



Research article

Attitude, knowledge, and barriers of Chinese clinical and nursing students in implementing complementary and alternative medicine for COVID-19 : a cross-sectional study

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ABSTRACT

Background: Complementary and alternative medicine (CAM) has emerged to combat the global COVID-19 pandemic. However, no studies have been conducted to evaluate the attitudes, knowledge, and barriers of Chinese clinical and nursing students in implementing CAM during this period.

Objective: The aim of this study was to investigate the attitude, knowledge, and barriers of Chinese clinical and nursing students in using CAM in the context of COVID-19.

Methods: An online-based cross-sectional survey was carried out among Chinese medical students, majoring in clinical medicine or nursing, in Nanjing, Jiangsu Province, and Zhengzhou, Henan Province from May to July 2022. A total of 402 clinical and 644 nursing students responded to a self-administered questionnaire through the Questionnaire Star and WeChat APPs. SPSS 25 (version 25) was used for data analysis. Proportions were compared by Chi-square test. Level of significance between groups was analyzed using independent student t-test and Mann-Whitney *U* test.

Results: The average score of attitude was 46.63 (SD: 7.38) in clinical students and 49.84 (SD: 6.76) in nursing students. The top four most commonly used CAM treatments in China were proprietary Chinese medicine, diet therapy, decoction, and acupuncture and moxibustion (59.66 %, 22.28 %, 11.66 %, 9.85 %). The students had a good mastery of knowledge about CAM-based prevention and control of COVID-19 (mean score 7.36). The score of CAM knowledge in nursing students was significantly higher than that in clinical students (7.56 VS 7.04, $P = 0.000$). Gender, grade, previous use, age, and knowledge score could affect students' attitude towards CAM. The main barriers in spreading CAM use included time-consumption, bad taste, and fear of treatment-related pain (24.5 %). Compared with clinical students, nursing students were more likely to recommend CAM to patients in the future ($P = 0.002$).

Conclusions: During the COVID-19 pandemic, nursing students were more positive towards CAM use, had a better mastery of CAM knowledge than clinical students. CAM is expected to provide

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better outcomes in COVID-19 patients. Future studies should focus on the changes in students' attitudes over time and exploration of influencing factors on CAM use.

1. Background

Complementary and alternative medicine (CAM), a non-mainstream treatment, is complementary or alternative to conventional medicine. CAM involves acupuncture, herbal medicine, and massage, yoga, relaxation therapy, and homeopathy, and has been used in the treatment of chronic diseases such as anxiety disorders, cardiovascular and cerebrovascular diseases, and cancer [1–4].

Between November 2017 and June 2018, up to 50.8 % of cancer patients at the Lucien Neuwirth Cancer Institute (France) received CAM consultation, with a satisfaction rate of 61–81 % [5]. In Canada, 52 % of cancer patients in various stages used CAM after diagnosis [6]. In a national survey in Germany, 85 % of general practitioners were reported to use at least one CAM modality weekly, represented by herbal remedies (77 %) and vitamins (41 %) [7].

The COVID-19 pandemic brings a huge burden on the healthcare system of China. CAM has been adopted to combat the COVID-19 epidemic. It has been reported that Chinese Herbal Medicine (CHM) can relieve symptoms, reduce fatigue, prevent aggravation, and facilitate recovery of pulmonary and vascular functions in patients with COVID-19 [8,9]. For example, Qingfei Paidu Decoction combined with western medicine can reduce the aggravation rate by 71 %, increase the effective rate by 13 %, and shorten the time of virus shedding by 4.78 days [10].

The World Health Organization has recommended the integration of Complementary and Alternative Medicine (CAM) with modern medicine, as part of the global “health for all” approach [11]. Currently, few scholars have conducted research on attitudes towards CAM and COVID-19 knowledge, especially among medical and nursing students who determine the prospect of CAM. Therefore, it is necessary to investigate their attitudes towards CAM and obstacles in using CAM.

