Research Article

ความรู้และทัศนคติต่อกัญชาทางการแพทย์ของนิสิตระดับปริญญาตรี

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บทคัดย่อ

ความรู้และทัศนคติต่อกัญชาทางการแพทย์ของนิสิตระดับปริญญาตรี

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ความต้องการใช้กัญชาทางการแพทย์ที่สูงในประชากรทั่วโลกจึงทำให้การประเมินความรู้และทัศนคติต่อการใช้กัญชาทางการแพทย์จึงเป็นสิ่งที่สำคัญ เนื่องจากสามารถนำผลมาใช้ในการให้การศึกษาอย่างเป็นทางการเกี่ยวกับการใช้กัญชาทางการแพทย์สำหรับนักศึกษาระดับปริญญาตรีในมหาวิทยาลัย เพื่อป้องกันไม่ให้เกิดการใช้กัญชาในทางสันทนาการหรือนำไปใช้ในทางที่ผิด ดังนั้นการศึกษานี้จึงทำการประเมินความรู้และทัศนคติเกี่ยวกับการใช้กัญชาทางการแพทย์ของนักศึกษาระดับปริญญาตรีที่เรียนสายการแพทย์และไม่ได้เรียนสายการแพทย์ รวมถึงหาปัจจัยที่ส่งผลกระทบต่อระดับความรู้และทัศนคติต่อการใช้กัญชาทางการแพทย์ **ระเบียบวิธีวิจัย:** การวิจัยนี้มีรูปแบบการศึกษาภาคตัดขวางเชิงสำรวจที่ดำเนินการศึกษากับนิสิตระดับปริญญาตรีจำนวน 393 คนจากสามสาขาการศึกษาได้แก่ สายวิทยาศาสตร์สุขภาพจำนวน 86 คน สายวิทยาศาสตร์และเทคโนโลยีจำนวน 124 คน และสายมนุษยศาสตร์และสังคมศาสตร์จำนวน 183 คน การคัดเลือกตัวอย่างตามโควตาถูกใช้เพื่อเลือกจำนวนตัวอย่างตามสัดส่วนของกลุ่มประชากรในแต่ละสาขาวิชา โดยใช้เกณฑ์การคัดเลือกดังนี้ 1) นิสิตปริญญาตรีปีการศึกษา พ.ศ. 2563, 2) ยินยอมเข้าร่วมงานวิจัย และ 3) สามารถอ่านและเข้าใจภาษาไทยได้ ในขณะที่ตัวอย่างที่กรอกแบบสอบถามไม่สมบูรณ์จะถูกคัดออกจากการศึกษา สถิติเชิงพรรณนาใช้ในการรายงานลักษณะของผู้เข้าร่วมงานวิจัยและคะแนนของความรู้และทัศนคติเกี่ยวกับการใช้กัญชาทางการแพทย์ ในขณะที่ ANOVA ใช้ในระบุว่าคะแนนของความรู้และทัศนคติเกี่ยวกับการใช้กัญชาทางการแพทย์มีค่าแตกต่างกันหรือไม่ในสามสาขาวิชา นอกจากนี้การวิเคราะห์การถดถอยพหุคูณใช้เพื่อประเมินผลกระทบของปัจจัยทางประชากรต่อคะแนนความรู้และทัศนคติ **ผลการศึกษา:** นักศึกษาสาขาวิทยาศาสตร์สุขภาพมีคะแนนความรู้สูงกว่านักศึกษาอีกสองสาขา($F = 23.34$, $p < 0.01$) ในทางตรงกันข้าม นักศึกษาสายวิทยาศาสตร์สุขภาพมีคะแนนทัศนคติน้อยกว่านักศึกษาอีกสองสาขา ($F = 5.51$, $p < 0.01$) จากการวิเคราะห์การถดถอยพหุคูณพบว่านักศึกษาที่มีอายุมากกว่าและกำลังเรียนสายวิทยาศาสตร์สุขภาพจะมีคะแนนความรู้เกี่ยวกับกัญชาทางการแพทย์สูงกว่านักนักศึกษาที่อายุน้อยกว่าและกำลังเรียนสายอื่น ในขณะที่นักศึกษาเพศหญิง, กำลังเรียนอยู่ในชั้นปีที่สองและชั้นปีที่สาม, ไม่เคยใช้กัญชามาก่อน และกำลังเรียนสายวิทยาศาสตร์สุขภาพมีคะแนนทัศนคติเกี่ยวกับกัญชาทางการแพทย์ที่ต่ำกว่านักศึกษาเพศชาย, กำลังเรียนอยู่ชั้นปีที่หนึ่ง, เคยใช้กัญชามาก่อนและกำลังเรียนสายอื่น **สรุปผลการวิจัย:** นักศึกษาสายวิทยาศาสตร์สุขภาพมีความรู้ที่ดีกว่าแต่มีคะแนนทัศนคติที่ต่ำกว่านักศึกษาอีกสองสาขา การได้รับการฝึกอบรมอย่างเป็นทางการเกี่ยวกับกัญชาทางการแพทย์ที่เพียงพอควรต้องถูกรวมเข้าไปอยู่ในหลักสูตรการศึกษาและการฝึกปฏิบัติงาน แต่อย่างไรก็ตามการศึกษาดังกล่าวนี้ควรถูกดำเนินการศึกษาในกลุ่มประชากรไทยทั่วไปอีกครั้ง

