

The Role of Personal Habits, Learning Strategies, Family and Cultural Background in Critical Thinking Skills Among Undergraduate Medical Students in Malaysia

ABSTRACT

In the medical field, critical thinking is identified as a process of collecting and examining patients' information with the end goal of a precise clinical judgment. We aimed to determine the level of critical thinking among undergraduate medical students and investigate the associations between the personal habits, family and cultural background and critical thinking. This cross-sectional study was conducted among undergraduate medical students of private medical university in Malaysia, and a total of 102 students participated in this study. The data was collected using an online questionnaire, designed in English, and consisting of structured close-ended questions. Unpaired t test and ANOVA were used for data analysis. 23.5% of the respondents had positive disposition towards critical thinking, while 56.9% had ambivalent/mixed disposition and 19.6% had averse/hostile disposition towards critical thinking. The overall mean score for participants was 60.0 (SD=15.5), indicating an average of ambivalent/mixed disposition towards critical thinking. Findings reveals that there was a significant association between non auditory learners and critical thinking skills. Non auditory learners had a higher critical thinking score compared to auditory learners with a mean difference of 6.93 (P=0.024). Besides that, a significant association was established between people who disagreed that teacher have the absolute authority and critical thinking skills among undergraduate medical students (P=0.003). However, there was no association between gender and critical thinking skills. This study shows that there is a room for improvement for medical students to enhance the development of their critical thinking ability. Medical education curriculum should include problem-based learning, case-based learning, medical simulation, and student-centred models to develop critical thinking skills among medical students.

KEYWORDS: Critical thinking, medical students, cross-sectional study, Malaysia

INTRODUCTION

Based on the American Philosophical Association, the process of purposeful, self-regulatory judgement is defined as critical thinking. Reasoned consideration of evidence, context and conceptualizations is required for this process. [1] In other words, critical thinking is achieved when a person is able to ask questions, acknowledge and test previous assumptions, and to analyse, interpret and reason with a piece of information provided. [2]

There are two dimensions of critical thinking, comprising of both cognitive skills and affective dispositions. Interpretation, analysis, evaluation, inference, explanation, and self-regulation are the elements of core cognitive critical thinking skills. [3] Human disposition is an individual's consistent internal motivation in solving problems and reasoning with critical thinking skills. [4, 5] Critical thinking disposition is required for the appropriate usage of critical thinking skills. [6] Those who have "critical spirit" are those who seek curiosity, have a keen mind, a strong dedication to reason, and a thirst for reliable information. [3]

In the medical field, critical thinking is identified as a process of collecting and examining patients' information with the end goal of a precise clinical judgment. According to European Heart Association, critical thinking is an important element of clinical reasoning. [7] Clinical reasoning is a cognitive and metacognitive processes in which information obtained in a clinical case is integrated with the clinician's knowledge, experience and critical thinking to provide an accurate diagnosis and to improve the patient's physiological and psycho-social state. [8, 9] Medical students need to ponder abstract problems, have good team work with their colleagues and be able to detect quality information. [10] Hence, clinical reasoning and critical thinking should be used interchangeably and collaboratively in order to meet the demands of the rapidly evolving health care system. [11, 12]

According to the United Kingdom General Medical Council (GMC), one of the expected outcomes of medical student graduates is competence in clinical reasoning. [13]. Despite its importance, 10%-15% of all clinical errors were coming from clinical reasoning errors and relatively little curriculum time was given to this subject. [14] Therefore, measuring critical thinking skills among undergraduate medical students will give some insight into their clinical reasoning as critical thinking is the core element of clinical reasoning. [15]

In Iran, a study conducted among first- and last-year medical students showed that the critical thinking disposition score was lower than average. The lack of difference between first and last year students clearly showed that the academic curriculum should be designed in a way to promote and strengthen critical thinking disposition. [16] In another survey conducted among medical students in Iran, it was found that 87.4% of them had a negative inclination towards critical thinking, and 12.6% had an ambivalent inclination. In other words, no student had a positive inclination towards critical thinking. [17] In Malaysia, a recent cross-sectional study was conducted among nurses with a minimum of 1-year working experience by administering Health Sciences Reasoning Test (HSRT). The result showed that only 2.6% of nurses were generally strong in the overall score of HSRT. [18] According to the aforementioned studies, the critical thinking skills among healthcare professionals were generally weak, indicating that there was definitely room for improvement for the development of critical thinking skills.

