

Knowledge, risk perceptions, and preventive behaviours among undergraduate students in Selangor amidst the Covid-19 transition: An observational study

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ABSTRACT

Introduction: The emergence of COVID-19 in 2019 marked one of the most devastating pandemics in recent history, leading to widespread infections and fatalities globally. In response to efforts to mitigate its impact, people were enlightened through various channels about the new disease and necessary preventive measures, prompting a significant lifestyle shift to scale down the transmission. This study determines the level of knowledge, risk perception, and preventive behaviors among undergraduate students at a public university in Selangor, Malaysia during the endemic transition phase, which began from 1st April 2022 until 5th May 2023. **Method:** Employing a cross-sectional design and stratified random sampling method across six medical and health sciences courses, questionnaires were distributed via email to selected 531 participants. Statistical analysis was conducted with SPSS version 27.0, utilizing Pearson correlation, independent t-tests, and One-Way ANOVA to examine associations between variables. **Results:** The study revealed mean scores of 29.50 ± 2.2 for knowledge, 35.60 ± 0.2 for risk perception, and 31.55 ± 6.6 for preventive behavior. Gender showed significant associations with both risk perception (t: -2.6, p: .011) and preventive behaviour (t: -3.0, p: .004), while educational background was significantly correlated with preventive behaviour. Risk perception was significantly associated with both knowledge (r: .124, p: .007) and preventive behaviour (r: .054, p: .241). **Conclusions:** There are significant associations between COVID-19 risk perception and both knowledge and preventive behaviour. Gender has a significant association with risk perception and preventive behaviour, and educational background has a significant association with preventive behaviour. Unfaltering awareness and proactive engagement in preventive measures are essential to sustaining efforts against the ongoing threat of the pandemic.

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1. INTRODUCTION

The global outbreak of COVID-19, caused by SARS-CoV-2 virus, one of the β group of coronaviruses [12], rapidly escalated into an unprecedented public health crisis in 2020. Within the first fifty days of the epidemic that began in Wuhan, China on 31st December 2019, the virus reportedly killed over 1,800 people and infected more than 70,000 [1]. While early concerns centered on the clinical manifestations of the disease [2,3]—ranging from asymptomatic presentations to severe respiratory distress—public health experts have increasingly recognized that effective containment hinges not only on medical interventions but also on public knowledge, risk perception, and preventive behaviors [27].

As of late June 2023, there were approximately 760 million confirmed cases of COVID-19 worldwide, with 6,945,714 reported deaths globally [23]. In Malaysia, around 5 million cases were reported, with a total cumulative death toll of 38,887 due to COVID-19 [14]. The mortality rate of COVID-19 has been a major concern since the pandemic began. Even during the endemic transition phase of almost a year, the number of cases continues to rise. Several studies conducted early in the pandemic demonstrated a significant association between knowledge, risk perception, and preventive behaviour [9,11,15,19]. Understanding the public's knowledge, risk perception, and practices is critical in controlling the spread of infectious diseases such as COVID-19. Studies have consistently demonstrated that higher levels of knowledge correlate positively with heightened risk perception and the adoption of preventive behaviors, including mask-wearing, hand hygiene, and physical distancing [5,11]. This linkage highlights the importance of public education as a non-pharmaceutical intervention, especially in mitigating community transmission. Although COVID-19 is no longer classified as a Public Health Emergency of International Concern, the persistent emergence of new variants necessitate continued Public Health vigilance.

Focusing on this transitional period, it is particularly vital to assess the prevailing knowledge, risk perception, and preventive behaviour concerning COVID-19. Endemic transition does not signify the elimination of the virus but rather its managed presence within communities. The level of knowledge, risk perception and preventive behaviours may be different as we believe that the understandings related to COVID-19 among people may change since the beginning of the pandemic. This study provides valuable insights for tailoring ongoing public health strategies, ensuring that communities remain resilient against potential resurgences.

This study specifically targets undergraduate students at a public university in Selangor, Malaysia, as the focal population. Young adults, particularly university students, represent a socially dynamic group characterized by tertiary education level, high mobility, and frequent interpersonal interactions. However, research indicates that many university students possess limited health literacy, which can adversely affect their health outcomes and behaviors [28]. Furthermore, there is limited study investigating the knowledge, risk perception, and preventive behaviour among Malaysian university students during the endemic transition phase, rendering this investigation timely and significant.