คำสำคัญ: กัญชาทางการแพทย์, นักศึกษาปริญญาตรี, ความรู้, ทัศนคติ, ประเทศไทย

Knowledge and Attitudes Towards Medical Cannabis of Bachelor's Degree Students

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Abstract

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Given the growing demand for medical cannabis (MC) use across the globe, knowledge and attitude assessment is imperative to give the formal education related to MC use for undergraduate students in the university. It is expected to prevent the cannabis use for recreational purposes or abuse treatment. Therefore, this study assessed those two aspects regarding MC use among students with medical and non-medical backgrounds and their associated factors. **Material and Method:** A cross-sectional survey was conducted among 393 undergraduate students from health sciences (n = 86), pure sciences and technology (n = 124), and social sciences and humanities (n = 183). A quota-sampling was employed to select study subjects in proportion to the study population of each faculty. The inclusion criteria were as follows: 1) undergraduate students in the academic year of 2020, 2) consent to participate in this study, and 3) able to read and understand the Thai language and data collection process. Subjects who were unable to complete the questionnaire were excluded. Descriptive statistics were used to report participant characteristics and scores for knowledge and attitudes towards MC, while ANOVA was used to determine whether the scores for knowledge and attitudes regarding MC differed among the three study fields. In addition, multiple regression analysis was used to assess the impact of demographic factors on knowledge and attitudes scores. **Results:** Students in health sciences had higher knowledge scores than those in the other two fields ($F = 23.34$, $p < 0.01$). Conversely, students in health sciences had lower attitude scores than those in the other two fields ($F = 5.51$, $p < 0.01$). Multiple regression analyses showed that older students and those in the health sciences field had higher knowledge scores than younger students and those in the other two fields, whereas female, second- and third-year students, and those of non-cannabis users, and in health sciences field had lower attitude scores than male and first-year students, and those of previous cannabis users and in the other two fields. **Conclusions:** Therefore, students in health sciences had better knowledge, but their attitudes were lower than those in the other two fields. Ample formal MC training should be included in the study curricula and field practice. However, these findings should be reinvestigated in the general Thai population.

Keywords: Medical cannabis; Undergraduate students; Knowledge; Attitudes; Thailand

Introduction

Cannabis is a medicinal plant belonging to the genus Cannabis that was previously prohibited from medicinal use worldwide in the 1930s and 1940s because of its several neurological adverse effects such as hallucination and loss of consciousness, as well as violence, criminal behavior, and deviant behaviors when used for recreational purposes (Pollio, 2016; Ko GD *et al.*, 2016; Turcotte D *et al.*, 2010). However, there has been growing attention to the medicinal use of cannabis, known as medical cannabis (MC), for a variety of conditions worldwide (Ko GD *et al.*,2016). Currently, growing evidence supports the use of MC for various medical conditions such as chemotherapy-induced nausea and vomiting, intractable epilepsy, spasticity in multiple sclerosis, neuropathic pain, and weight loss in patients with HIV (Smith LA *et al.*, 2015; Silvestro S *et al.*, 2019; Corey-Bloom J *et al.*, 2012; Lee G *et al.*, 2018; Badowski ME *et al.*, 2016). However, it is limited to use as an alternative treatment for those conditions when patients are resistant to mainstream therapies.

Given the high prevalence use of cannabis among college students worldwide, knowledge about cannabis use for medical purposes among college students remains limited. Previous research indicated that knowledge regarding MC was relatively low among pharmacy and medical students (Berlekamp D *et al.*, 2019; Benavides A *et al.*, 2020; Jain R *et al.*, 2018). Similarly, previous studies indicated that knowledge about MC among healthcare professionals was poor (Carlini BH *et al.*, 2017; Szyliowicz D and Hilsenrath P *et al.*, 2019; Moeller KE and Woods B., 2015; Ziemianski D *et al.*, 2015). Consequently, healthcare professionals may be reluctant to recommend and dispense MC to patients. However, another previous study comparing university students with different study fields revealed that those with medical backgrounds had higher levels of knowledge about MC than those without medical backgrounds in terms of pharmacologic effects and indications (Felnhofer A *et al.*, 2021). Evidence regarding attitudes about MC is mixed among college students, as some previous studies reported that pharmacy students and healthcare professionals had positive attitudes and tended to favor MC usage (Berlekamp D *et al.*, 2019; Szyliowicz D and Hilsenrath P *et al.*, 2019; Moeller KE and Woods B., 2015). Conversely, a previous study by Felnhofer *et al.* found that students with medical backgrounds had negative attitudes about MC, as they expressed lower support for prescription and legalization than those without medical backgrounds (Felnhofer A *et al.*, 2021). These findings therefore imply that knowledge and attitudes towards MC are associated with MC use behaviors in various aspects among college students. Nevertheless, evidence concerning knowledge and attitudes regarding MC among college students remains mixed and further investigation is needed.