Furthermore, there were many studies done previously on the assessment of critical thinking skills in countries such as China, Iran and Canada. [16, 17, 19] However, in Malaysia, similar studies were conducted among undergraduate students of business, accountancy and nursing students. [18, 20, 21] To the best of our knowledge, there is limited information about critical thinking skill and its association between personal habits, learning strategies, family and cultural background among undergraduate medical students in Malaysia. Therefore, the primary objective of this research was to assess the level of critical thinking among undergraduate medical students in Malaysia.

This evaluation is extremely important because as future doctors, medical students need to apply their critical thinking skills to make major decisions swiftly in order to save lives. [10] Treating patients is predominantly problem solving. In conjunction with that, problem solving ability can be reinforced by critical thinking. On the contrary, without critical thinking, one will rely on heuristics and can be the victim of cognitive bias. [22] Cognitive bias will eventually lead to diagnostic errors, which results in increased morbidity

and mortality in patients. [23] Misdiagnosis was the leading cause of malpractice claims [24] and accounted for about 10% of hospital deaths. [25] Based on a cross-sectional study conducted in emergency department in Hospital Universiti Sains Malaysia (HUSM), Kelantan, Malaysia, it was found that prevalence of medical error was 30.5%. [26] Therefore, critical thinking should be both explicitly taught and assessed to prevent medical/clinical errors in the future. [10]

In addition, critical thinking helps to foster independence. It prepares medical students to face the complex problems in a self-directed manner and develop a self-correcting mindset. For instance, the ability to make a significant clinical decision independently in a stressful and high-paced environment, especially in the Intensive Care Unit (ICU) is crucial for medical students. [27] Furthermore, curiosity is a key characteristic in the development of critical thinking. It is stated that when curiosity is stimulated, one will think deliberately and wisely to find out a solution. [27] Hence, it is necessary for medical students to adapt the nature of curiosity as it can help them understand their patient's condition more precisely and this will boost their confidence to come up with the right diagnosis. [28]

Moreover, it is also important to recognise the important factors that play a role in moulding critical thinking. Personal habits, family and cultural background are some factors that play an important role in instilling critical thinking in medical students. [29] With this in mind, our secondary objective of this research is to investigate the associations between the aforementioned factors and critical thinking skills among undergraduate medical students.

METHODOLOGY

An analytical cross-sectional study was conducted from December 2021 to January 2022 among undergraduate medical students of a private medical university, Manipal University College Malaysia (MUCM) in Malaysia. Our university consists of two campuses, in Muar and Melaka. There are three programmes offered by MUCM, Foundation in Science (FIS), Bachelor of Dentistry (BDS), and Bachelor of Medicine and Bachelor of Surgery (MBBS). In Muar campus, there are clinical year students from semester 6 and 7; in Melaka campus, there are pre-clinical year students from semester 1 to 4, and clinical year students from semester 8 to 10. We recruited only the students who were attending MBBS programme, and the estimated total student population was 1000.

The sample size for this research was calculated using a Epi-info sample size calculator. We used population size of 800, study estimate of 51.67% (percentage of medical students who had manifested a strong critical thinking skills), [30] and a precision error of 9%, the minimum sample size required for our study was 104. Taking non-response rate of 10% into consideration, our final sample size was 116.

The sampling method used to conduct this study was purposive sampling, which is a non-probability sampling method. The inclusion criteria of this study were (1) the participant must be an undergraduate medical student in Manipal University College Malaysia (MUCM) and (2) students of at least 18 years old who had voluntarily agreed to participate in this study and completed all questions in the given questionnaires including the consent form. The exclusion criteria of this study were students who failed to complete all the questions in the given questionnaire and those who took multiple attempts on the same questionnaire.