This study determines sociodemographic factors and the level of knowledge, risk perceptions, and preventive behaviours related to COVID-19 among undergraduate students at a public university in Selangor, Malaysia during the endemic transition phase, which began from 1st April 2022 until 5th May 2023. It also aims to determine the association between knowledge, risk perception and preventive behaviours related to COVID-19. Based on existing literature, we hypothesize that higher levels of knowledge are associated with greater risk perception and more consistent engagement in preventive behaviors. By elucidating these relationships, our findings aim to inform targeted health promotion interventions and contribute to the broader body of knowledge on pandemic management in endemic contexts.

2. MATERIALS AND METHODS

2.1 Study design

This study used cross sectional study to study knowledge, risk perception and preventive behaviour among undergraduate students in a public university using an online Google Form Questionnaire.

2.2 Population, samples and sampling

The study was conducted among undergraduate students from Faculty of Medicine and Health Sciences session 2022/2023. Undergraduate students who were registered and actively studying at the Faculty of Medicine and Health Sciences in University Putra Malaysia for session 2022/2023 were selected randomly based on the calculated sample size by using a random number generator. Those who refused to participate, aged less than 18 years old or more than 25 years old, non-citizens, and the researchers of the study (part of study population) were excluded from the study.

2.3 Sample calculation

One-sample problem formula was used to calculate the sample size. This calculation was done by using ethnicity factor [26] and adjusted for 10%, resulting in 531 students. As this study used a stratified random sampling method, an equal proportion of samples was randomly selected from each department in the faculty. After the calculated sample size divided by the total population size (1515 undergraduate students), 35.05% of students were selected from each department of the faculty.

2.4 Instruments

Risk perception and preventive behaviour questionnaires were adopted from Survey, Tool and Guidance on COVID-19 by World Health Organization (WHO), which has been validated [7]. The 11 questions for the knowledge section were adapted from the instrument used among preparatory school students in Southwest Ethiopia, that was reviewed by research and community service experts [24]. Knowledge of COVID-19 was evaluated through a set of eleven factual questions to assess respondents' knowledge acquired through experience or education. Respondents were then asked to indicate their level of familiarity using 'Yes', 'No', or 'Don't Know' responses. Individuals who got higher scores indicate they had a higher knowledge on COVID-19. On the other hand, participants who got a lower score meant that they had lower knowledge of COVID-19. The highest score for knowledge was 33 and lowest score was 11.

Risk perception on COVID-19 was measured by ten questions aimed at assessing individuals' judgments and appraisal of risk of immediate or long-term threat to their health and well-being [7]. Respondents were asked to indicate how likely they thought each statement was to be true, with five response options from 'Extremely likely' (point 5) to 'Extremely Unlikely'(point 1), providing insight into their perceptions of risk. Higher scores reflected greater risk perception of COVID-19, while lower scores indicated lower risk perception. The risk perception scale ranged from 10 to 50.

Preventive behaviour regarding COVID-19 was examined through nine questions focused on actions took by individuals to prevent or recognize illness when they do not show symptoms of disease [7]. Participants were asked how often they did each behaviour, on a five-point Likert scale that ranged from 1 = Not at all to 5 = Very much for each question, which reflected on their preventive behaviours. A higher score indicated greater adoption of preventive behaviours to reduce the risk of COVID-19 infection, while a lower score reflected lower adoption. The preventive behaviour scale ranged from 9 to 45.

2.5 Validity and reliability

The questionnaire used in this study was partially developed by the authors, with several items adopted and adapted from established instruments in previous studies. The content validity of the questionnaire was evaluated by two experts, and revisions were made based on their feedback. A pilot test was then conducted with 20 students, who were subsequently excluded from the main study. Reliability analysis was performed separately for each component of the questionnaire—Knowledge, Attitudes, and Practices (KAP)—using data from the pilot test. Cronbach's Alpha Coefficients for all components exceeded 0.7, indicating acceptable internal consistency.