Moreover, several demographic factors have proven to affect both knowledge and attitude towards MC among undergraduate students. Our literature search showed that older students and those with health sciences background were significantly associated with knowledge towards MC (Jain R *et al.*, 2018; Jintapaputhanasiri N and Junsom N, 2020, Gazibara T *et al.*, 2017), while female students and those with health scieces background were significantly associated with negative attitudes towards MC (Felnhofer A *et al.*, 2021). Conversely, the previous study showed that there were no any demographic factors affecting both knowledge and attitude towards MC (Ongarj P *et al.*, 2021). Therefore, factors affecting both knowledge and attitute towards MC also deserve further investigation.

In Thailand, a local movement and political campaign sought to amend and implement new legislation regarding the use of MC. Therefore, the Thai National Legislative Assembly amended the original Narcotic Act B.E. 2522 (1979) that forbade cannabis use for all reasons to legalize use for research and medical purpose and permit its use if patients have a prescription from their authorized physicians, dentists, or registered Thai-traditional medical personnel. This amended law was enacted on February 18, 2019 (Rehm J *et al.*, 2019). Furthermore, a task force has

been charged with creating 26 MC clinics in public hospitals to increase the accessibility of cannabis for patients requiring the substance for medical purposes. This legal change could remove sociopolitical barriers and enhance the acceptance of, and demand for, MC by the public in Thailand.

To date, there is public interest and acceptance for MC in Thailand. College students has become great interest in exploring knowledge and attitudes towards MC because previous evidence showed the levels of knowledge and attitudes towards MC were directly associated with the MC use behaviors (Park SY *et al*., 2022), and those with low level of knowledge was more likely to consume some illicit drugs including cannabis (Alves R *et al*., 2021). However, no previous Thai study has been conducted to evaluate knowledge and attitudes regarding MC among Thai college students. Therefore, this study assessed knowledge and attitude levels regarding MC and identified relevant influencing factors among Thai college students. Moreover, we compared the levels of knowledge and attitudes towards MC among three major disciplines including health sciences, pure sciences and technology, and social sciences and humanities.

Materials and Methods

1. Study samples and settings

A cross-sectional internet-based survey was conducted by recruiting undergraduate students (n = 393) from 19 faculties at Burapha University, Bangsean campus (Chonburi, Thailand). The inclusion criteria were as follows: 1) undergraduate students in the academic year of 2020, 2) consent to participate in this study, and 3) able to read and understand the Thai language and data collection process. Subjects who were unable to complete the questionnaire were excluded. A quota-sampling method was employed to select the number of study subjects in proportion to the study population from each faculty, and sample size calculation was also performed using Yamane's formula as follows (Hajian-Tilaki K, 2011):

$$n = \frac{N}{1+Ne^2},$$

where n is the sample size required, N is the study population, and e is the acceptable error. Using Yamane's formula with an error of 0.05 and a population of 20,881 (statistics from the registration system on July 10, 2020), the total sample size required was 393 students.

2 Instrument

2.1 Instrument development

The questionnaire was modified from three previous studies: 1) Moller and Woods , 2) Philpot *et al*., and 3) Arona K *et al*. (Moeller KE and Woods B., 2015; Philpot LM *et.al.*, 2011; Arora K *et.al.*, 2020) who developed their questionnaires for assessing knowledge and attitudes regarding MC among pharmacy students, primary care providers, and older adults in Colorado, respectively.

The revised questionnaire was constructed to assess three aspects. The first aspect was demographic characteristics including gender, age, tobacco, alcohol consumption, year of study, department, and MC status (seven items). The second aspect was the knowledge of the study subjects regarding MC including indications, adverse effects, practical guidelines, and laws (20 items), for which the response options were constructed as follows: 1 = yes, 2 = no, and 3 = do not know. To evaluate the knowledge level, the correct answer to each question was scored as one point, and zero points were given otherwise. Then, the summed score was used to produce total scores ranging from 0 to 20 points. The final aspect was attitudes about MC regarding utilization, production, and quality control (24 items), for which the response options were scored on a five-point Likert scale as follows: 1 = strongly disagree, 2 = disagree, 3 = not sure, 4 = agree, and 5 = strongly agree. Moreover, reverse scoring was performed for all items stated in a negative fashion (item 3 and 8 from MC utilization, item 4 from MC production, and item 2 and 4 from quality control for MC) Therefore, the total scores for attitudes ranged from 24 to 120 points. Higher scores indicate better knowledge and attitudes concerning MC.

2.2 Content validity and reliability testing and cognitive debriefing

Three pharmacists were invited to serve as experts evaluating our questionnaire. Of these, two are board-certified pharmacy specialists in clinical pharmacy, whereas the third expert has a PhD in social and administrative pharmacy and works in the fields of questionnaire development and testing. Regarding the content validity testing for the questionnaire, one expert gave a score of two for three items, but the others awarded scores of four for all items, providing an S-CVI of 0.95 concerning the knowledge of MC. Regarding the attitudes about MC, two experts rated one item by giving the scores of one and two, respectively, whereas one expert awarded a score of four, giving an S-CVI of 0.97. Concerning the reliability testing, KR-20 and Cronbach's alpha coefficient were 0.72 and 0.84 for the knowledge and attitudes regarding MC, respectively. Both KR-20 $\geq$ 0.70 and Cronbach's alpha $\geq$ 0.70 denoted acceptable reliability (Meehanpong P and Chatdokmaiprai K, 2018; DeVon HA *et al.*, 2007). For cognitive debriefing, the 30 subjects in the convenience sample indicated that all questions were clear and relevant to the construct of interest.

