

ORIGINAL RESEARCH ARTICLE

Perception Of Telemedicine Visits During The Coronavirus Disease 2019 Pandemic: A Cross-Sectional Study Among Medical Students

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ABSTRACT

Telemedicine is described as healing at a distance together with the utilization of electronic information and telecommunication technology to improve patient's outcome by enabling better access to care and medical information of an individual's needs. During COVID-19 pandemic, telemedicine could be a vital tool in providing care to patients while maintaining social distancing. The aim of this research is to determine the perception of telemedicine visits during this COVID-19 pandemic among medical students in a private medical university in Malaysia. A cross-sectional study was conducted from May 2021 to June 2021 and purposive sampling was used to enrol students for this study. Data collection was done by distribution of a google link consisting of the questionnaires to the students. The questionnaire was divided into three parts which were the sociodemographic information, preference of telemedicine, and experience with telemedicine. The data was analysed by Epi Info software version 7.2. The analysis included frequency tables, percentages, odd ratios, and chi-square test. A total of 150 students had participated in this study. The majority (74.67%) prefer to visit their regular doctor in person compared to those opting for telemedicine visits (25.33%). During this COVID-19 pandemic, it is seen that the percentage of medical students who prefer to see their doctor in person has fallen to 48.67% while 51.33% prefer telemedicine visits. After social distancing ends, only 4.66% prefer telemedicine visits. Telemedicine visits are not popular among the medical students

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because the concept is still new in Malaysia, and it is underdeveloped. Further studies and publicity on telemedicine visits in Malaysia might encourage them to have more enthusiasm for telemedicine.

INTRODUCTION

Telemedicine is described as healing at a distance together with the utilization of electronic information and telecommunication technology to improve patient outcomes by enabling better access to care and medical information of an individual's needs [1,2]. Telemedicine combines the convenience, low cost, and easy accessibility of health-related information and communication using the Internet and related technologies. Beginning with the use of telephone consultations, telemedicine has become more sophisticated with each technological advance and now incorporates complex telecommunications and computer technologies to provide healthcare information and services to clients in multiple locations, which is particularly relevant during pandemics because it can maintain the containment phase [3].

Telemedicine is mainly divided into either from healthcare professionals to healthcare professionals or from healthcare professionals to patients [2]. Firstly, Store-and-forward, or asynchronous telemedicine, which involves the exchange of pre-recorded data between two or more people at different times. For example, a referring patient or medical professional sends an email description of a medical case to an expert, who will then send opinions on the diagnosis and best management [2]. In Spain, physician orders are assigned to pharmacy electronic systems by Patient Electronic Medical Record (PEMR) and medications are dispensed to patients [3]. Also, my health (La meva salut) has increased, a digital platform provided by the public system that makes available to patients the main medical documents from the PEMR so that patients can access their medical certificates. This option is in addition to their existing access to discharge reports, laboratory results, radiological and other complementary reports [3]. Next, synchronized, or real-time telemedicine which requires related personnel to be present at the same time to exchange information instantly, such as in a video conference. However, relevant information can be transmitted in a variety of media, such as text, audio, video, or still images [2]. For instance, online consultations, Tele-monitoring/screening and chatbots which enable for recommendations, FAQs and connecting at-risk patients with a doctor [3].

COVID-19 epidemic has posed a challenge to different countries' innovation and resilience, and telemedicine played a critical role in shaping health policy [3]. Routine clinic appointments, including those for patients with diabetes, were cancelled at the eleventh hour. The unavailability of well-established telemedicine system in many countries resulting in large groups of patients with diabetes rapidly found themselves left with little to no medical support during this pandemic [5]. In China, The National Telemedicine Centre established the Emergency Telemedicine Consultation System, a telemedicine-supported outbreak alert and response network. The private sector participated in

organizing the response, with ZTE and China Telecom providing 5G technology to West China Hospital Sichuan University [7]. Meanwhile in Singapore, a tracking system was developed that could identify and report the GPS tracking of people under quarantine and link that information to their serological test results so that they had a map of the chain of transmission [8]. Also in Spain, during the epidemic in the Spanish region of Catalonia, health authorities have implemented a follow-up system in primary care that monitors patients' symptoms by telephone and readmits them to hospital if symptoms worsen. This implementation provides longitudinal and continuous care for patients [9].