2.6 Data collection

After gaining ethical approval, an email was sent to the Faculty of Medicine and Health Sciences to request student details. The distributed questionnaire is an online version of questionnaire via Google Form link, that was distributed to the selected students via email. Study information was clearly stated to participants before the study commenced via attached Study Information Sheet. Participants provided their informed consent by electronically signing the consent form, which was included as the initial section of the online questionnaire distributed via email. All questions were provided in English. A follow-up email was sent a week later to remind participants who had not yet responded. Additionally, class representatives from each course were involved to remind their peers to complete the questionnaire. Data collection period was from 27th February until 28th March 2023.

2.7 Data analysis

The data collected were analyzed using SPSS IBM version 27 (Statistical Program for Social Science). Descriptive analysis was employed in the study. A normality test for the scores of knowledge, risk perception, and preventive behaviour was conducted using a histogram with a normal curve, Q-Q plot, detrended Q-Q plot, and box plot. Pearson correlation, independent t-tests, and One-Way ANOVA were used to examine the associations between sociodemographic factors, knowledge, risk perception, and preventive behaviour. Findings with a p-value < 0.05 were considered to be statistically significant.

3. RESULTS

Responses were received from 468 out of 531 students, yielding a response rate of 88.14%. Prior to data analysis, a normality test was conducted, confirming that the data were normally distributed.

The mean age of study participants was 21.6 ± 0.1 years (range: 17 to 35 years). As shown in Table 1, the sample predominantly comprised females, accounting for 81.8% (n=383), while males represented 18.2% (n=85). The majority of participants were Malay at 62.6% (n=293), followed by Chinese 20.5% (n=96), Indian 12.6% (n=59), and Others 4.3% (n=20). The "Others" category included Indonesian, African, Peribumi Sabah, Peribumi Sarawak, Iranian, Bugis, Saudi Arabian, Bidayuh, Dusun, Iraqi, and Melanau ethnicities. In terms of educational background, the largest proportion were Doctor of Medicine students at 37.8% (n=177), followed by Bachelor of Biomedical Sciences 19.2% (n=90), Bachelor of Science Environmental and Occupational Health 17.7% (n=83), Bachelor of Science Nutrition and Community Health 9.4% (n=44), Bachelor of Science Dietetics 8.5% (n=40), and Bachelor of Nursing 7.3% (n=34). Socioeconomic status was mainly from the B40 income group at 43.2% (n=202), followed by M40 at 35.0% (n=164), and T20 at 21.8% (n=102). Most participants were Malaysian citizens, comprising 97.9% (n=458), while non-Malaysians accounted for 2.1% (n=10), including Indonesian, Senegalese, Iranian, Saudi, Chinese, and Iraqi nationals.

Table 1. Sociodemographic characteristics of respondents

Variables	Mean (s.d.)	Frequency (n)	Percentage (%)
Age	21.6 (0.1)		
Gender			
Male		85	18.2
Female		383	81.8
Ethnicity			
Malay		293	62.6
Chinese		96	20.5
Indian		59	12.6
Others		20	4.3
Educational background			
Doctor of Medicine		177	37.8
Bachelor of Biomedical sciences		90	19.2
Bachelor of Nursing		34	7.3
Bachelor of Science Dietetic		40	8.5
Bachelor of Science Nutrition and Community Health		44	9.4
Bachelor of Science Environmental and Occupational Health		83	17.7
Household Income per month (RM)			
≤ RM4,849 (B40)		202	43.2
RM4,850 - RM10,959 (M40)		164	35.0
≥ RM10,960 (T20)		102	21.8
Nationality			
Malaysian		458	97.9
Non-Malaysian		10	2.1

Source: Fatimah Ahmad Fauzi et al (2026)

3.1 Descriptive findings of knowledge, risk perceptions & preventive behaviours

The total mean score of respondents regarding knowledge was 29.50 ± 2.2 . From the study, the highest score was 33 while the lowest score was 11. Question stated that “COVID-19 is caused by a virus” had the highest number of respondents who answered correctly with 99.36% whereas question about “COVID-19 cannot penetrate cloth masks”, had the lowest number of respondents who answered correctly with 47.22%.

The mean score for respondents regarding risk perception is 35.60 ± 0.2 . Question about the “likelihood of getting COVID-19 if not vaccinated” had the highest number of respondents who answered correctly with 55.1% respondents. Whereas question about the “ability to manage daily activities as long as being able to self-isolate if being infected with COVID-19” had the lowest number of respondents who answered correctly with about 7.1%. From the study, the highest score was 50 while the lowest score was 10.