3. Data collection

The researchers approached the convenience sample with having time available to complete the online questionnaire, and asked each participant to complete the self-administered questionnaire as follows: 1) demographic information, 2) knowledge about MC, and 3) attitudes about MC. Before the study commenced, an information sheet written in plain language to explain the study purposes and overall study process was given to each participant. However, subjects could withdraw from the study if they felt uncomfortable at any time. Finally, all study subjects were asked to provide written informed consent for their participation. After the completed questionnaires were returned by each participant, we checked the answers for completeness to avoid any missing responses. This study was granted ethical approval from the Burapha University Institutional Review Board (approval number: 065/2563).

4. Data analysis

The data entry was performed by three researchers (KC, ND and PK) and rechecked for correctness completeness, and missing values by one researcher (KK) in the SPSS program. No missing values were detected from the questionnaires.

Descriptive statistics were used to describe participant characteristics and scores for knowledge and attitudes regarding MC. Categorical variables such as gender, year of study, alcohol consumption, tobacco use, and cannabis status were reported as frequencies and percentages, whereas continuous variables including age and scores of knowledge and attitudes regarding MC were reported as the mean and standard deviation.

To employ the parametric statistics, we investigated whether both knowledge and attitude scores were normally distributed, and we found that both scores were normally distributed. Therefore, the parametric statistics were employed. Univariate analysis of variance (ANOVA) was used to determine whether the scores for knowledge and attitude regarding MC differed among the three study fields, and a post-hoc test (least significant difference [LSD] at a significance level of 0.05) was also performed to compare pairs of study fields.

Multiple regression analysis was undertaken to identify all possible factors affecting knowledge and attitudes regarding MC. In this analysis, the dependent variables were knowledge and attitude scores, whereas the independent variables were all possible factors such as age, gender, year of study, tobacco use, alcohol consumption, and cannabis status. In terms of studying faculties, we categorized 19 faculties into three study fields as follows: 1) health sciences, 2) pure sciences and technology, and 3) social sciences and humanities. Hence, these three study fields were entered into the multiple regression analysis as independent variables to assess whether they were associated with knowledge and attitudes scores. Higher knowledge and lower attitude scores were observed among women, older participants, non-smokers, non-drinkers, non-cannabis users, and participants from health science

disciplines. Moreover, the association between knowledge and attitudes regarding MC was investigated using Pearson's correlation, and a negative correlation between these two aspects was expected.

All statistical analyses were performed using IBM SPSS version 23 (IBM Corporation, Armonk, NY, USA), and $p < 0.05$ was considered statistically significant.

Results

1. Characteristics of the study population

Table 1 displays the basic characteristics of all undergraduate students (n = 393). We invited 394 students to complete the questionnaire, but one person did not report their cannabis status, and was excluded from the study. The average age of the remaining 393 students was 20.1 ± 1.4 years. Most participants were female (n = 265, 67.4%) and second year students (n = 137, 34.9%). The participants were mostly non-smokers (n = 366, 93.1%) and drinkers (n = 283, 72.0%). Moreover, most of them had never used MC (n = 379, 96.4%). Nevertheless, we found that gender, year of study, smoking status and alcohol consumptions were statistically different across three study fields.

2. Knowledge about MC

Table 2 presents the knowledge scores of the subjects regarding MC. Knowledge was significantly better in health sciences than in the other two fields (F = 23.34, p < 0.01, LSD p < 0.01), with overall scores of 11.15 ± 3.82, 8.65 ± 4.36, and 7.49 ± 4.07 for health sciences, pure sciences and technology, and social sciences and humanities, respectively. Concerning each domain of the knowledge score, univariate ANOVA revealed that students in health sciences had significantly better knowledge than those in the other two fields for all four domains. Among the entire cohort, students had the highest knowledge scores for practical guidelines and laws (2.38 ± 1.36 and 2.39 ± 1.25, respectively), whereas their score was lowest for indications (1.80 ± 1.52). Similar to the findings for overall knowledge, students in health sciences had better knowledge scores than those in the other two fields (F = 18.45, p < 0.01, LSD p < 0.05 for practical guidelines; F = 11.56, p < 0.01, LSD p < 0.01 for laws).

3. Subjects' attitudes regarding MC

As displayed in Table 3, students in social sciences and humanities had better overall attitudes about MC than those in the other two disciplines (F = 5.51, p < 0.01). A significant difference was found between students in health sciences and those in social sciences and humanities (LSD p < 0.01). Among the three disciplines, students in social sciences and humanities had better attitudes than those in the other two fields for MC production (F = 5.74, p < 0.01, LSD p < 0.05), whereas students in social sciences and humanities had better attitudes about MC utilization than those in health sciences (F = 5.51, p < 0.01, LSD p < 0.01). However, no difference was found for the quality control domain (F = 2.00, p = 0.14).