Given the high risk of transmission of the disease through person-to-person contact, telemedicine may be helpful in containing COVID-19 spread by reducing direct contact. The main advantage of telemedicine is used in the follow-up of patients after hospital discharge, which is also applicable to patients diagnosed with COVID -19. Accordingly, it can reduce patient-physician contact and lead to increased population monitoring [5]. On March 7, 2020, an urban academic medical centre in Parma, Emilia-Romagna Region, Italy developed a comprehensive paediatric infectious disease telemedicine programme. The use of telemedicine for the management of paediatric infectious diseases permitted us to avoid hospital access in 90 % of the cases, favouring reduction of pressure on the hospitals [4].

This IT-based innovation has been introduced for decades, but the usage of these services has failed to prevail despite the numberless reported advantages. Developing countries have swiftly adopted the technology without appropriate planning and strategy. Despite over two decades of telemedicine adaptation, developing countries are yet to achieve outstanding success in mitigating the expenses of care or revamp access to care [6]. Also, many factors need to be considered including the types of information to be transmitted, the quantity of information to be transferred, and security and privacy, the choice of transmission method for any telemedicine application with consideration of what one would like and what one can afford and the right people are also required and they must be properly trained. All these have created setbacks in developing countries which may not have the capability to introduce telemedicine in their healthcare system [10]. Moreover, systematic review by Taylor shows randomized controlled trials of telemedicine are expensive and time-consuming to conduct such experiments. In some settings it is difficult, for ethical, administrative, or scientific reasons, to organize the random assignment of patients to different conditions and so doctors, clinics, hospitals or even health authorities must be used as the unit of randomization. Most of these studies have been carried out as demonstrations, to show that a proposed application can be implemented in a chosen setting [11]. Additionally, a study showed that slow connectivity, incompatibility of software and hardware, insufficient understanding of the benefits of telemedicine could be a possible reason for the low interest in utilizing telemedicine [14].

According to Dario, it was shown that patients with different chronic conditions accepted telemedicine services and reported similar perceptions of them. For example, patients perceived that they saved time because monitoring their health from home meant that travelling to health facilities was not always necessary and were connected to health

and/or social care professionals round the clock. However, patients with COPD showed more concerns than others regarding caregivers. These patients had problems with the instrument measurement because occasionally, the instrument could not function properly. Some patients felt that the service occasionally interrupted the continuity of their care. No general difficulties were noted in the study and patients with the range of conditions studied rated the service positively, like other studies [12,13].

In Malaysia, there are limited studies conducted in the past [14-16]. However, their studies are conducted among health care professionals and there are no studies conducted among students, especially students who are currently studying in courses which are related to health care. Hence, this study would broaden the database available by comparing the perception of telemedicine visits among medical students in a private medical university in Malaysia during the COVID-19 pandemic.

The COVID -19 pandemic triggered an unprecedented need to provide care remotely. Within days of widespread recommendations for social distancing and orders to stay put, there was a rapid expansion of telemedicine services across multiple specialties and locations to continue to meet patients' need for outpatient care [1]. The purpose of this study was to determine whether there is a necessary use of telemedicine due to the 2019 coronavirus disease, and whether the limited choice both the provider and the patient had an impact on the perceptions of telemedicine by patients who had experience with telemedicine prior to the pandemic and those who were exposed to telemedicine only during the pandemic.

The distinctive feature of our study and previous studies was that this study focused on the perception of medical students in Malaysia. So far, there are no such studies focused mainly on medical students. The general objective of the study was to determine the perception of telemedicine visits during this COVID-19 pandemic among medical students. Besides that, this study was also to comprehend what did medical students think about the use of telemedicine in the future. Furthermore, this study was to learn the impression of those who had first experienced telemedicine during this COVID-19 pandemic.

METHODS

Study design, setting, and population

A cross sectional study was conducted from May 2021 to June 2021 in the study university, which is a private medical university in Malaysia. This study aimed to assess the preference of telemedicine visits during the COVID-19 pandemic, and a study population of 1300 medical students from the study university was selected.