The total mean score for respondents on preventive behaviour is 31.55 ± 6.6 . Question stated that “I use disinfectants to clean hands when soap and water are not available” had the highest number of respondents who answered correctly with 29.9 % respondents. Whereas question stated “I use antibiotics to prevent or treat COVID-19” had the lowest number of respondents who answered correctly with 13.5%. From the study, the highest score was 45 while the lowest score was 13.

3.2 Association between sociodemographic factors & knowledge, risk perceptions & preventive behaviours

The analysis showed no significant association between sociodemographic factors and knowledge. An independent t-test was conducted to compare risk perception scores between males and females. A significant association was found between gender and risk perception, with $t(466) = -2.6$, $P = 0.011$. The mean score for females ($M = 35.9$, $SD = 4.6$) was higher than that for males ($M = 34.5$, $SD = 4.4$). The magnitude of the difference in means (mean difference = -1.4 , 95% CI: -2.5 to -0.3) was significant. Therefore, the result indicates a significant association between gender and risk perception ($P = 0.011$).

There were significant differences in preventive behaviour scores between males and females, with $t(110.635) = -2.963$, $P = 0.004$. The mean score for females ($M = 32.03$, $SD = 6.27$) was higher than that for males ($M = 29.40$, $SD = 7.62$). The magnitude of the difference in means (mean difference = -2.63 , 95% CI: -4.382 to -0.870) was significant, indicating a significant association between gender and preventive behaviour ($P = 0.004$).

Educational background also showed a significant association with preventive behaviour. Although this association reached statistical significance, the actual difference in mean scores between groups was relatively small, with an effect size (eta squared) of 0.02. Post-hoc comparisons using the Dunnett C test indicated that the mean score for Bachelor of Nursing students ($M = 34.38$, $SD = 5.24$) was significantly different from Doctor of Medicine students ($M = 31.28$, $SD = 6.88$) and Bachelor of Biomedical Sciences students ($M = 30.66$, $SD = 6.52$). However, Bachelor of Science Dietetic students ($M = 30.90$, $SD = 7.18$), Bachelor of Science Nutrition and Community Health students ($M = 30.89$, $SD = 6.12$), and Bachelor of Science Environmental and Occupational Health students ($M = 32.59$, $SD = 6.31$) did not differ significantly from Groups 1, 2, or 3. Thus, the results show a significant association between educational background and preventive behaviour ($P = 0.049$). The summary for association result of sociodemographic factors with knowledge, risk perception and preventive behaviour were presented in Table 2.

Table 2. Summary for result of sociodemographic factors association with knowledge, risk perception and preventive behaviour on COVID-19

Socio-demographic Factors	Knowledge			Risk Perception			Preventive Behaviour		
	Mean	Test Statistic r/t/F	p-value	Mean	Test Statistic r/t/F	p-value	Mean	Test Statistic r/t/F	p-value
Age	29.5	0.03	0.586	21.6	0.33	0.747	21.6	0.06	0.217
Gender									
Male	29.1	-	0.102	34.5	-	0.011*	29.4	-	0.004**
Female	29.6	1.70		35.9	2.60		32.0	3.00	
Nationality									
Malaysian	29.5	-	0.664	35.6	1.50	0.120	31.6	0.90	0.346
Non-Malaysian	29.8	0.40		33.4			29.6		
Ethnicity									
Malay	29.6	1.30	0.287	35.6	0.40	0.988	31.2	1.30	0.275
Chinese	29.3			35.6			31.6		
Indian	29.2			35.8			33.1		
Others	30.2			35.6			31.8		

Educational Background

DM	29.2	1.30	0.256	36.0	1.3	0.252	31.3	2.2	0.049*
BBS	29.8			35.0			30.7		
BN	29.9			36.7			34.4		
BSD	29.8			35.5			30.9		
BSNCH	29.3			34.7			30.9		
BSEOH	29.6			35.5			32.6		

Household Income

B40	29.5	0.02	0.981	35.4	0.6	0.572	31.5	0.1	0.878
M40	29.5			35.9			31.7		
T20	29.5			35.6			31.3		

*p<.05

**p<.01

DM: Doctor of Medicine

BBS: Bachelor of Biomedical Sciences

BN: Bachelor of Nursing

BSD: Bachelor of Science Dietetic

BSNCH: Bachelor of Science Nutrition and Community Health

BSEOH: Bachelor of Science Environmental and Occupational Health

Source: Fatimah Ahmad Fauzi et al (2026)