The data were collected by the distribution of an online self-administered questionnaire through Google Form to the targeted undergraduate medical students in Manipal University College Malaysia (MUCM). The questionnaire was designed in English and consisted of structured close-ended questions. Informed consent from each participant was taken. The questionnaire consisted of four parts. The first part consisted of sociodemographic information of the participants, which included age, gender, ethnicity, nationality, educational level, total family income and the number of family members.

The second part consisted of a critical thinking skill assessment which was made up of 20 close-ended questions. Participants were given the choice of 'Yes' and 'No'. Examples of questions asked were 'Are you courageous enough to ask tough questions about some of your longest-held and most cherished beliefs?' and 'Do you make a serious effort to be analytical about the foreseeable outcomes of your decisions?'. The assessment of critical thinking skills was adopted from a self-rating form in "Critical Thinking: What It Is and Why It Counts" written by Peter A. Facione. [3] For every 'Yes' option on the odd-numbered question and for every 'No' option on the even-numbered question, five marks were given. The minimum score for this section was 0 marks while the maximum score was 100 marks. If the total score is 70 or above, the disposition towards critical thinking is positive; if the total score is 50-70, it indicates an ambivalent/mixed overall disposition towards critical thinking; if the total score is 50 or lower, it indicates an averse or hostile disposition toward critical thinking.

The third part consisted of nine statements and one question to assess the role of personal habits in affecting critical thinking skills among undergraduate medical students. Personal habits including learning strategies and reading habits were asked. For nine statements, the participants were asked to respond on a three-point Likert scale such as agree, indecisive and disagree; depending on the personal extent to which they agreed on the personal habits. Examples of statements given were 'I set a time to study' and 'I prefer to study in a group.' Learning style of students was identified by a close-ended question with the choice of visual, auditory, kinesthetic (hands-on experience) and reading/writing. Students were allowed to choose more than one answer for this question. We adapted a questionnaire from previous research entitled "Factors Affecting the Development of Critical Thinking of Indonesian Learners of English Language" written by Rohmani Nur Indah, Agung W. Kusuma. [29]

The fourth part consisted of 10 statements to assess the role of family and cultural background in affecting critical thinking skill among undergraduate medical students. The students were asked to respond to the statements on a three-point Likert scale such as agree, indecisive and disagree; depending on the personal extent to which they agreed on the statements given. Examples of the statement given were 'I am given the same rights as my siblings to give an opinion in the family' and 'If I do not agree on something, I am encouraged to voice out my opinion'. We adapted a questionnaire from previous research entitled "Factors Affecting the Development of Critical Thinking of Indonesian Learners of English Language", written by Rohmani Nur Indah, Agung W. Kusuma. [29]

Data collected were entered into Microsoft Excel. Level of critical thinking was categorized into positive disposition, ambivalent/mixed disposition and averse/hostile disposition. Positive disposition towards critical thinking was considered when the

participants had a total score of 70 or above; ambivalent/mixed disposition was considered when the participants had a total score of 50-70; averse/hostile disposition was considered when the participants had a total score is 50 or lower. Data were then analysed using Epi Info version 7.2. Independent variables in this study were gender, personal habits, learning styles, family and cultural background. The dependent variables were critical thinking skill assessment's score among undergraduate medical students. For categorical data (age, gender, ethnicity, nationality, educational level, total family income, number of family members, personal habits, family and cultural background), frequency and percentage were calculated. For the quantitative data, which is the critical thinking score, frequency, percentage, mean and standard deviation were calculated. The statistical tests used to find out the association between independent variables and dependent variable were shown in table 1. We set the level of significance at 0.05.