1.1. Study population and procedure

A cross-sectional survey study was conducted via online platforms from May to July 2022. For epidemiological investigations, an online survey features high confidentiality, anonymity and response rate, as well as honest responses. In this study, participants were selected by convenience sampling, a non-probability sampling technique to determine a target population according to certain practical criteria, such as availability at a given time, willingness to participate in, accessibility, and geographical proximity to the researchers. Having provided informed consent and familiarized themselves with the Helsinki Declaration of 1975, the participants were surveyed at two online Apps (WeChat and Questionnaire Star applications). The basic information, such as age and academic years, were obtained from the administrative departments of universities. The subjects consisted of clinical and nursing students of the first, second, third, fourth and fifth years of four medical universities in Jiangsu and Henan Provinces in China. The questionnaires were first sent to junior (First- and Second-Year), and then to senior (Third-, Fourth- and Fifth-Year) students. Each student had 15 min to complete the questionnaire, and afterwards received a monetary reward of 10 RMB.

Selection of participants is shown in Fig. 1.

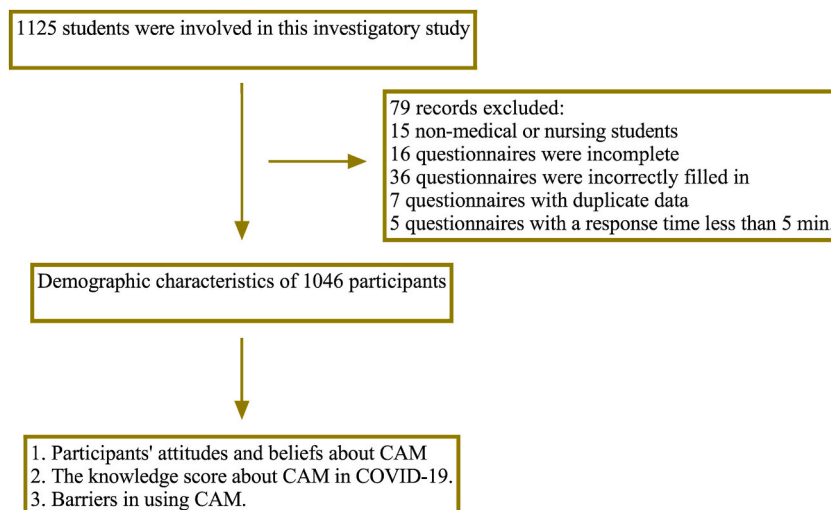


Fig. 1. Study flow diagram.

1.2. Inclusion and exclusion criteria

The students were selected according to the following inclusion criteria: (1) undergraduate students with an age of more than or equal to 18 years; (2) majoring in clinical medicine or nursing; (3) having an electronic device such as a computer or a mobile phone that can receive electronic questionnaires; (4) showing a healthy physical and mental condition and willingness to participate in the investigation. Excluded were those students who were mentally or physically unfit or unwilling to participate in.

1.3. Study instruments and their validity and reliability

The socio-demographic information questionnaire, the CAM Health Belief Questionnaire, and the questionnaire of CAM fighting COVID-19 in China were used to collect data.

1.4. Socio-demographic information questionnaire

Age, gender, major, grade, degree of education, and experience in using CAM were all included in the demographic information questionnaire. Questions like “What do you think are the barriers in using or recommending CAM therapy? (a. Time-consumption, bad taste and fear of CAM-related pain; b. Lack of trusted specialists of CAM. c. Lack of efficacy; d. Negative reports on CAM; e. Lack of scientific evidence; f. Lack of CAM knowledge; g. Others)” were asked in this section.