Sample size

According to previous study that was carried out among living individuals in Selangor, Malaysia, they found that 20.4% of the population prefers the use of telemedicine for visits to their primary care provider (PCPs), from which estimated populations of 0.204 was taken in our studies [10]. Microsoft Excel Sample Size Calculator was used with our population size (N) of approximately 1300 medical students in total [17]. The study estimate was 20.4% with the precision error of 7%. With this we calculated our minimum sample size was 121. Taking the non-responses percentage of 20% into consideration, the final sample size (n) is 152.

Sampling method

Purposive sampling was used as the sampling method while conducting the study, which is a non-probability sampling method. The inclusion criteria were the medical students who voluntarily agreed to participate in the study and the questionnaires must be completed to be considered valid for the research after they filled up the consent form. Meanwhile, for the exclusion criteria, included those who did not fill up the consent form, not available when the questionnaires were distributed, incomplete questionnaires, and irrelevant responses.

Data collection

The data collection was done by the distribution of a google link consisting of the questionnaires to the class representatives of Semester 1 to Semester 10 to be shared in their respective class groups. The questionnaire taken was from a previous study on telemedicine for surgical consultation and is modified accordingly for this study [18]. They were informed that the online questionnaire will take around 5 to 10 minutes to answer and their participation is completely voluntary with informed consent taken.

The questionnaire was divided into three parts: 1) Sociodemographic information, 2) preference of telemedicine, 3) Had a virtual/telephone visit before. The questions are prepared as multiple-choice question, and short answers. In part 1, there were 12 questions consisting of demographic data (age, gender, ethnicity, education level whether it is preclinical or clinical year, family monthly income, health insurance status with specification, and average duration it takes to reach the doctors' office and nearest hospital respectively). They were also asked whether any family member is there working in healthcare and telemedicine, and to specify the occupation if yes. They were also asked if they had any medical training on telemedicine and how limited their interactions and activities during social distancing in which they are supposed to choose the best option that fits their daily life in the past 2 weeks.

There are 8 questions in Part 2. First question was asked on whether participant had a virtual or telephone for a doctor's appointment before. Next question, they were asked to rank how they would prefer to see their primary doctor, either in person, video chat or phone call. They were also asked to rank as the previous question, on how they would prefer their initial consultation. They were asked to rank according to the scale, where 1 is most preferred and 3 is least preferred. They were asked about their opinion on difference in cost for telemedicine visits, preference of visit to primary doctor during social distancing, how they would prefer their initial consultation with their primary doctor during social distancing and after it ends. They are asked to choose the best option that fits them. They were also asked on 8 components regarding the first appointment with a doctor in which they must choose between options, "more effective in person", "effective either way", or "more effective virtually". Scores 1, 2, or 3 are given according to the respective options chosen.

In part 3, there are three questions regarding their experience with telemedicine. They were asked whether their telephone visit was because of COVID-19 in which they must choose "YES" or "NO". Next, they are asked to rate their overall satisfaction with their visit with a 5-point scale, where 1 is extremely satisfied and scale 5 is extremely dissatisfied. They were also asked to choose between options, "Yes", "No", or "Maybe" on whether they would like to continue to see their doctor virtually in future.

Data processing & data analysis

Data collected was entered into Microsoft Excel. Data was then analysed statistically using Epi Info version 7.2 from the Centres of Disease Control and Prevention websites (CDC). For the quantitative data (age), the mean, standard deviation and range were calculated, whereas for the qualitative data (gender, ethnicity, employment status of family members, educational level (preclinical, clinical), family monthly income, medical training, health insurance status, average duration takes to reach the nearest doctor office and hospital and experience with telemedicine), the frequency of those data were counted, and the percentage were calculated. We set the level of significance at 5% which is 0.05 ($p < 0.05$). Unpaired t-Test, ANOVA, and Chi-Square tests were used for data analysis.