Table 1: Statistical tests to assess the relationship between various independent variables and dependent variable

Independent variables	Dependent variables	Statistical tests
Gender	Critical thinking skills assessment score	Independent t-test
Personal habits		One-way ANOVA
Learning styles		Independent t-test
Family and cultural background		One-way ANOVA

RESULTS

A total of 102 students participated in this study. Table 2 shows the sociodemographic characteristics of medical students. Among the students, 80.4% was between the ages of 21 to 24, and majority of the students were females (65.7%). Besides, 90.2% of students were Malaysian students and 9.8% were international students. Regarding ethnicity, 41.2% were Indians and 40.2% Chinese. In addition, 87.2% were clinical students and pre-clinical students were 12.8%. 40.2% students were from family which had income of RM4360-9619 (M40) and 38.2% students were from family which had income of more than RM9619 (U20). [Table 2]

Table 2: Socio-demographic profile of the undergraduate medical students (n=102)

Variables	Frequency (%)
Age	
≤20	16 (15.7)
21-24	82 (80.4)
≥25	4 (3.9)
Gender	
Male	35 (34.3)
Female	67 (65.7)
Ethnicity	

Malay	9 (8.8)
Chinese	41 (40.2)
Indian	42 (41.2)
Others	10 (9.8)
Nationality	
Malaysian	92 (90.2)
Non-Malaysian	10 (9.8)
Educational level	
Pre-clinical	13 (12.8)
Clinical	89 (87.2)
Total family income	
< RM 4360 (U20)	22 (21.6)
RM 4360 – RM 9619 (M40)	41 (40.2)
>RM 9619 (B40)	39 (38.2)
Number of family members	
≤5	75 (73.6)
>5	27 (26.4)

Table 3 answered our primary research objective to assess the level of critical thinking among undergraduate medical students. 56.9% had ambivalent/mixed disposition towards critical thinking, while 23.5% of them had positive disposition towards critical thinking and 19.6% of them had averse/hostile disposition towards critical thinking. [Table 3]

Table 3: Critical thinking skills score among undergraduate medical students

Variables	Frequency (%)
Critical thinking skills score	
Positive disposition	24 (23.5)
Ambivalent/Mixed disposition	58 (56.9)
Averse/Hostile disposition	20 (19.6)
Mean (SD)	60.0 (15.5)

Table 4 shows personal habit that affects critical thinking. Setting study time was agreed by 50% of the students, 23.5% preferred to study in a group, 62.7% of them preferred reading different kind of books, 49% agreed that writing regularly to enhance skills, 70.6% of students agreed that they were curious more about new things, 81.4% agreed that they used internet to find reference, 75.5% agreed asking peers questions, 39.2% agreed on watching debate/ talk show on tv, and 31.4% of students agreed that 'Facts are facts' and no interpretation is needed. [Table 4]

Table 4: Personal habits among undergraduate medical students

Variable	Agree Frequency (%)	Indecisive Frequency (%)	Disagree Frequency (%)
Set study time	51 (50.0)	41 (40.2)	10 (9.8)
Prefer to study in a group	24 (23.5)	40 (39.2)	38 (37.3)

Reading different kind of books	64 (62.7)	28 (27.5)	10 (9.8)
Write regularly to enhance skills	50 (49.0)	32 (31.4)	20 (19.6)
Curious more about new things	72 (70.6)	23 (22.5)	7 (6.9)
Use internet to find reference	83 (81.4)	14 (13.7)	5 (4.9)
Ask peers questions	77 (75.5)	21 (20.6)	4 (3.9)
Watch debate/ talk show on TV	40 (39.2)	34 (33.3)	28 (27.5)
Think that 'Facts are facts', no interpretation is needed	32 (31.4)	41 (40.2)	29 (28.4)

Table 5 shows the type of learning strategies among MUCM students. 76.5% of students were visual learners, 54.9% of students were auditory learners while 65.7% of students preferred hands-on experience (Kinesthetic). Among them, 65.7% of students used the method of reading/ writing to learn. [Table 5]

Table 5: Learning strategies among medical students

Variable	Yes Frequency (%)	No Frequency (%)
Visual	78 (76.5)	24 (23.5)
Auditory	56 (54.9)	46 (45.1)
Kinesthetic (Hands-on experience)	67 (65.7)	35 (34.3)
Reading/ writing	67 (65.7)	35 (34.3)