1.5. Questionnaire of CAM fighting COVID-19 in China

A 10-item measure (CHBQ-CAM Health Belief Questionnaire) constructed by Désirée Lie and John Boker and two other questions (about whether the COVID-19 pandemic has affected their perception and trust in CAM) were used to evaluate students' attitude towards CAM [12,13]. The items were framed in the seven-point, Likert-type rating scale format, where 1 = “Absolutely Disagree” and 7 = “Absolutely Agree”, with a total score of 70. A score of 35 indicated a neutral attitude, a score higher than 35 indicated a positive attitude, and a score lower than 35 indicated a negative attitude.

1.6. The CAM treating COVID-19 questionnaire

Our self-designed questionnaire consisted of 10 items related to CAM knowledge. We invited traditional Chinese medicine experts and public health experts to conduct expert consultation. The knowledge questionnaire was mainly composed of questions about indications for CAM therapies. Each question was given three response options: true, false, and I don't know, in which “true” was assigned with one 1 point, and the latter two answers with 0 point. The total score ranged from 0 to 10 points, and a higher score indicated a more positive attitude. After modification, the final questionnaire was formed, and a pre-survey was conducted among 70

Table 1
Characteristics of the study population.

Variable		Medical students(N = 402) (%)	Nursing students(N = 644) (%)	χ^2	p-value
Gender	Males	190(47.26)	43(6.44)	235.48	0.000 ^a
	Females	212(52.74)	601(93.32)		
Grade	Junior	212(52.74)	362(56.21)	1.21	0.27
	Senior	190(47.26)	282(43.79)		
Age (years)	18–21	303(75.37)	479(74.38)	0.13	0.72
	22–25	99(24.63)	165(25.62)		
Place of residency	Rural	221(54.97)	330(51.24)	1.38	0.24
	Urban	181(45.03)	314(48.76)		
Parents' level of education	< High school	222(55.22)	469(72.83)	34.2	0.000 ^a
	≥High school	180(44.78)	175(27.17)		
Source of information	Media or internet	128(31.84)	228(34.58)	5.27	0.15
	Teachers	86(21.39)	152(23.60)		
	Newspapers or magazines	115(28.61)	179(27.79)		
	Others	73(18.16)	86(13.35)		
Previous use	Yes	261(64.93)	557(86.49)	67.53	0.000 ^a
	No	141(35.07)	87(13.51)		
Types of CAM ever used	Decoction	31(7.71)	91(14.13)		
	Acupuncture and Moxibustion	37(9.20)	66(9.47)		
	Diet therapy	62(15.42)	171(26.55)		
	Proprietary Chinese medicine	197(49.00)	427(66.30)		
	Tai Chi	25(6.22)	71(11.02)		
	Spirituality/Prayer	7(1.74)	25(2.85)		
	Homeopathy	1 (0.25)	2 (0.15)		
	Others	1(0.25)	1(0.15)		
Would you recommend using it?	Yes	275 (68.4 %)	496 (77.0 %)		0.002
	No	127 (31.6 %)	148 (23.0 %)		

^a P-value <0.05 was considered statistically significant. P value computed using chi-square test.

students. The Cronbach's coefficient of the questionnaire was 0.786.

1.7. Statistical methods

In this study, 1125 questionnaires were collected. After deleting the invalid questionnaires, such as those with consistent responses, multiple missing answers, and completing the questionnaire in less than 5 min, a total of 1046 valid questionnaires were obtained, with an effective rate of 92.98 % (1046/1125). All information was incorporated into a Microsoft Excel spreadsheet. For data analysis, SPSS version 25.0 was employed. The means \pm standard deviation or median (range) was used to convey quantitative data. Categorical data were expressed as frequency distributions. Chi-Square test was used to compare frequencies. Student t-test was used for group comparison of normally distributed variables, and Mann-Whitney *U* test for group comparison for continuous non-normally distributed variables [14]. General linear model univariate analysis was employed for comparison between attitudinal score and each independent normal demographic variable. Correlation was calculated using Spearman correlation analysis [15]. Statistical tests were two-sided with significance set at a *P* value less than 0.05.