4. Factors affecting knowledge and attitude levels concerning MC

Table 4 presents factors associated with knowledge and attitudes concerning MC. As expected, the hypothesis was confirmed, as older students and those in health sciences tended to have higher knowledge scores for MC than their counterparts (all p < 0.05), while the third-year student had lower knowledge scores than those of the first-year students (p < 0.05). Regarding attitude scores, the hypothesis was also confirmed because female students, students in health sciences, second- and third-year students, and non-cannabis users were more likely to have lower attitudes about MC than their counterparts (all p < 0.05). A negative correlation between knowledge and attitudes regarding MC was also observed (r = −0.061, p > 0.05). As also shown in Table 4, the regression equations for both knowledge and attitude scores were as follows: Knowledge scores = -1.566 + 0.168 Age -0.207 Pure sciences and technology – 0.414 Social sciences and humanities major-0.157 Third year student

Attitude scores = 0.2907 – 0.250 Gender + 0.166 Social sciences and humanities major – 0.178 Second year student -0.152 Third year student -0.146 Never-users of cannabis

To compute for both scores, age is a continuous variable, and others are categorical variables, where 1= yes, and 0 = no for all categorical variables.

Table 1 Sample characteristics

Characteristics	Field of study			P-value
	Health sciences (n = 86)	Pure sciences and technology (n = 124)	Social sciences and humanities (n = 183)	
Gender, n (%)				0.013[a]
Male	18 (20.9)	50 (40.3)	60 (32.8)	
Female	68 (79.1)	74 (59.7)	123 (67.2)	
Age (years)				
Mean ± SD	20.2 ± 1.5	20.0 ± 1.3	20.2 ± 1.3	0.541[b]
Year of study, n (%)				<0.001[a]
First year	25 (29.1)	41 (33.1)	44 (24.0)	
Second year	32 (37.2)	30 (24.2)	75 (41.0)	
Third year	21 (24.4)	37 (29.8)	38 (20.8)	
Fourth year	2 (2.3)	16 (12.9)	24 (13.1)	
Fifth year	6 (7.0)	-	2 (1.1)	
Sixth year	-	-	-	
Smoking, n (%)				0.011[a]
Non-smokers	84 (97.7)	119 (96.0)	163 (89.1)	
Smokers	2 (2.3)	5 (4.0)	20 (10.9)	
Alcohol, n (%)				0.002[a]
Non-drinkers	36 (41.9)	35 (28.2)	39 (21.3)	
Drinkers	50 (58.1)	89 (71.8)	144 (78.7)	
Medical cannabis status, n (%)				0.091[a]
Never-users	81 (94.2)	123 (99.2)	175 (95.6)	
Previous users	5 (5.8)	1 (0.8)	8 (4.4)	

[a]Chi-square, [b]One way ANOVA

Table 2 Knowledge scores of medical cannabis use

Questions	Mean±SD			F-test	P-value
	Health sciences	Pure sciences and technology	Social sciences and humanities		
Indications (6 items) Question: Do you think MC is indicated for the following conditions?					
1. Chemotherapy-induced nausea and vomiting	0.58 ± 0.50	0.40 ± 0.49	0.34 ± 0.48	7.09	<0.01
2. Enhancing quality of life in patients during end-stage cancer or supportive care	0.60 ± 0.49	0.49 ± 0.50	0.44 ± 0.50	3.31	0.04
3. Depression	0.37 ± 0.49	0.27 ± 0.45	0.16 ± 0.37	7.53	<0.01
4. Dravet syndrome and Lennox–Gastaut syndrome	0.30 ± 0.46	0.19 ± 0.39	0.17 ± 0.38	3.17	0.04
5. Spasticity in patients with multiple sclerosis	0.50 ± 0.50	0.31 ± 0.46	0.26 ± 0.44	8.31	<0.01
6. Migraine	0.17 ± 0.38	0.14 ± 0.35	0.08 ± 0.28	2.65	0.07
Total (knowledge about indications)	**2.53 ± 1.47**	**1.79 ± 1.44**	**1.46 ± 1.49**	**15.74**	**<0.01**

Table 2 Knowledge scores of medical cannabis use (*cont.*)