Table 6 shows family and cultural background role in critical thinking. 76.5% agreed on having the same rights to give opinion, 76.5% agreed on being encouraged to voice out different opinion, 70.6% agreed on asking questions in class, 66.7% agreed that they would have discussion with family, 85.3% agreed on giving explanation when they disagree with something, 49% agreed that they would criticize parents, 62.7% agreed that parents answered all questions, 69.6% of them agreed on being encouraged to read a lot since young, and 30.2% of them agreed that teachers had the absolute authority. Finally, correcting teacher in school was agreed by 37.3% of students. [Table 6]

Table 6: Family and cultural background among medical students

Variable	Agree Frequency (%)	Indecisive Frequency (%)	Disagree Frequency (%)
Having the same rights to give opinion	78 (76.5)	15 (14.7)	9 (8.8)
Encouraged to voice out different opinion	78 (76.5)	21 (20.6)	3 (2.9)
Ask questions in class	72 (70.6)	25 (24.5)	5 (4.9)
Have discussion with family	68 (66.7)	23 (22.5)	11 (10.8)
Give explanation when disagree with something	87 (85.3)	14 (13.7)	0 (0)
Criticizing parents	50 (49.0)	25 (24.5)	27 (26.5)
Parents answer all questions	64 (62.7)	31 (30.4)	7 (6.9)

Encouraged to read a lot since young	71 (69.6)	27 (26.5)	4 (3.9)
Teachers have the absolute authority	22 (21.6)	49 (48.0)	31 (30.2)
Correcting teacher in school	38 (37.3)	42 (41.2)	22 (21.6)

Table 7 shows that male students had higher critical thinking skills than female students (mean difference -3.48 (95% CI -9.91 to 2.95)), but it was not significant. [Table 7]

Table 7: Association between gender and critical thinking skills among medical students

Independent variable	Critical thinking skills score Mean (SD)	Mean difference (95% CI)	P value
Gender			
Female	58.8 (15.7)	-3.48 (-9.91, 2.95)	0.285 ^a
Male	62.3 (15.3)		

^aIndependent t-test

Table 8 shows there were no statistically significant association between personal habits and critical thinking skills among medical students. [Table 8]

Table 8: Association between personal habits and critical thinking skills

Independent Variable	Critical thinking skills score Mean (SD)	P value
Set study time		
Agree	61.0 (16.0)	0.354 ^b
Indecisive	58.8 (15.3)	
Disagree	55.0 (13.0)	
Prefer to study in group		
Agree	60.3 (19.0)	0.969 ^b
Indecisive	60.0 (15.0)	
Disagree	59.6 (14.1)	
Reading different kind of books		
Agree	59.2 (14.4)	0.806 ^b
Indecisive	61.4 (18.6)	
Disagree	61.0 (14.9)	
Write regularly to enhance skills		
Agree	61.0 (15.3)	0.786 ^b
Indecisive	59.5(16.3)	
Disagree	58.3 (15.6)	
Curious about new things		
Agree	61.9 (15.7)	0.493 ^b
Indecisive	57.4 (16.2)	
Disagree	56.4 (11.1)	

Use internet to find reference		
Agree	60.4 (15.2)	0.589 ^b
Indecisive	60.0 (18.0)	
Disagree	53.0 (15.2)	
Ask peers questions		
Agree	61.2 (15.3)	0.189 ^b
Indecisive	58.1 (16.7)	
Disagree	47.5 (9.6)	
Watch debate/ talk show on TV		
Agree	62.6 (16.2)	0.369 ^b
Indecisive	57.7 (15.4)	
Disagree	59.1 (14.7)	
Think that 'Facts are facts' and no interpretation is needed		
Agree	58.6 (14.4)	0.566 ^b
Indecisive	59.3 (15.2)	
Disagree	62.6 (17.3)	

^bOne-way ANOVA

Table 9 shows the association between learning strategies and critical thinking skills among medical students. Auditory learners had lower mean critical thinking skills score than those who were non-auditory learners (mean difference 6.93, 95% CI 0.92 to 12.9) with P value of 0.024. There were no statistically significant association between other learning strategies such as visual, kinesthetic, reading or writing, and critical thinking skills among medical students. [Table 9]

Table 9: Association between learning strategies and critical thinking skills among medical students