Ethical consideration

The participants were informed that the participation in this survey is completely voluntary, and written informed consent was taken through Google form. The participants were assured that the information collected through this survey is confidential and their anonymity and privacy were well maintained. The research was approved by Research Ethics Committee, Faculty of Medicine, Manipal University College Malaysia (MUCM), Malaysia.

RESULTS

A total of 150 responses were collected from the online questionnaire distributed. Table 1 illustrates the frequency and percentage of different demographic variables. For the age group in years, the majority (72.67%) were below 22 years. For gender, 62.67% participants were female while 37.33% are male. According to race, the greatest number of participants were Indians with a percentage of 50.67, followed by Chinese (27.33%), others (15.33%) and Malays (6.67%). 32% of participants had family members working as a doctor, while 68% responded no. Besides that, 14% of participants had family members working in telemedicine, while 86% responded no. Only 6% of participants had medical training in telemedicine before while 94% did not have that experience. On the average duration to travel to the doctor's office, 92.67% participants took about 15 to 30 minutes to arrive. More than half of the participants (64.67%) had health insurance. For the question on how limited their social interaction and activities during social distancing are, 73.33% had responded that they only leave their home for essential activities (Table 1).

Tables 1. Sociodemographic information of the participants (n=150)

Variables	Frequency (n)	Percentage (%)
Age		
≤ 22	109	72.67
> 22	41	27.33
Mean (SD)	21.55 (1.59)	
Gender		
Female	94	62.67
Male	56	37.33
Ethnicity		
Malay	10	6.67
Chinese	41	27.33
Indian	76	50.67
Others	23	15.33
Education level		
MBBS Pre-clinical year (Semester 1-5)	66	44.00
MBBS Clinical year (Semester 6-10)	84	56.00
Any of your family member working in healthcare (e.g., doctor)?		
Yes	48	32.00
No	102	68.00
Any family member with work in telemedicine.		
Yes	21	14.00
No	129	86.00
Family monthly income		
≤ RM 4849	25	16.67
RM 4850 - RM 10959	71	47.33

≥ RM 10960	54	36.00
Have you ever had any medical training about telemedicine before?		
Yes	9	6.00
No	141	94.00
How far, on average do you have to travel (one-way) to get to your doctor's office?		
15-30 minutes	139	92.67
30-60 minutes	10	6.67
1-2 hours	1	0.67
How far, on average do you have to travel (one-way) to get to the nearest hospital?		
15-30 minutes	135	90.00
30-60 minutes	14	9.33
1-2 hours	1	0.67
Do you have any insurance?		
Yes	97	64.67
No	53	35.33
How limited are you in your interactions and activities during social distancing? Choose an option that best fits your day-to-day life for the past 1-2 weeks.		
I have not left the house.	34	22.67
I only leave the house for essential activities (e.g., groceries, prescriptions, mandatory work)	110	73.33
I still hang out with close friends/ family not in my household.	4	2.67
I have not really made any changes to my daily life.	2	1.33

Table 2 depicts the preference of medical students on telemedicine visits. 74.67% of the participants preferred to visit their regular or primary doctor in person, with 16.67% preferring phone calls and only 11.33 % preferred video chat. During social distancing, only the minority of the participants showed their preference to consult with video chat (19.33%), either phone or video chat (8.67%), and phone calls (2.67%). None of the participants had chosen phone call to have their initial consultation with a doctor after social distancing ends (Table 2).

Tables 2. Preference of telemedicine visits during the coronavirus disease 2019 pandemic (n=150)