2. Results

2.1. Characteristics of participants

Table 1 shows the general characteristics of the 1046 students included. Gender, education level, experience in using CAM, and frequency in browsing CAM News showed significant differences between clinical and nursing students. The proportion of females was higher than that of males among clinical and nursing students (*P* = 0.000). The educational level of clinical students' parents was higher than that of nursing students' parents (*P* = 0.000). The frequency of CAM use by nursing students was significantly higher than that by clinical students (*P* = 0.000). The media and internet were the major sources of information on CAM for clinical and nursing students (31.84 %, 34.58 %). Over three-quarters (78.20 %) reported that they had ever used at least one CAM modality. Proprietary Chinese medicine was the most used, followed by diet therapy, decoction, and acupuncture and moxibustion (59.66 %, 22.28 %, 11.66 %, 9.85 %). Compared with clinical students, nursing students were more likely to recommend CAM to their patients in the future (*P* = 0.002).

3. Participants' attitudes towards CAM use

Table 2 describes the average score of participants' attitudes towards CAM use during the COVID-19 pandemic. In all participants, "COVID-19 has made me more aware of CAM" and "I trust CAM more than before and will use it to prevent and treat diseases" both scored above 5, indicating that the students' attitudes became more positive after the outbreak of COVID-19. Compared to clinical students, nursing students were more confident in CAM (mean score 5.79, 5.18). Clinical and nursing students all agreed that patients' expectations and beliefs should be considered in CAM treatment (Mean score 5.60, 5.74). Nursing students were strongly objected to the statement that "Complementary therapies are a threat to public health and the effects of complementary therapies are usually the

Table 2
Attitudes and beliefs of clinical and nursing students towards CAM.

Items	Mean (SD)		<i>P</i> -value
	Medical students (N = 402)	Nursing students (N = 644)	
1. The COVID-19 epidemic has made me more aware of CAM.	5.29(1.23)	5.71(1.34)	0.000 ^a
2. After the outbreak of COVID-19, I trust CAM more than ever and will use it to prevent and treat diseases.	5.18(1.31)	5.79(1.54)	0.000 ^a
3. The physical and mental health are maintained by an underlying energy or vital force.	3.81(1.79)	4.97(1.45)	0.000 ^a
4. Health and disease are a reflection of balance between positive life-enhancing forces and negative destructive forces.	4.16(1.67)	5.15(1.35)	0.000 ^a
5. The body is essentially self-healing and the task of a health care provider is to assist in the healing process.	3.97(1.80)	4.37(1.59)	0.000 ^a
6. A patient's symptoms should be regarded as a manifestation of a general imbalance or dysfunction affecting the whole body.	5.29(1.32)	5.27(1.14)	0.515
7. A patient's expectation, health beliefs and values should be integrated into the patient care process.	5.60(1.29)	5.74(1.07)	0.244
8. Complementary therapies are a threat to public health. ^b	5.53(1.30)	5.77(1.35)	0.000 ^a
9. Treatments not tested in a scientifically recognized manner should be discouraged. ^b	3.91(1.69)	3.85(1.75)	0.480
10. Effects of complementary therapies are usually the result of a placebo effect. ^b	4.79(1.41)	5.32(1.36)	0.000 ^a
11. Complementary therapies include ideas and methods from which conventional medicine could benefit.	4.95(1.20)	5.18(1.11)	0.001 ^a
12. Most complementary therapies stimulate the body's natural therapeutic powers.	4.49(1.41)	4.73 (1.36)	0.003 ^a

CHBQ (CAM Health Belief Questionnaire) items from 3 to 12.

^a *P*-value <0.05 was considered statistically significant.

^b Item response is scored in reverse, so a higher value indicates a stronger recognition.

result of a placebo effect.” ($P = 0.000$). Nursing students were much more likely to believe that “CAM is an idea or method that can benefit people” ($P = 0.001$). Nursing students were more likely than clinical students to believe that “physical and mental health is sustained by latent energy” ($P = 0.000$) and “CAM can activate some latent energy to cure diseases” ($P = 0.003$).