3.3 Association between knowledge, risk perceptions & preventive behaviours

Summary for association results between knowledge, risk perception, and preventive behaviours were presented in Table 3. The Pearson correlation test revealed a significant association between knowledge and risk perception related to COVID-19 ($P = 0.007$), with a correlation coefficient of $r = 0.1$, indicating a small correlation. However, no significant association was found between knowledge and preventive behaviour ($P = 0.2$). On the other hand, there was a significant association between risk perception and preventive behaviour ($P < 0.001$), with a correlation coefficient of $r = 0.3$, suggesting a moderate correlation.

Table 3. Summary for Association Result of Knowledge, Risk Perception and Preventive Behaviour

	Pearson Correlation, r	P-value
Knowledge and Risk Perception	0.1	0.007**
Knowledge and Preventive Behaviour	0.1	0.2
Risk Perception and Preventive Behaviour	0.3	< 0.001***

**p<0.01

***p<0.001

Source: Fatimah Ahmad Fauzi et al (2026)

4. DISCUSSIONS

4.1 Knowledge, risk perceptions & preventive behaviours

The findings of this study indicate that undergraduate students demonstrated a relatively high level of knowledge, with a mean score of 29.50 ± 2.2 out of a maximum of 33. Most participants (99.36%) correctly identified that COVID-19 is caused by a virus, indicating good understanding of the basic cause of the disease. However, knowledge about the effectiveness of cloth masks in preventing COVID-19 was lower, with only 47.22% answering correctly. This difference suggests some gaps in knowledge about protective measures. As reported by Kundu (2021), such differences may be related to participant characteristics, including the higher educational level of the study population [9, 29]. The high level of knowledge observed may also be explained by the timing of the questionnaire distribution, which coincided with the height of the COVID-19 outbreak, when widespread coverage likely increased public awareness and understanding of the disease, as people sought information to protect themselves and their families.

The mean score for risk perception towards COVID-19 in this study was 35.60 ± 0.2 out of a maximum of 50, indicating a moderately high level of perceived risk. The responses showed that many participants correctly recognized the risk of contracting COVID-19 without vaccination. In comparison, Asefa (2020) reported a higher mean risk perception score of 40.7, with 53.4% of participants showing higher levels of perceived risk [10]. This difference may be related to different study instruments used to measure risk perception. The higher mortality rate associated with COVID-19 compared to other respiratory diseases could also influence risk perception [10]. On the other hand, a study conducted among health professionals working in selected public university hospitals in Ethiopia reported a lower mean score for risk perception, at 23.59, indicating a lower perception of risk [9]. Furthermore, media coverage in Scandinavian countries was reported to focus more on the risks of COVID-19 abroad rather than domestic risks, which contributed to lower public risk perception towards the virus within those countries [11].

The mean score for preventive behaviour towards COVID-19 in this study was 31.55 ± 6.6 out of a maximum of 45, indicating a relatively high level of preventive practices. In the questionnaire, the highest correct response rate was observed for the statement, "I use disinfectants to clean hands when soap and water are not available," with 29.9% of participants responding correctly. Similarly, an online survey among Bangladeshi residents showed 67.2% of study respondents scored well for the preventive practices, with participants commonly engaging in measures such as wearing masks consistently outside home and washing hands with soap after returning home [13].

4.2 Association between sociodemographic factor & knowledge

This study revealed no significant association between sociodemographic factors and knowledge of COVID-19. This finding is consistent with previous research involving university students in health-related fields [19,26], where similar levels of knowledge were reported across different demographic groups, likely due to shared educational exposure to health topics. In the context of this study, the shared academic background of participants likely contributed to the uniformity in knowledge levels observed.

Another important significant association between education level and COVID-19 knowledge was also reported by Sazali et al. in 2021 [17]. The study reported that participants holding a diploma had significantly higher mean knowledge scores compared to those with a degree ($p < 0.05$). Additionally, students enrolled in medical faculties demonstrated notably higher knowledge levels than those in non-medical faculties ($p < 0.001$). The findings differed from current study, and this mismatch could be due to differences in the characteristics of sampling. This study was conducted among undergraduate students aged 20 to 25 years old, with educational background limited to Medical and Health Sciences courses, which may explain the absence of a significant association between education and COVID-19 knowledge.