Questions	Mean±SD			F-test	P-value
	Health sciences	Pure sciences and technology	Social sciences and humanities		
Adverse effects (5 items) Question: Do you think MC can trigger the following symptoms?					
1. Constipation	0.29 ± 0.46	0.23 ± 0.42	0.19 ± 0.39	0.22	0.42
2. Diabetes	0.55 ± 0.50	0.27 ± 0.45	0.21 ± 0.41	17.59	<0.01
3. Dizziness/nausea	0.65 ± 0.48	0.42 ± 0.50	0.45 ± 0.50	6.34	<0.01
4. Dry lips	0.64 ± 0.48	0.49 ± 0.50	0.51 ± 0.50	2.53	0.08
5. Hallucination	0.60 ± 0.49	0.48 ± 0.50	0.55 ± 0.50	1.53	0.22
Total (knowledge about adverse effects)	**2.73 ± 1.44**	**1.90 ± 1.59**	**1.91 ± 1.57**	**9.57**	**<0.01**
Practical guidelines (4 items) Question: Do you think the following statements are correct?					
1. MC can be used as a first-line therapy in all cases	0.72 ± 0.45	0.52 ± 0.50	0.28 ± 0.45	28.36	<0.01
2. MC should not be used by patients with a family history of psychosis without supervision by health professionals	0.63 ± 0.49	0.65 ± 0.48	0.49 ± 0.50	5.04	<0.01
3. MC can be used by pregnant or breastfeeding women without any harm	0.73 ± 0.45	0.56 ± 0.50	0.49 ± 0.50	7.44	<0.01
4. MC users cannot adjust the doses of MC without any suggestions from health professionals	0.92 ± 0.28	0.79 ± 0.41	0.74 ± 0.44	5.69	<0.01
Total (knowledge about practical guidelines)	**3.00 ± 1.13**	**2.52 ± 1.42**	**1.99 ± 1.30**	**18.45**	**<0.01**
Laws (5 items) Question: Do you think the following statements are correct?					
1. Certified health professionals can prescribe MC	0.92 ± 0.28	0.78 ± 0.41	0.77 ± 0.42	4.53	0.01
2. MC can be purchased online if needed	0.78 ± 0.42	0.58 ± 0.50	0.50 ± 0.50	9.99	<0.01
3. Government agencies can legally produce MC	0.56 ± 0.50	0.54 ± 0.50	0.42 ± 0.50	3.21	0.04
4. No more than six cannabis plants can be cultivated per registered Thai household	0.41 ± 0.49	0.40 ± 0.49	0.33 ± 0.47	1.11	0.33
5. Cannabis is classified in the fourth category of narcotics	0.22 ± 0.42	0.12 ± 0.33	0.10 ± 0.31	3.63	0.03
Total (Knowledge about laws)	**2.88 ± 1.05**	**2.44 ± 1.28**	**2.12 ± 1.26**	**11.56**	**<0.01**
Grand total (Overall knowledge of medical cannabis)	**11.15 ± 3.82**	**8.65 ± 4.36**	**7.49 ± 4.07**	**23.24**	**<0.01**

Table 3 Sample attitudes regarding medical cannabis use

Questions	Mean±SD			F-test	P-value
	Health sciences	Pure sciences and technology	Social sciences and humanities		
MC utilization (16 items)					
1. Cannabis should be legalized for medical purposes	3.79 ± 0.86	4.02 ± 0.80	3.97 ± 0.98	1.75	0.18
2. Most people receive benefits from using MC	3.24 ± 0.84	3.65 ± 0.91	3.54 ± 0.98	5.08	0.01
3. MC has more adverse effects than modern medicines	2.86 ± 0.75	2.98 ± 0.83	3.01 ± 0.91	0.88	0.42
4. MC can help patients recover better than modern medicines	2.69 ± 0.76	2.93 ± 0.72	2.99 ± 0.90	4.13	0.02
5. MC exerts faster therapeutic effects than modern medicines	2.88 ± 0.86	2.99 ± 0.76	3.06 ± 0.90	1.23	0.28
6. MC is important for patient treatment	3.37 ± 0.87	3.48 ± 0.82	3.41 ± 0.96	0.44	0.64
7. Current evidence supports the quality, effectiveness, and safety of MC	3.33 ± 0.93	3.45 ± 0.87	3.37 ± 0.94	0.53	0.59
8. Legalized MC would cause addiction or crime rates to increase	3.06 ± 1.08	2.94 ± 1.05	3.10 ± 1.13	0.89	0.41
9. Increasing the number of indications for MC would benefit more patients	3.92 ± 0.87	3.89 ± 0.71	3.92 ± 0.90	0.06	0.94
10. MC can limit the use of modern medicines	3.21 ± 0.88	3.11 ± 0.78	3.00 ± 0.87	1.92	0.15
11. MC use should be more promoted in hospitals	3.36 ± 0.84	3.51 ± 0.88	3.61 ± 0.95	2.23	0.10
12. It is acceptable to prescribe MC for unapproved indications to your family members	2.20 ± 0.93	2.50 ± 1.05	2.83 ± 1.19	10.21	<0.01
13. It is acceptable to prescribe MC with unapproved indications to yourself	2.17 ± 1.05	2.46 ± 1.15	2.73 ± 1.17	7.29	<0.01
14. MC should be used without any legal restrictions	2.56 ± 1.14	2.85 ± 1.37	3.25 ± 1.27	9.50	<0.01
15. It is acceptable to prescribe MC to your family members for approved indications	3.77 ± 0.92	3.72 ± 1.03	3.88 ± 0.96	1.10	0.33
16. It is acceptable to prescribe MC to yourself for approved indications	3.77 ± 0.92	3.77 ± 0.92	3.90 ± 0.90	1.08	0.34
Total (attitudes about MC utilization)	**3.14 ± 0.49**	**3.27 ± 0.46**	**3.35 ± 0.59**	**5.51**	**<0.01**

Table 3 Sample attitudes regarding medical cannabis use (*cont.*)

