). Likewise, 183 (96.8%) respondents agreed that immunocompromised people are highly likely to demonstrate severe symptoms.

A sum of 120 respondents (63.5%) agreed to be vaccinated early. Majority of them displayed confidence and reliance on the COVID-19 vaccine. Despite that, it can be deduced that some are still hesitant to be the first to receive these vaccines which may be due to uncertainties regarding the safety and efficacy of these newly developed vaccines (Syed Alwi et al., 2021). However, only 26 (13.8%) respondents agreed that it is unnecessary for children and young people to observe precautionary measures in curbing COVID-19 transmission. According to CDC (2020d), children portray less severe symptoms when infected by SARS-CoV-2 compared to adults. However, it is vital for children to practice preventive actions such as washing hands, wearing masks and social distancing as well to avoid possible complications of the disease (CDC, 2020e).

Besides, twenty-five respondents (13.2%) agreed that traditional medicines could cure COVID-19. Several studies showed that traditional medicines may be used to prevent and treat the infection. In China, the spread of COVID-19 was successfully halted when traditional Chinese medicines were incorporated into the treatment regimen for COVID-19 patients (Zhao et al., 2021). According to preclinical studies conducted by Ding et al. (2017) and Runfeng et al. (2020), herbal medicines containing an abundance of flavonoid compounds are proven to exert antiviral properties in some human lung derived cell lines. Some of the herbal medicines frequently distributed in China for COVID-19 treatment include liquorice root, Forsythia fruit and Baical Skullcap root (Huang et al., 2020). However, it should be noted that further clinical trials and evaluations are warranted for the validation of herbal medicines' usage in preventing COVID-19 (Panyod et al., 2020). In contrast with our findings, a similar study obtained a higher percentage of respondents (39.6%) who emphasized on taking herbal medicines in effort to combat the infection of COVID-19 (Ali et al., 2020). In general, these findings showed that the respondents were aware about measures that should be taken to halt COVID-19 transmission.

Table 4: Awareness of Students Regarding COVID-19

Questions	N (%)	
	Agree	Disagree
Compliance with the Ministry of Health precautions/Standard Operating Procedures (SOP) will prevent the spread of COVID-19.	185 (97.9)	4 (2.1)
It is important to keep my distance from others, to avoid spreading COVID-19.	188 (99.5)	1 (0.5)
To protect myself from COVID-19 exposure, I should stay home if I am sick, unless I am receiving medical care.	179 (94.7)	10 (5.3)
A person can prevent getting the infection of COVID-19 by avoiding eating outside, in close areas such as restaurants/ cafe.	181 (95.8)	8 (4.2)
To prevent transmission of COVID-19, people must avoid going to crowded places and/or avoid taking public transport.	187 (98.9)	2 (1.1)
People should avoid touching their eyes, nose, and mouth with unwashed hands.	187 (98.9)	2 (1.1)
Washing hands is essential to protect myself from COVID-19.	189 (100.0)	0 (0.0)
After being in a public place, after nose-blowing, coughing or sneezing, people must wash their hands with soap and water, or use hand sanitizer containing at least 60% alcohol, for at least 20 seconds.	178 (94.2)	11 (5.8)
Ordinary residents can wear medical masks (3 layers) to prevent COVID-19 infection.	184 (97.4)	5 (2.6)
People should only wear a mask if they are infected with the virus, or if they are caring for someone with suspected COVID-19.	42 (22.2)	147 (77.8)
A person can prevent getting the infection of COVID-19 by avoiding crowded places such as train stations/ shopping malls.	189 (100.0)	0 (0.0)
A person can prevent getting the infection of COVID-19 by avoiding contact with blood or body fluids of an infected person.	154 (81.5)	35 (18.5)
Immunocompromised people (diabetic, renal failure, chronic lung disease patients) are more likely to have severe symptoms.	183 (96.8)	6 (3.2)
It is not necessary for children or young people to take precautionary measures to prevent COVID-19 transmission.	26 (13.8)	163 (86.2)
Isolation and treatment of people infected with COVID-19, are effective ways to reduce the spread of the virus.	186 (98.4)	3 (1.6)
People in contact with someone infected with COVID-19 should be immediately quarantined, in an appropriate location, for a general observation period of 14 days.	188 (99.5)	1 (0.5)
Traditional medicine can cure COVID-19.	25 (13.2)	164 (86.8)
I would like to be among the first/ earliest group to receive COVID-19 vaccine.	120 (63.5)	69 (36.5)

Conclusion

This study determines the degree of knowledge and awareness amongst Diploma in Pharmacy students at Universiti Teknologi MARA Cawangan Pulau Pinang, Kampus Bertam. All

respondents attained good and excellent levels of knowledge about COVID-19 as evidenced by the accurate responses in the survey. Likewise, most of the participants demonstrated good awareness about COVID-19 transmission and prevention. They gained their knowledge about COVID-19 through multiple sources of information whereby social media, television as well as families and friends were the top three. Most of the respondents agreed that touching infected surfaces can lead to COVID-19 transmission. They also concurred that COVID-19 spreads through respiratory droplets, the elderly are more susceptible to the disease as well as clinical manifestations such as fever and shortness of breath. In addition, the respondents realized the importance of practicing social or physical distancing as well as avoiding crowded and confined areas to reduce COVID-19 transmission. Moreover, they also expressed the importance of practicing handwashing and to self-isolate or quarantine if exposed to COVID-19 infected persons.

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Ethics Approval

Prior to collecting the data reported in this study, ethical approval has been granted from Research Ethics Committee (REC), Universiti Teknologi MARA (REC/04/2021(MR178)).

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