Also, in this study gender did not show a significant relation with knowledge. This contrasts with findings by Sultana et al, which demonstrated that females had higher levels of COVID-19 knowledge compared to male [18]. Such differences may be attributable to variations in sample demographics, cultural contexts, and pandemic phase.

4.3 Association between sociodemographic factor & risk perception

There was a statistically significant association between gender and risk perception ($P = 0.011$) in which females showed more impact of risk perception about their surroundings compared to males. This increased concern among females may clarify the observed association. A study conducted across eight countries also found this similar association, suggesting that females are more into anticipating and following the rules and guidelines, which may contribute to their higher risk perception [8].

However, other variables considered including age, nationality, ethnicity, education, and household income were not significantly associated with risk perception in this study. Nonetheless, risk perception has been associated with these factors in several other studies [26–34]. For instance, a study carried out in China revealed a significant association between age and risk perception, where older age group had a higher risk perception compared to younger ones [25]. Moreover, it has been observed that individuals with higher educational backgrounds have a higher risk perception towards COVID-19 [15].

The differences in findings between this study and others may be attributed to variations in sample characteristics. This study focused on students aged 20 to 25, with educational backgrounds limited to Medicine and Health Sciences courses, which may explain the absence of significant associations for certain sociodemographic factors in this context.

4.4 Association between sociodemographic factor & preventive behaviour

The study found a significant association between gender and preventive behaviour ($P = 0.004$). This finding aligns with a study conducted in Taiwan, which also showed that women are more likely than men to engage in health-preventive behaviours related to COVID-19 [20]. These results support previous research indicating that women are generally more inclined to adopt new preventive measures.

In terms of educational background, there was also a significant association between education level and preventive behaviour. According to Sazali (2021), individuals with higher educational backgrounds tend to exhibit more preventive behaviours towards COVID-19, possibly due to their greater factual knowledge, particularly among respondents from medical faculties [17].

However, other factors such as age, nationality, ethnicity, and household income were not significantly associated with preventive behaviour in this study. Despite this, several other studies have identified associations between these factors and preventive behaviour. For instance, González-Herrera (2022) found that older individuals are more likely to engage in preventive behaviours, with a significant association between age and the frequency of preventive behaviours ($P < 0.001$) [10]. Given that most of the respondents in this study were among young aged group, it explains the insignificant association between age and preventive behaviour.

Other studies also have linked household income with preventive behaviour. A study conducted in Malaysia by Azlan (2020) found that young people aged 18 to 49 years, students, and those with household monthly income less than RM3,000 were more likely to wear face masks when leaving their house, whereas those earning more than RM12,000 per month were less likely to do so [5]. It could be explained by public awareness to monitor health status and avoid high healthcare costs among low-income population [5].

4.5 Association between knowledge & risk perception

This study found a significant association between knowledge and COVID-19 risk perception ($P = 0.007$). The link might be attributed to the participants' educational backgrounds as they are enrolled in faculties of medical and health sciences. Observational study among university students in Borneo, Malaysia [17] showed students enrolled in medical faculties demonstrated higher knowledge levels than those in non-medical faculties ($p < 0.001$). Research done by Cipolletta et al. has identified a relationship between the level of education and risk perception for COVID-19, suggesting that people with higher educational attainment had increased perceived risk related to COVID-19 and avoid behaviours aimed at preventing transmission of the disease [6]. Similarly, Taghrir et al. noted that people with more education were more likely to practice precautionary behaviours, possibly because their education contributes to the likelihood of engaging in safety behaviours [19].

4.6 Association between knowledge & preventive behaviour

This study also demonstrated that there was no significant association between knowledge and preventive behaviour ($P = 0.241$), which contrasts with the findings presented by Honarvar et al. [11]. Nonetheless, past studies have shown some people do protect themselves according to trusted policies and evidence-based information rather than their own knowledge or beliefs [21]. Appropriately, in line with the present finding that knowledge was not a significantly associated with protective behaviour.