Questions	Mean±SD			F-test	P-value
	Health sciences	Pure sciences and technology	Social sciences and humanities		
MC production (4 items)					
1. MC can be grown by approved government agencies	3.58 ± 0.89	3.65 ± 0.85	3.73 ± 0.97	0.87	0.42
2. The quality control process of MC production achieves an acceptable standard in Thailand	2.88 ± 0.94	3.17 ± 0.99	3.19 ± 1.01	3.09	0.05
3. There are sufficient MC products for Thai patients requiring them	2.84 ± 0.77	3.19 ± 0.85	3.19 ± 1.00	5.12	0.01
4. The Thai MC production process is unreliable	2.42 ± 1.03	2.66 ± 1.00	2.71 ± 1.09	2.34	0.10
Quality control for MC (4 items)					
1. The quality control process for MC achieves an acceptable standard	2.73 ± 0.91	2.98 ± 0.84	3.00 ± 1.00	2.60	0.08
2. Treatment effectiveness does not differ between MC products that do or do not achieve the quality control standard	3.44 ± 1.07	3.15 ± 0.88	3.21 ± 1.01	2.35	0.10
3. The safety of MC products differs between products that do and do not achieve the quality control standard	3.62 ± 0.96	3.44 ± 0.90	3.59 ± 0.90	1.38	0.25
4. The Thai standard of quality control process cannot guarantee the quality of cannabis plants	2.44 ± 0.95	2.55 ± 0.97	2.75 ± 1.18	2.79	0.06
Total (attitudes about quality control for MC)	**3.06 ± 0.45**	**3.03 ± 0.43**	**3.14 ± 0.55**	**2.00**	**0.14**
Grand total (overall attitudes about MC)	**3.14 ± 0.49**	**3.21 ± 0.38**	**3.29 ± 0.53**	**5.51**	**<0.01**

MC = medical cannabis

Statistical significance is indicated by bold values ($p < 0.05$)

Table 4. Factors associated with knowledge and attitude scores for medical cannabis using multiple linear regressions

Subject characteristics	Sample size (n)	Knowledge scores	Attitude scores
		standardized coefficient	standardized coefficient
Gender (Ref: male)			
Female	128	0.083	−0.250***
Age (years)	393	0.168*	0.106
Area of study (Ref: health sciences)			
Pure sciences and technology	124	−0.207**	0.065
Social sciences and humanities	183	−0.414***	0.166*

Table 4. Factors associated with knowledge and attitude scores for medical cannabis using multiple linear regressions (*cont.*)

Subject characteristics	Sample size (n)	Knowledge scores	Attitude scores
		standardized coefficient	standardized coefficient
Year of study (Ref: first year)			
Second year	137	0.022	−0.178**
Third year	96	-0.157*	−0.152*
Fourth year	42	-0.142	−0.061
Fifth year	8	0.041	−0.095
Tobacco use (Ref: smokers)			
Non-smokers	366	0.076	0.037
Alcohol use (Ref: drinkers)			
Non-drinkers	110	0.072	0.029
Cannabis status (Ref: previous users)			
Never-users	379	−0.041	−0.146**

* p < 0.05, ** p < 0.01, *** p < 0.001

Ref: reference value

Discussion

This is the first study to explore knowledge and attitudes concerning MC and factors affecting knowledge and attitudes among Thai undergraduate students. Knowledge and attitudes concerning MC are particularly relevant to the Thai context because the Thai government instituted a policy legalizing cannabis for medical purposes (Rehm J *et al.*, 2019). However, there are some concerns regarding cannabis use among undergraduate students because MC can trigger addiction and abuse if improper use occurs. Therefore, knowledge and attitudes regarding MC and the associated factors could facilitate the development of policy concerning the use of MC among undergraduate students.

As expected, undergraduate students in health sciences had the highest overall knowledge scores, whereas those in social sciences and humanities had the lowest scores. We reasoned that although the existing curriculum at the university does not have a specific course on MC for all undergraduate students, those in health science disciplines are more likely to perform self-study related to the effects of MC on health and medical conditions. They may therefore have better knowledge about MC than students in other disciplines. Unlike a previous study, there was no notable difference in knowledge about MC between students with and without medical backgrounds (Felnhofer A *et al.*, 2021). Differences in the exact questions between these two studies might explain this discrepancy because the current study's questions mainly assessed the subjects' general knowledge regarding MC whereas Felnhofer *et al.* mainly asked participants about the known effects of bioactive compounds (Felnhofer A *et al.*, 2021). To ascertain this finding, inquiries about the known effects of bioactive compounds are greatly encouraged in future studies.

Conversely, students in health sciences had lower overall attitudes scores than those in the other two fields, especially concerning MC utilization and production. These results are in line with those of previous research reporting

that medical students and physicians were more hesitant recommend MC as medical treatment for individual patients than non-medical students and the general public, and they were more skeptical about its benefits (Felnhofer A *et al.*, 2021; Isralowitz R *et al.*, 2021; Charuvastra A *et al.*, 2005). This reflects a lack of support for MC use in medical practice for patients (Felnhofer A *et al.*, 2021; Zolotov Y *et al.*,2018; Mathern GW *et al.*, 2015). Consequently, this emphasizes the need to include ample formal MC training in academic curricula and field practice to reduce the discrepancy concerning attitudes about MC between the general public and medical professionals (Felnhofer A *et al.*, 2021; Isralowitz R *et al.*, 2021; Abazia DT and Bridgeman MB, 2018).