Independent variable	Critical thinking skills score Mean (SD)	Mean difference (95% CI)	P value
Visual			
No	62.1 (19.2)	2.72 (-4.49, 9.94)	0.525 ^a
Yes	59.4 (14.3)		
Auditory			
No	63.8 (17.8)	6.93 (0.92, 12.9)	0.030 ^a
Yes	56.9 (12.7)		
Kinesthetic (Hands-on experience)			
No	62.6 (18.0)	3.91 (-2.50,10.33)	0.268 ^a
Yes	58.7 (14.0)		
Reading/ writing			
No	62.6 (18.0)	3.91 (-2.50,10.33)	0.268 ^a

Yes	58.7 (14.0)		
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^aIndependent t-test

Table 10 shows that there were no statistically significant association between family and cultural background and critical thinking skills among medical students. However, students who disagreed that teachers had the absolute authority showed the highest mean critical thinking score, which was 66.8 (SD=14.3), followed by those who were indecisive with a mean of 59.1 (SD=16.2) and those who agreed with a mean of 52.5 (SD=11.7). The p value was 0.003 and the result was statistically significant. [Table 10]

Table 10: Association between family and cultural background and critical thinking skills among medical students

Independent Variable	Critical thinking skills score Mean (SD)	P value
Having the same rights to give opinion		
Agree	60.8 (15.5)	0.634 ^b
Indecisive	58.3 (16.9)	
Disagree	56.1 (14.7)	
Encouraged to voice out different opinion		
Agree	60.7 (15.5)	0.713 ^b
Indecisive	57.6 (16.8)	
Disagree	58.3 (7.6)	
Ask questions in class		
Agree	61.9 (15.7)	0.128 ^b
Indecisive	56.0 (15.2)	
Disagree	52.0 (10.4)	
Have discussion with family		
Agree	61.0 (16.0)	0.684 ^b
Indecisive	58.0 (15.0)	
Disagree	58.2 (14.5)	
Give explanation when disagree with something		
Agree	60.0 (15.1)	0.689 ^b
Indecisive	58.2 (17.9)	
Disagree	0 (0)	
Criticizing parents		
Agree	58.8 (15.0)	0.112 ^b
Indecisive	58.8 (15.3)	
Disagree	65.2 (16.1)	
Parents answer all questions		
Agree	60.5 (15.5)	0.385 ^b
Indecisive	60.8 (16.5)	
Disagree	52.1 (9.9)	

Encouraged to read a lot since young		
Agree	61.4 (16.2)	0.355 ^b
Indecisive	57.2 (14.4)	
Disagree	53.8 (4.8)	
Teachers have the absolute authority		
Agree	52.5 (11.7)	0.003 ^b
Indecisive	59.1 (16.2)	
Disagree	66.8 (14.4)	
Correcting teacher in school		
Agree	59.6 (15.5)	0.927 ^b
Indecisive	60.7 (15.2)	
Disagree	59.3 (16.9)	

^bOne-way ANOVA

DISCUSSION

This study aimed to assess the level of critical thinking among undergraduate medical students in Malaysia, while the specific research objective was to investigate the factors that were associated with critical thinking skills among our participants. In this study, we found that majority of the students (56.9%) had an ambivalent/mixed disposition toward critical thinking, while 23.5% of students had a positive disposition and 19.6% of them had an averse/hostile disposition toward critical thinking. Our results echoed a comparative study conducted among college nursing students in China, Japan, and Samoa in which the results showed that the critical thinking ability of nursing students from all three countries was at a moderate level. [31] According to a systematic review carried out among medical science students, it was found that critical thinking disposition was at a low and moderate level in most studies. [32] A descriptive cross-sectional correlational study carried out among medical students in Ahvaz Jundishapur University of Medical Sciences located in the southwest Iran revealed that the majority of them (87.4%) had a negative inclination towards critical thinking, 12.6% had an ambivalent inclination and no student had a positive inclination towards critical thinking. [17] Based on descriptive and exploratory quantitative research conducted among allied health science students from allied health college in the south-eastern United States, 64.9% of the students had weak critical thinking skills while 31.6% had moderate critical thinking skills and 3.5% had strong critical thinking skills. [33] A cross-sectional study of medical students from the Jilin University showed 51.67 % of the students were indicating positive to strong critical thinking tendency. [30] According to a previous cross-sectional study conducted among medical students in three medical institutions in China, 60% of the students had a positive disposition toward critical thinking. [19] By comparing the level of critical thinking between nurses with medical students, unfortunately, there is a contrast noted which raised some concerns. In Malaysia, a recent cross-sectional study was conducted among nurses with a minimum of 1-year working experience in public