Variables	Frequency (n)	Percentage (%)	
Prefer to visit regular/primary doctor			
In Person	Most Preferred	112	74.67
	Neutral	8	5.33
	Less Preferred	30	20.00
Video Chat	Most Preferred	17	11.33
	Neutral	98	65.33
	Less Preferred	35	23.33
Phone Call	Most Preferred	25	16.67
	Neutral	33	22.00
	Less Preferred	92	61.33
If you needed to see a doctor, please rank how would you prefer to have your initial consultation			
In Person	Most Preferred	113	75.33
	Neutral	10	6.67
	Less Preferred	27	18.00
Video Chat	Most Preferred	19	12.67
	Neutral	87	58.00
	Less Preferred	44	29.33
Phone Call	Most Preferred	26	17.33
	Neutral	33	22.00
	Less Preferred	91	60.67
During social distancing, how would you prefer to see your regular/primary doctor?			
In person	73	48.67	
Video Call	29	19.33	
Phone Call	4	2.67	
Either phone or video	13	8.67	
No preference any of the above	31	20.67	
If you needed to see a doctor during social distancing, how would you prefer to have your initial consultation?			
In person	79	52.67	
Video Call	32	21.33	
Phone Call	7	78.67	
Either phone or video	12	8.00	
No preference any of the above	20	13.33	
If you needed to see a doctor after social distancing ends, how would you prefer to have your initial consultation?			
In person	132	88.00	
Video Call	5	3.33	
Phone Call	0	0	
Either phone or video	2	1.33	

No preference any of the above	11	7.33
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Table 3 shows the perception of telemedicine visits among medical students. 78.67% of participants had the belief that telehealth should cost less than an in-person visit. Majority of the participants, 51.33% presume it was more effective in person for the doctor to review history and the reason for referral in the first appointment while 44% believe it was effective either way and 4.67% agree it was more effective virtually. To initiate or complete a diagnostic work-up, 84% of the participants believe it was more effective in person. The majority (94%) of participants feel it was more effective in person to perform a physical examination. For discussing treatment options, 53.33% believe it was effective either way while 42% believe it was more effective in person and remaining 4.67% were for more effective virtually. 73.33% think it was more effective in person to establish trust and comfort with a doctor. Besides that, 57.33% of participants agreed it was more effective in person for the monitoring of the condition of the patient after treatment (Table 3).

Table 3. Perception of telemedicine in undergraduate students (n=150)

Variables		Frequency (n)	Percentage (%)
Prefer to visit regular/primary doctor			
In Person	Most Preferred	112	74.67
	Neutral	8	5.33
	Less Preferred	30	20.00
Video Chat	Most Preferred	17	11.33
	Neutral	98	65.33
	Less Preferred	35	23.33
Phone Call	Most Preferred	25	16.67
	Neutral	33	22.00
	Less Preferred	92	61.33
If you needed to see a doctor, please rank how would you prefer to have your initial consultation			
In Person	Most Preferred	113	75.33
	Neutral	10	6.67
	Less Preferred	27	18.00
Video Chat	Most Preferred	19	12.67
	Neutral	87	58.00
	Less Preferred	44	29.33
Phone Call	Most Preferred	26	17.33
	Neutral	33	22.00
	Less Preferred	91	60.67
During social distancing, how would you prefer to see your regular/primary doctor?			
In person		73	48.67
Video Call		29	19.33

Phone Call	4	2.67
Either phone or video	13	8.67
No preference any of the above	31	20.67
If you needed to see a doctor during social distancing, how would you prefer to have your initial consultation?		
In person	79	52.67
Video Call	32	21.33
Phone Call	7	78.67
Either phone or video	12	8.00
No preference any of the above	20	13.33
If you needed to see a doctor after social distancing ends, how would you prefer to have your initial consultation?		
In person	132	88.00
Video Call	5	3.33
Phone Call	0	0
Either phone or video	2	1.33
No preference any of the above	11	7.33

Table 4 highlights the experience of telemedicine in undergraduate medical students. 88% of the participants did not have any experience about a virtual or telephone doctor's appointment, and only 12% had experienced telemedicine before. Among those with experience in telemedicine, 27.78% of them were extremely satisfied, and 22.22% of them were satisfied with their experience (Table 4).

Table 4. Experience of telemedicine in undergraduate students (n=150)

Variables	Frequency (n)	Percentage (%)
Have you ever had a virtual or telephone (Telemedicine) doctor's appointment?		
Yes	18	12.00
No	132	88.00
Earlier you indicated that you had a virtual/telephone visit, was that because of COVID-19?		
Yes	6	33.33
No	12	66.67
Earlier you indicated that you had a virtual/telephone visit. Please rate your overall satisfaction with your visit.		
Extremely Satisfied	5	27.78
Satisfied	4	22.22
Neutral	7	38.89
Dissatisfied	2	11.11
Extremely Dissatisfied	0	0.00

Earlier you indicated that you had a virtual/telephone visit. Would you like to continue to see your doctor virtually in the future?