Table 3 shows that CHBQ scores differ with demographic characteristics. A score of more than 35 points indicated that students had a positive attitude. The students’ mean CHBQ score was 48.6 (SD: 7.38), 46.63 (SD: 7.66) in clinical students and 49.84 (SD: 6.76) in nursing students. Nursing students’ attitude towards CAM was more positive than that of clinical students ($P = 0.000$), and junior students had a more positive attitude than senior students ($P = 0.005$). Students who had ever used CAM were more likely to believe in CAM ($P = 0.001$). Gender and age could affect students’ attitude towards CAM. Details are shown in Table 3.

4. Knowledge score

In the survey, questions about CAM in the prevention and control of COVID-19 were listed to objectively assess students’ knowledge (Table 4). Most of the students (89.39 %) knew that “Tai chi, acupuncture and moxibustion, Baduanjin, and Meridian stimulation can be used in the rehabilitation of COVID-19”. In addition, 86.62 % knew that Chinese decoction can alleviate symptoms of fever, cough, and sore throat for COVID-19 patients; 64.15 % did not know what doctors chose to prevent COVID-19 at the beginning of the outbreak; and 56.40 % did not know the effects of the integrated traditional Chinese and Western medicine in Jiangxia FangCang Hospital.

As shown in Table 5, we found that participants had a good mastery of CAM knowledge in the prevention and control of COVID-19 (mean score 7.36). Nursing students were more aware of CAM in the prevention and control of COVID-19 than clinical students (7.56 vs 7.04). The knowledge score of females was significantly higher than that of males (7.47 vs 7.02). There were significant differences in mean knowledge scores between major, gender, grade, and age groups (Table 5). CAM knowledge score was significantly and positively associated with the attitude score (Supplementary Table S1). A higher knowledge score indicated a more positive attitude towards CAM (Spearman correlation coefficient of 0.62, $P = 0.000$).

5. Barriers in using CAM

Participants’ inclination to utilize CAM was found to be influenced by time-consumption, bad taste, and fear of CAM-related pain (24.5 %). A notable proportion of the participants (18.4 %) expressed their unwillingness to use CAM due to the absence of trusted specialists. Additionally, a significant number of participants associated their reluctance with lack of efficacy (15.9 %) and negative reports on CAM (15.1 %). Lacks of CAM knowledge and scientific evidence were not regarded as primary barriers to the spread of CAM therapies (Fig. 2).

- a. Time-consumption, bad taste and fear of CAM-related pain; b. Lack of trusted specialists of CAM.
c. Lack of efficacy; d. Negative reports on CAM; e. Lack of scientific evidence; f. Lack of CAM knowledge; g. Others.

6. Discussion

It has been proven in China that that the combination of CAM (especially TCM) and standard management may play a vital role in treating patients with COVID-19 [16,17]. For example, Qingfei Paidu Decoction has been absorbed into the Chinese clinical guidelines for COVID-19 pneumonia treatment and has shown evident clinical effectiveness [18]. The public attitudes towards CAM may have changed. Here, we provided a panoramic view about the attitudes of Chinese clinical and nursing students towards the use of CAM for COVID-19.

According to our survey results, the students’ knowledge about CAM was mainly acquired from media and internet. Joel Yarney

Table 3
Association between students’ demographic characteristics and attitudes towards CAM.

Variable		CHBQ (Mean SD)	P-value
Major	Medical students	46.63(7.66)	0.000 ^a
	Nursing students	49.84(6.76)	
Gender	Males	45.19(8.16)	0.000 ^a
	Females	49.59(6.48)	
Grade	Junior	49.35(7.31)	0.005 ^a
	Senior	47.72(6.79)	
Age (years)	18–21	49.25(6.72)	0.001 ^a
	22–25	46.71(7.89)	
Place of residency	Rural	48.38(7.65)	0.532
	Urban	48.86(6.49)	
Parents’ level of education	< High school	48.61(6.78)	0.167
	≥ High school	48.59(7.72)	
Previous use	Yes	49.07(7.04)	0.001 ^a
	No	46.93(7.19)	

^a P-value <0.05 was considered statistically significant. CHBQ, CAM Health Belief Questionnaire.