hospitals. The result showed that 57.9% of nurses did not manifest the required level of critical thinking skill and only 2.6% of nurses were generally strong in critical thinking. [18]

Our study showed that there was no significant association between gender and critical thinking skills among undergraduate medical students even though male had a higher mean critical thinking skills score than female. This finding was consistent with a cross-sectional study conducted among Master of Arts students studying at the Azad University of Shiraz branch which reported that there was no significant difference between males and females' critical thinking levels. [34] Similar results were also seen in a cross-sectional study done among Iranian learners attending English as a foreign language course, which revealed that there was no significant association between gender and critical thinking skills. [35] Another similar finding was obtained from a descriptive cross-sectional study conducted among undergraduate nursing students in Australia, which showed no significant association between gender and critical thinking skills. [36] However, a significant association between the gender and critical thinking skills, was found in a cross-sectional study done among University Putra undergraduates in Malaysia where gender has a significant impact on critical thinking disposition. [37] In addition, there was significant difference in critical thinking skills between gender among science students of all Islamic senior high schools in Surakarta City, Indonesia. [38]

In this research, we studied the association between personal habits and critical thinking skills. Based on our study, there was no significant association between personal habits and critical thinking skills. Some of the personal habits in our study were setting a time to study, preferring to study in a group, reading a different kind of books, writing regularly to enhance skills, curious about new things, using the internet to find a reference, asking peers questions, watching debate/talk shows on TV, and thinking that 'Facts are facts' and no interpretations are needed. According to the previous literature about the development of critical thinking skills for nursing students, it was stated that curiosity was one of the critical thinking enhancement behaviours. [39] There were other personal factors affect critical thinking skills. In a previous study done among undergraduate English Foreign Language (EFL) learners majoring in English translation and English literature at the Islamic Azad University, Central Tehran and Roudehen branches, a significant association was found between creativity and critical thinking skills. This study also found that there was a significant association between autonomy which refers to the ability to make decisions well and manage one's affairs and critical thinking skills. [40] Some of the qualities of autonomy can be seen in the personal habits that we studied in our research such as setting a time to study and preferring to study in a group. Furthermore, under personal habits, we studied the association between learning strategies and critical thinking. In our study, there was a significant association between auditory learners and critical thinking skills. Auditory learners had a lower critical thinking score compared to non-auditory learners. In a study done by the Department of Psychiatry, Medical Sciences Building, Queen Mary, University of London, London, UK, it was found that noise exposure impairs performance. A subject's performance may be disturbed if the speech was played while the subject was reading or trying to memorise something. [41] Moreover, the other learning strategies that we studied were visual learning, kinesthetic learning, and reading/writing. All these factors above had no significant association with critical thinking skills.