There is a possibility for young Malaysian adults being lack of knowledge on the characteristics of this new virus since COVID-19 itself is a new virus and they followed the protective standard operating procedure (SOP) as to comply with government orders. The findings indicate that Malaysian young adults implement preventive behaviours directed by authority figures irrespective of their knowledge on COVID-19. This is perhaps due to perception or reluctance to embrace preventive measures. Furthermore, external misinformation may also affect individual compliance with preventive behaviours.

4.7 Association between risk perception & preventive behaviour

Results indicated a significant association between risk perception and preventive behaviour ($P < 0.001$). Those who are more at risk may be more motivated to seek preventive information and think about the benefits and costs of engaging in them. This finding aligns with results from Tsegaw (2022), who reported that individuals with higher levels of perceived risk were more likely to adopt preventive behaviours such as physical distancing, handwashing, and facemask-wearing practices [22]. In contrast, a study conducted among Iranian Medical students [19] found that self-reported preventive behaviours and risk perception was significantly negative correlated ($r = -0.128$; $P < 0.05$). It indicated that risk perception declines as preventive behaviours increased. The study investigated among medical students who may know the consequences of preventive behaviours, which may explain the negative correlation. In the context of present study population, consisting of undergraduate students from medical and health sciences backgrounds, this association is particularly meaningful. Furthermore, as the population transitions into the endemic phase of COVID-19, maintaining risk awareness among students remains essential to sustain adherence to preventive measures. Strengthening risk communication strategies tailored to student populations could help maintain vigilance and promote continued engagement in preventive behaviours, thereby supporting broader public health efforts in managing endemic COVID-19.

5. CONCLUSIONS

In conclusion, there are significant associations between COVID-19 risk perception and both knowledge and preventive behaviour. Gender has a significant association with risk perception and preventive behaviour, and educational background has a significant association with preventive behaviour. On the other hand, COVID-19 knowledge did not significantly correlate with any sociodemographic features in this study population.

6. STRENGTH AND LIMITATIONS

The study used an observational study design, allowing for quick execution at minimal expense. The cross-sectional design enabled the examination of multiple variables simultaneously and was well-suited for both descriptive analysis and hypothesis testing.

However, there were several limitations. First, the sample consisted exclusively of students from the Faculty of Medicine and Health Sciences, which limited the generalizability of the findings to broader populations or different settings. Additionally, the understanding of COVID-19 remains incomplete due to its relatively recent emergence. As a result, long-term follow-up studies are needed to better understand the long-term effects and complications of the virus, which may influence knowledge, risk perception, and preventive behaviour related to COVID-19.

7. RECOMMENDATIONS

The study found no association between knowledge and preventive behaviour towards COVID-19, indicating that the current health education strategies may need modification to enhance preventive behaviours. The government could consider expanding its approach by disseminating more information about COVID-19 prevention not only through social media but also via campus-based awareness campaigns, peer education networks, and virtual reality simulations that provide immersive experiences related to COVID-19 transmission and prevention.

Additionally, more research on knowledge, risk perception, and preventive behaviour towards COVID-19 is encouraged. This study was limited to students from the Faculty of Medicine and Health Sciences, which restricts the generalizability of the findings. Future studies should aim to include broader populations across Malaysia to gain a more comprehensive understanding of the public's knowledge, risk perception, and preventive behaviours related to COVID-19.

8. CONFLICT OF INTEREST

The authors declare no conflicts of interest regarding the research, authorship, and publication of this manuscript. The study was conducted independently, without any financial or personal relationships that could influence the research outcomes.

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7. CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest regarding the research, authorship, and publication of this manuscript. The study was conducted independently, without any financial or personal relationships that could influence the research outcomes.

8. AUTHORS' CONTRIBUTIONS

Ding Ming Zhi , Sofara Ashfia Tasnim Binti Mohammad Zairy , and Somaganth A/L Armugum carried out the research, wrote and performed analysis. Fatimah Ahmad Fauzi conceptualised the central research idea and refined the manuscript writing. Nor Afiyah Mohd Zulkefli supervised research progress; Norhasliza Abu Bakar anchored the review, revisions before the article submission.

9. ETHICS STATEMENT

This study received ethical approval from the Human Research Ethics Committees of Universiti Putra Malaysia (JKEUPM-2022-146), and written informed consent from all study participants were obtained prior to their responses.

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