Table 4
Scores of CAM knowledge about COVID-19.

Correct response Statement	Frequency	Percentage
	(N = 1046)	(%)
1. So far, the use rate of TCM in treating COVID-19 has reached 95 percent in Hubei province of China. (T)	753(71.99)	
2. In the treatment of mild cases of COVID-19 with TCM, the conversion rate of severe cases is zero in Jiangxia FangCang Hospital in Wuhan. (T)	590(56.40)	
3. Chinese decoction can alleviate symptoms of fever, cough, and sore throat for COVID-19 patients. (T)	906(86.62)	
4. TCM can balance immune response and improve hematopoiesis and coagulation systems. (T)	803(76.77)	
5. Once there is evidence, Chinese medicine can be used with confidence. Especially for some early and middle stage patients. (T)	717(68.54)	
6. Qingfei Detoxification Decoction is an effective prescription to treat COVID-19 and was recommended by government. (T)	764(73.04)	
7. Lianhua Qingwen capsules can be used for critical COVID-19. (F)	704(67.30)	
8. Tai chi, Acupuncture and Moxibustion, Baduanjin, and Meridian stimulation can accelerate the recovery of COVID-19 patients. (T)	935(89.39)	
9. At the start of COVID-19, a large number of people use Banlangen and Amur honeysuckle to prevent COVID-19. (T)	671(64.15)	
10. The World Health Organization (WHO) fully affirmed the contribution of TCM in fighting the epidemic situation of COVID-19. (T)	844(80.69)	

T stands for true; F stands for false; TCM, Traditional Chinese Medicine.

Table 5
The comparison of knowledge scores in different groups.

Variable	CAM knowledge score (Mean SD)	p-value
Major	Medical students	7.04(1.95)
	Nursing students	7.56(1.56)
Gender	Males	7.02(1.83)
	Females	7.47(1.69)
Grade	Junior	7.55(1.66)
	Senior	7.14(1.79)
Age (years)	18–21	7.44(1.70)
	22–25	7.13(1.83)
Place of residency	Rural	7.34(1.75)
	Urban	7.38(1.73)
Parents' level of education	< High school	7.40(1.73)
	≥ High school	7.30(1.76)
Previous use	Yes	7.39(1.69)
	No	7.28(1.88)

^a P-value <0.05 was considered statistically significant. CAM-Complementary and Alternative medicine.

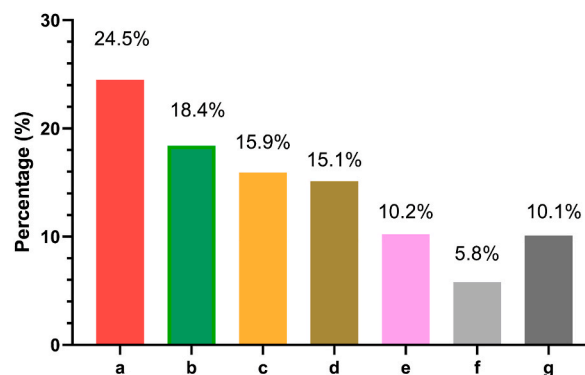


Fig. 2. Barriers in using CAM.

et al. have also found that people often acquire CAM knowledge from the internet and people around them [19]. This can be easily explained by the rapid development of social media [20]. Over three-quarters of the respondents (78.20 %) reported that they had used at least one CAM modality, a proportion that is significantly higher than those in previous study conducted among Hong Kong students majoring in medicine (32.6 %) [21] and a study by Lie et al. in USA medical students (74 %) [22]. First, this may be explained by a higher proportion of women in our study (our study, 77.72 %; Hong Kong, 52 %; USA, 48 %). More frequently, women use CAM to treat minor ailments such as anemia and dysmenorrhea [23,24]. Secondly, over thousands of years, Chinese people have established a habit of relying on TCM to treat various diseases, such as cough, plague and cancer. Third, the Chinese government is vigorously promoting the integration of TCM with Western medicine, and TCM has become a compulsory course for medical students, thus enhancing the

positive attitudes of Chinese medical students towards CAM.