Yes	5	27.78
No	1	5.56
Maybe	12	66.67

Table 5 shows the association between demographic characteristics, experience about telemedicine, and preference of telemedicine. Female students were more likely to have more preference of telemedicine than male students (OR= 0.36, 95% CI 0.17 - 0.75, p-value= 0.005). Based on ethnicity, Chinese and Indian students had a higher preference towards telemedicine as compared to Malay students. The p-value was 0.035 for Malay students showing there is a significant association between race and preference of telemedicine. The MBBS pre-clinical year students were significantly more likely to have more perception of telemedicine than clinical year students (OR= 1.98, 95% CI 1.02 - 3.86, p-value= 0.042) (Table 5).

Table 5. Factor associated with preference of telemedicine (n=150)

Variables	Frequency (n)	Percentage (%)
Have you ever had a virtual or telephone (Telemedicine) doctor's appointment?		
Yes	18	12.00
No	132	88.00
Earlier you indicated that you had a virtual/telephone visit, was that because of COVID-19?		
Yes	6	33.33
No	12	66.67
Earlier you indicated that you had a virtual/telephone visit. Please rate your overall satisfaction with your visit.		
Extremely Satisfied	5	27.78
Satisfied	4	22.22
Neutral	7	38.89
Dissatisfied	2	11.11
Extremely Dissatisfied	0	0.00
Earlier you indicated that you had a virtual/telephone visit. Would you like to continue to see your doctor virtually in the future?		
Yes	5	27.78
No	1	5.56
Maybe	12	66.67

Table 6 shows the demographic characteristics, experience about telemedicine, and perception of telemedicine visits. MBBS pre-clinical students had a mean score of 1.67 (SD=0.39), slightly higher than MBBS clinical students with a mean score of 1.49 (SD=0.34). The mean difference was 0.18 with 95% CI range from 0.06 to 0.29. The p-value was 0.004 showing there is a significant association between education and perception of telemedicine. Past medical training about telemedicine had a mean score of 1.90 (SD=0.60), higher than those with no past medical training about telemedicine, with a mean score of 1.55 (SD=0.34). The mean difference was 0.35 with 95% CI range from 0.11 to 0.60. The p-value was 0.005 thus showing there is a significant association between past medical training about telemedicine and perception of telemedicine. Those having insurance had a mean score of 1.62 (SD=0.36), higher than those without insurance with a mean score of 1.47 (SD=0.27). The mean difference was 0.15 with 95% CI range from 0.03 to 0.27. The p-value was 0.016 showing that there is a significant association between health insurance status and perception of telemedicine (Table 6).

Table 6. Factor associated with perception of telemedicine (n=150)

Variables	Perception of telemedicine visits	Mean Difference (95% CI)	P-Value
	Mean (SD)		
Age (Year)			
≤ 22	1.58 (0.38)	0.05 (-0.18,0.19)	0.438
> 22	1.53 (0.33)		
Gender			
Male	1.56 (0.37)	-0.02 (-0.14,0.10)	0.759
Female	1.57 (0.38)		
Ethnicity			
Malay	1.87 (0.39)	-	0.050
Chinese	1.50 (0.38)		
Indian	1.57 (0.37)		
Others	1.56 (0.29)		
Education level			
MBBS Pre-clinical year (Semester 1-5)	1.67 (0.39)	0.18 (0.06,0.29)	0.004
MBBS Clinical year (Semester 6-10)	1.49 (0.34)		
Any of your family member working in healthcare (e.g., doctor)?			
Yes	1.61 (0.34)	0.05 (-0.07,0.18)	0.405
No	1.55 (0.15)		
Any family member with work in telemedicine.			
Yes	1.59 (0.41)	0.03 (-0.15,0.20)	0.761
No	1.56 (0.37)		
Family monthly income			