In addition, we studied the association between family and cultural background and critical thinking skills. Students who agreed that teachers have absolute authority had the lowest critical thinking skill score than the students who disagreed and those who were indecisive, and this association was significant. According to a previous qualitative study, teachers who had absolute authority denied a significant portion of student's opinions about seeking inclusion in the curriculum. [42, 43] If an individual's access to their preferred way of thought and learning opportunities was denied by a cultural system like educational guidelines and traditions, he/she will be less likely to think critically. [43] In our study, there were no significant associations between other family and cultural backgrounds (had the same rights to give an opinion, encouraged to voice out different opinion, encouraged to read a lot since young, asked questions in class, had discussion with family, gave explanation when disagreed with something, criticized parents, corrected teacher in school, sought parents' help to answer all questions) and critical thinking skills among undergraduate medical students. Based on a cross-sectional study carried out among medical students in China, 58.19% of the participants showed a positive attitude toward critical thinking, [44] which was lower than the 78% of American undergraduates that displayed a positive attitude toward critical thinking. [45] This indicated that there was a difference in critical thinking skills between different cultural backgrounds. Cultural systems can decrease individuals' will to think critically. [46] As a result of the individualistic culture exhibited in western culture, they were encouraged to ask questions, actively participate in classroom activities, and express opinions freely to investigate the validity of arguments. [47] In addition, the classroom environment in the U.S. encourages critical thinking (using a collaborative approach to solve problems), arguments, and debates. [48, 49] On the contrary, collectivism practised in Asian culture placed importance on harmony in relationships to avoid contradiction. [50] For example, Chinese students perceived the critique of peer's opinions as a disruption of group harmony. Besides, critical questioning, unconventional views, and questioning teachers' authority were not encouraged. [49,51] Hence, Asian culture had a lower tendency to engage in behaviours in critical thinking such as rarely asking questions and keeping quiet during group discussions. [47] In terms of family background, parents played a crucial role in instilling critical thinking. According to a previous study, authoritarian parenting styles characterised by high expectations, high parental control, low responsiveness, and low parental support will decrease children's sensitivity and disposition towards critical thinking. [52] In this case, parents expect children to obey their rules without explanation and discussion. Children were neither encouraged to voice out different opinions nor criticize parents. [53] Other family factor such as family socio-economic status affect critical thinking. According to a study conducted among medical students in China, there was a weak, positive correlation between family socioeconomic status and the development of critical thinking. Students from the high socioeconomic families had higher critical thinking scores. [54]

Unfortunately, we faced some limitations when carrying out this study. Firstly, this study was conducted only in one private medical college at only one point in time; hence it was not reflected of any other current clinical practise in Malaysia and the generalizability of results was reduced. Besides, 87.2% of our respondents were in their clinical phase and the minority of them were in their pre-clinical phase. This difference was due to the difficulty we faced in

approaching pre-clinical students as they were in a different campus. Furthermore, there was a time limitation in our study as our community medicine posting is only six weeks duration. As this study was cross-sectional, changes over time were not observable.

In this study, we found that undergraduate medical students had an ambivalent/mixed disposition toward critical thinking. Hence, it is advised to sensitize medical students by instilling some information about critical thinking and its importance during their foundation course in the form of lectures. Medical students should practice the habit of questioning, brainstorming, active learning, and peer learning to improve their critical thinking skills. Learning strategies such as concept mapping, collaborative writing, and team-based learning will enhance critical thinking skills as well. Besides, family plays an important role in improving critical thinking by encouraging children to think in a new and different way, ask questions and freely express their opinion. Furthermore, the medical education curriculum should include problem-based learning, case-based learning, medical simulation, and student-centered models to develop critical thinking skills among medical students.

CONCLUSION

In conclusion, majority of undergraduate medical students had an ambivalent/mixed disposition towards critical thinking. In our study, there was a significant association between auditory learning and critical thinking skills. Auditory learners had a lower critical thinking score than non-auditory learners. Moreover, there was a significant association between students who agreed that teachers having the absolute authority and critical thinking skills score. Students who agreed that teachers have the absolute authority had the lowest critical thinking skill score compare to students who disagreed and indecisive. In addition, there was no significant association between gender and critical thinking skills among undergraduate medical students. Hence, further study is required to find out the reasons for the deficiencies in critical thinking skills among undergraduate medical students. In a nutshell, medical students, family and the medical colleges should work hand-in-hand to instil and enhance critical thinking skills for the benefit of the healthcare system.

Ethical Approval

This research was conducted ethically and approved by the Research Ethics Committee, Faculty of Medicine of Manipal University College Malaysia (MUCM).

Consent

Participants were given informed consent to enter this analytical cross-sectional study and participation was voluntary. The participants were also given a choice to decline their participation at any time of the study. All information obtained was anonymous as names and roll numbers were not collected. The participants' information was kept confidential and used only for the purpose of this research.

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