We found that the most widely used CAM was Chinese patent medicine, followed by diet therapy, acupuncture and moxibustion. Because modern pharmaceutical technology has enabled the mass-production of Chinese patent medicine that is simple, convenient, powerful and effective, almost all comprehensive hospitals have a department of TCM diagnosis and treatment. Students can easily obtain and utilize traditional Chinese patent medicine for both minor physical and psychological health issues. Homeopathy was rarely mentioned by the students, which we think may be due to that they had never heard of these therapies in China.

Recent surveys have shown evidence differences in attitudes towards CAM among populations in European, Asian and African countries. In our survey, the students' mean CHBQ score was 48.63, higher than those in other countries, suggesting that Chinese people have a more positive attitude towards CAM [25,26,27]. This may be explained by the fact that our survey was conducted during the COVID-19 outbreak, during which TCM was officially recommended by government and a lot of cases were effectively treated by CAM.

During this period, the news media were the most efficient approach for the public to get information about CAM fighting against COVID-19, which increased their trust in CAM.

The total average score of the CHBQ was 46.63 (SD: 7.66) in clinical students, and 49.86 (SD: 6.76) in nursing students, indicating that nursing students had a more positive attitude towards CAM than clinical students ($P = 0.000$). This is consistent with the survey conducted by Bruce F. Walker et al. in Australia [25], but contrary to the survey conducted by Peter Bai James et al. in Sierra Leone [28]. This phenomenon may be attributed to the following reasons. As mentioned earlier in this study, nursing students used CAM more frequently than clinical students, and had a better mastery of CAM knowledge in COVID-19 than clinical students (knowledge mean score 7.56 VS 7.04, $P = 0.000$). The nursing students had a high proportion of females, and the clinical students had a high proportion of males. Female students also pay more attention to psychological status, thus turning them more keen on meditation, music therapy, massage, nutrition therapy, yoga than males during the COVID-19 pandemic [29].

This phenomenon deserves attention that the attitude of medical students was weaker than that of nursing students, and the attitude of senior students was weaker than that of junior students. Studies have shown that communication about CAM use between these clinicians and patients is not thorough enough [30,31]. Patients withhold information about their CAM usage for fear of disapproval [32]. We think that the different attitudes towards CAM among physicians, nurses, and patients may contribute to this phenomenon. Hence, it is recommended that medical education institutions incorporate CAM knowledge into their curriculum at an early stage, utilize effective teaching strategies, and foster the initiative of medical students in CAM practices, which can facilitate the communication with patients and help patients relieve their pain.

The barriers in spreading CAM included time-consumption, bad taste and fear of CAM-related pain (24.5 %), followed by lack of trusted CAM experts (18.4 %). This is obviously different from the results of studies conducted in other countries before the COVID-19 pandemic, most of which suggest that the lack of scientific evidence is a leading barrier [25]. The efficacy of some CAM therapies can be verified by scientific evidence. For example, TCM has its own mechanistic system that has been clinically verified for thousands of years, and there is no need to use western evidence-based standards to judge it. The long history of TCM use favors the positive attitude of Chinese people towards TCM. We believe that CAM needs to be improved in convenience, taste, experience and efficacy in the future, and more experts should be trained to promote the vigorous application of CAM.