This study also uncovered a negative correlation between knowledge and attitudes regarding MC. These findings contrasted those of a previous Thai study ($r = 0.388$, $p < 0.001$) (Ongarj P *et al.*, 2021). A wide range of subjects was accounted for discrepancy because the previous study recruited both undergraduate students and general public as their study samples (Ongarj P *et al.*, 2021), and we reasoned that samples from general public might have more knowledgeable, firsthand experience of cannabis users, having friends with previous cannabis users, which may positively affect both knowledge and attitudes towards MC than those of undergraduate students. Similar to the previous study conducted with general population (Gazibara T *et al.,* 2017), it revealed that samples with firsthand experience of cannabis and having friends with previous cannabis users positively affected both knowledge and attitude scores. This finding should therefore be reinvestigated in the general Thai population.

Hypothesized associations were confirmed for knowledge scores because older subjects, and those in health sciences had higher knowledge scores than their counterparts. This finding was consistent with that of a previous study (Jain R *et al.*, 2018; Jintapaputhanasiri N and Junsom N, 2020; Gazibara T *et al.,*2017). However, a dissimilar pattern of association among the year of study category was found because the third-year students had lower knowledge scores, while the fourth-year students had higher knowledge scores than the first-year student. Possible explanation is that the sample size of each subgroup was not equal yielding significant difference across year of study category, resulting in dissimilar pattern of association with knowledge scores. Therefore, the comparison of knowledge scores should be further investigated for this category in a larger population.

Concerning factors affecting attitudes about MC, lower attitude scores were observed among female, second- and third-year students, those in health sciences, and of non-cannabis users than their counterparts. Consistently, a previous study from Serbia and Slovakia reported that previous cannabis users were more likely to have positive attitudes about MC, implying that firsthand experience can influence attitudes about MC (Gazibara T *et al.,*2017; Kolena B *et al.,*2016). This study's results were also similar to the findings of Felnhofer et al. who found that among Austrian university students, female students, and those in health sciences were more likely to have negative attitudes about MC (Felnhofer A *et al.*, 2021). A possible explanation for this finding is that female students and those in health sciences have more concerns about MC and greater uncertainty about its ability to cause physical addiction among users and its negative effects than their counterparts, resulting in negative attitudes about MC (Felnhofer A *et al.*, 2021). Unlike the knowledge scores, gender was the contributing factor for attitude scores from the multiple regression analyses, and it was the baseline characteristics that differed across three study fields. Therefore, the attitude scores towards MC would have been different if we recruited the samples with similar distribution of gender characteristics across three study fields and this should be further investigated for both knowledge and attitudes towards MC in future study.

In addition, our study had dissimilar percentage of some baseline characteristics distribution among users and non-users for smoking and alcohol consumptions, and these

might have affected the knowledge and attitude towards in the regression analyses. The previous study found that there was significant association with cannabis use among smokers and drinkers among student university in Hong-Kong (Abdullah AS *et al.*,2002).

This study had some limitations. First, participants were not asked about the source of knowledge related to MC because such knowledge can be acquired through university classes or direct experience. The source of knowledge related to MC should be therefore investigated in future research to determine whether it is reliable and whether it influences attitudes about MC. Second, this study was conducted among undergraduate students (age, 18–27 years) reporting limited demographic information. In addition, it was conducted only one setting (Burapha University, Bangsean Campus) which may affect the results of the study in that samples from different settings may have different levels of knowledge and attitude towards MC. Future research should be conducted in a diverse population such as the general Thai population. Third, this study did not investigate the subjects' intentions to use MC because their attitudes might shape their behavior based on the theory of planned behavior (Felnhofer A *et al.*, 2021; Ajzen I ,1991), and thus, the intention to use MC should be further investigated in future research. Fourth, this study employed an Internet survey to collect data because of the COVID-19 outbreak during the period of data collection. This may have affected the validity of the collected data, especially regarding knowledge, because the participants may have searched the information using the Internet and other sources to respond to the questions. Therefore, face-to-face interviews should be used to collect data in future research. Fifth, the number of subjects was selected in proportions to the number of university students from each faculty. This is considered a non-probability sampling method and may lead to sampling bias that might have affected the results.

Conclusion

Our preliminary results suggest that undergraduate students have poor knowledge about the indications and adverse effects of MC. As expected, students in health science disciplines had better knowledge than those in the other two investigated disciplines. Ample formal MC training should be incorporated into study curricula and field practice to enhance knowledge about MC among undergraduate students. Regarding their overall attitudes, the subjects had positive attitudes related to the benefits and legalization of MC, implying there is growing support for cannabis legalization and usage in medical practice, which could enable the social and political acceptance of MC in Thailand. Nevertheless, the participants were skeptical about the quality control and production of MC in Thailand. Similar to previous findings, students with medical backgrounds had worse attitudes about MC than those in the other two fields (Felnhofer A *et al.*, 2021). However, these findings should be reinvestigated in a more diverse population such as the general Thai population in future research.

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