≤ RM 4849	1.67 (0.50)	-	0.265
RM 4850 - RM 10959	1.53 (0.36)		
≥ RM 10960	1.57 (0.30)		
Have you ever had any medical training about telemedicine before?			
Yes	1.90 (0.60)	0.35 (0.11,0.60)	0.005
No	1.55 (0.34)		
How far, on average do you have to travel (one-way) to get to your doctor's office?			
<30 minutes	1.57 (0.37)	0.02 (-0.22,0.25)	0.896
>30 minutes	1.56 (0.44)		
How far, on average do you have to travel (one-way) to get to the nearest hospital?			
<30 minutes	1.57 (0.37)	0.01 (-0.19,0.21)	0.942
>30 minutes	1.56 (0.43)		
Do you have any insurance?			
Yes	1.62 (0.36)	0.15 (0.03,0.27)	0.016
No	1.47 (0.27)		

DISCUSSION

This cross-sectional study was conducted to determine the preference and perception of telemedicine visits during this COVID-19 phase of pandemic among medical students in a private medical university in Malaysia. Besides that, this study was also to comprehend what do medical students think about the use of telemedicine in the future and to learn the impression of those who had first experienced telemedicine during this COVID-19 pandemic. Based on this study, most of the participants prefer to visit primary doctors in person rather than telemedicine visits, before the pandemic. It is further proven when most of the participants prefer in person than telemedicine visits, for the initial consultation with the doctor without the limitations of social distancing. This correlates with the cross-sectional survey done in an online crowd-sourcing marketplace in the United States, where 62% of the survey respondents prefer to see their surgeon in person in normal circumstances [20]. Interestingly, our study found that most of the participants prefer in person visits to the doctor during social distancing than telemedicine visits. Our study participants might be more inclined to believe in person consultation has more advantage than telemedicine hence their choice. In contrast to this finding, the previous study in the US found that 79% respondent preferred telemedicine for visits to their doctor during social distancing in this pandemic phase [20]. Another study through a survey among all departments of surgery in Michigan, US, noted significant sequential increase in tele-health and had estimated several-fold increase during peak COVID-19 phase [22]. Similarly, most of the participants in our study prefer in person initial consultation during the social distancing period compared to having telemedicine visits. According to a cross-sectional study conducted among patients established in the Department of otorhinolaryngology-Head and Neck Surgery in the US, patients chose in-person visits because they feel they are getting the care they needed [21]. From our study, we found that a high percentage (88%) of participants prefer in person visit for their initial consultation with a doctor after social

distancing ends. The reason for this might be because they prefer building a therapeutic relationship with their physician and share their disconcertion according to the previous study [21].

In this study, we found that there was only very small number of students had used telemedicine before which only one third of students use telemedicine due to COVID-19 pandemic. Based on their experience towards telemedicine, majority of students is quite satisfied of using telemedicine. According to the study of awareness and attitudes toward telemedicine in United States showed that medical students taking these electives see telemedicine as a valuable instructional tool that can help them improve their medical knowledge, patient-care abilities, and system-based practise [22]. The patients in California have been invited to participate in a survey of satisfaction towards the telemedicine during COVID-19 pandemic and it shows that a successful deployment of telemedicine for a low-income, under-resourced population is indicated by high levels of satisfaction as well as numerous remarks on safety and convenience [23]. Unfortunately based on the study we had done there is only less than one third of students planning to use the telemedicine again in future and there is two third of student felling hesitation on using telemedicine again in future.

Regarding the preference of telemedicine visits among medical students, most of the students believe that telehealth should cost less than an in-person visit. This may be because they think in-person visits are more effective and worth the price. For reviewing history, the majority says it is more effective in person and least prefer that it is more effective virtually. We would agree with this data because reviewing history in person will give more information and virtually patients may not give all the needed information, and this might end up in missed diagnosis. To initiate or complete diagnostic work-up (order test from labs, imaging, etc), majority says it is more effective in person while the least prefer more effective virtually. This may be since collection of samples (blood, stool, urine, etc) for laboratory tests will be easier if it is in person consultation compared to virtual consultation. To perform a physical examination, most of the students prefer more effective in person and the least say it is more effective virtually. It is evident that physical examination is the vital part for determining the diagnosis, which will not be able to be done on virtually. For discussing the treatment options, the majority says it is effective either way, followed by more effective in person and the least says it is more effective virtually. To offer an opinion regarding the benefits of treatment, the majority says it is effective either way, followed by more effective in-person and least goes with more effective virtually. This may be because discussing treatment and offering opinions regarding the benefits of treatment are verbal sessions so it can be done either in person or virtually. When it comes to explaining the technical components of the treatment, most of the students say it is more effective in-person, followed by effective either way and the least prefer more effective virtually. To establish trust and comfort, most of the students prefers more effective in person because trust cannot be gained from an online session, and it is more effective during an in-person visit. For explanation of how conditions will be monitored after the treatment, the majority prefer more effective in person, followed by