COVID-19 vaccination has emerged as a global response to the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) pandemic [33,34]. As a result, the World Health Organization is dedicated to urging countries worldwide to boost COVID-19 vaccine coverage [35]. However, there are still many barriers to vaccination, represented by the side effects of vaccines and potential fear of needles. Secondly, the news media propaganda increased the people's concerns and fears, which have hindered the vaccination rate [36]. CAM use is closely related to vaccination. Previous studies in Latin America and the Caribbean region have shown that the users of CAM have a lower intention to receive vaccines [37]. CAM users hold the belief that alternative therapies aimed at enhancing immunity can serve as a preventive measure against COVID-19 in lieu of vaccination. Nonetheless, there lacks robust evidence to substantiate the efficacy of CAM in averting COVID-19 infection. During the COVID-19 pandemic, Chinese individuals have exhibited a more favorable disposition towards CAM, resulting in a higher prevalence of CAM utilization within the population. Despite this trend, China has achieved a notably high vaccination rate [38]. Therefore, vaccination coverage varies according to the population using CAM. This may be related to the fact that Chinese CAM practitioners always put CAM on the same important position as modern medicine (including vaccination). Different complementary therapies showed varied associations with vaccination behavior. The relationship between CAM use and vaccination is complex, and the extent to which CAM can affect people's willingness to be vaccinated is still an important issue to explore.

COVID-19 can affect patients' mental health, increasing their depression and anxiety [39,40]. These disorders can be relieved by CAM [41]. Given the positive outcomes of CAM in managing anxiety and depression in clinical settings as evidenced by previous studies [42–44]. We speculated that the COVID-19 pandemic would lead to a short-term surge in the use of CAM therapy among patients with psychological disorders. Nevertheless, there is a lack of robust clinical evidence to definitively establish the efficacy of CAM only effective for patients with mild psychological disorders. Additionally, it remains unclear whether CAM usage may reduce patients' reliance on conventional anti-anxiety and depression medications. Consequently, further investigation is warranted to examine the preference for CAM among individuals with diverse mental diseases following public health crises, as well as to assess any potential correlation between the utilization of alternative therapies and the use of traditional anti-anxiety and depression medications.

7. Strengths and limitations

This is the first study to assess the attitudes of Chinese clinical and nursing students towards CAM during the COVID-19 pandemic. However, this study suffered from some limitations. First, the convenience sampling technique might have involved a large population of students who are more interested in CAM and more willing to participate in the study. Second, self-reported data about CAM use could not be rule out recall bias. Although the overall efficiency rate was 92.98 %, many students did not have a substantial understanding of the therapeutic mechanisms of CAM. Third, the population was selected from certain groups, so the results might be skewed by medical expertise. Fourth, participants were only from two cities of central and east China. Fifth, this study was cross-sectional, and did not allow to assess the changes in students' knowledge and attitude over time. Future research should be based on a larger sample size to longitudinally track the changes in students' attitudes over time and explore specific influencing factors.

8. Conclusions

In this survey, compared with medical students, nursing students had a more positive attitude. The media and internet were the main source of CAM information. Gender, grade, previous use, age, and knowledge score could affect students' attitude towards CAM. The main barriers that prevent the spread of CAM included time-consumption, bad taste and fear of CAM-related pain. Future prospective studies are needed to clarify a causal relationship and the impact of COVID-19 on students' attitude or knowledge.

Consent for publication

Consent for publication was granted by all authors.

Ethics approval and consent to participate

The Henan University of Chinese Medicine's Institutional Review Board reviewed this study and approved it as exempt. Implied consent was obtained from all participants at the time of questionnaire submission.

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Data availability statement

All data generated in this study are available from the corresponding author upon reasonable request.

CRediT authorship contribution statement

Hui Xie: Writing – original draft, Visualization, Software, Resources, Investigation, Data curation. **Yaqu Zhou:** Software, Resources, Methodology, Investigation. **Muhan Li:** Resources, Investigation, Formal analysis, Data curation. **Zhaoqi Chen:** Supervision, Resources, Data curation. **Yuling Zheng:** Writing – review & editing, Funding acquisition, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.heliyon.2024.e30915>.

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