effective either way and the least prefer more effective virtually. Virtual monitoring will be difficult because patient's every movement will not be observed, and any arising complications will be identified in later stages [24].

From our study, we found out that gender has a significant association with the preference of telemedicine visits. Females are more favourable towards telemedicine visits. This result is similar to a previous study among patients in Kaiser Permanente Northern California, where they found female patients were more likely to choose a telemedicine visit [25]. A previous study had reported most of their registered pregnant women preferred teleconsultations than visiting the doctor office [26]. This study also highlights the significant association between the educational level in MBBS and preference of telemedicine visits. Pre-clinical year MBBS students are more likely to go for telemedicine visits compared to clinical year MBBS students. This might be due to clinical students thinking it is time-consuming for them to incorporate telemedicine visits in their busy schedule in the hospital. In comparison with this finding, a study had found half of the general practitioners in Romania responded that tele-consultations were time-consuming compared to face-to-face visits [26]. There is no significant association between the factors; age, family member working as a doctor, family member working in telemedicine, family monthly income, experience of training in telemedicine, average duration to travel to nearest doctor's office and hospital, and the health insurance status with the preference of telemedicine.

In this research, a significant association was observed between the phases of educational level in MBBS and the perception of telemedicine visits. MBBS pre-clinical students have a higher perception on telemedicine visits than clinical year students. From this study, we were unable to find the reasons behind this perception, but future research may be needed to explore further. Those who had experience in medical training on telemedicine are more likely to be perceptive on telemedicine visits. They might understand the advantages of telemedicine since they had the training before. No studies had been done to show the association between past medical training in telemedicine and the perception on telemedicine visits. This study highlights the significant association between health insurance status and the perception of telemedicine visits. A previous study had found that those with high deductible health plan favours telemedicine visits [25]. There is no significant association between age, gender, ethnicities, family member working in healthcare, working in telemedicine, family monthly income, average duration to doctor's office, and to the nearest hospital.

We believe that one of the major limitations of our study was the lack of direct access to all medical students, which could lead to misunderstanding of the findings [22]. The participants are self-participating which means the response rate cannot be analysed and generalized [19]. Apart from that, rapid online surveys have been proposed as a highly effective way to assess evolving public perceptions during COVID-19 [27]. Therefore, the population of this study only represents relatively to those who are familiar with online surveys. In a nutshell, this study relies on responses given to the participants as questionnaires rather than responses of real patients facing their diagnoses and decisions.

Besides that, in resource-poor countries, the cost of implementing telemedicine must be evaluated against the necessity for pharmaceuticals and central control of medical equipment [28]. Based on many limitations above we can try to provide stable cloud services, and global info communicational infrastructure capabilities are enabling global interoperability of traditional medical systems, telemedicine instruments, health-related smart gadgets, and smartphone apps [29]. Reducing the cost of telemedicine devices, promote, and providing guidance for patient is another good recommendation to improve public started to accept telemedicine.

CONCLUSION

In conclusion, telemedicine is still quite new in Malaysia, so most of the people would not prefer telemedicine due to under development of telemedicine. Besides that, telemedicine requires many professionalisms and technicalities to ensure a smooth process. Other than that, ones who had experienced telemedicine before are all able to accept telemedicine visits. Further studies and publicity on telemedicine visits in Malaysia might encourage more people to have more enthusiasm for telemedicine. Hence, telemedicine visits in the future will be more well received by majority of the population in Malaysia.

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