ORIGINAL ARTICLE

Factors influencing the consumption of Jiaogulan herbal tea in Phayao Province, Northern Thailand

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ABSTRACT

Tea is a popular beverage that has experienced increased consumption due to its health benefits and cultural significance. This study aimed to examine Jiaogulan herbal tea consumption and its association with information sources in Phayao Province, Northern Thailand. The study also employed the Theory of Planned Behavior (TPB) as a framework to investigate Jiaogulan consumption behaviors. We conducted a cross-sectional study in Phayao Province that included 404 individuals aged 20 and above. The sample was selected using convenience sampling, and data were collected through a self-administered questionnaire. Approximately 25.7% of participants consumed Jiaogulan herbal tea in the three months prior to the study, and 32% had received information about its health benefits. Adjusted binary logistic regression analysis indicated a significant association between Jiaogulan tea consumption and receiving information from family members (AOR = 3.85, 95% CI = 1.58–9.42) and the internet (AOR = 3.44, 95% CI = 1.83-6.46). Among Jiaogulan herbal tea consumers, Spearman's rank correlation test showed a significant correlation between attitude and subjective norms (r_s = 0.377, p<0.001), and between subjective norms and Jiaogulan consumption behavior (r_s = 0.220, p=0.025). The results indicate that the TPB framework effectively predicts factors influencing the consumption of Jiaogulan herbal tea products. To promote tea consumption, efforts should be made to prioritize improving community knowledge and the public's understanding of herbal tea's health benefits.

Key words:

INTRODUCTION

Tea is a highly popular beverage worldwide, and its leaf extracts are commonly promoted and used as dietary supplements. The health benefits of drinking tea have attracted significant scholarly interest.[1,2] In 2022, global tea consumption was approximately 6.7 billion kg, and this figure is projected to increase to 7.4 billion kilograms by 2025.[3] Most herbal tea brewing employs medicinal plants that are consumed as ingredients daily.[4] The global tea consumption has increased recently, mainly due to tea's health benefits.[2] Herbal tea consists of various components produced from natural products. These comprise a diverse range of herbs, all of which have numerous health benefits for humans.[5] Materials from plants used in herbal tea can include roots, stems, leaves, fruits, flowers, seeds, bark, or whole herbal plants, fresh or dried.[1]

Gynostemma pentaphyllum (Thunb.) Makino, commonly known as "Jiao-Gu-Lan" in Chinese, is a plant species classified within the Cucurbitaceae family. It is grown extensively across northeast and southeast Asia, including countries such as India, Japan, China, Korea, Thailand, Malaysia, and the Philippines.[6] In accordance with traditional Chinese medicine principles, *G. pentaphyllum* is characterized by a mildly bitter taste and possesses neutral and warm properties.[7] The earliest documentation of Jiaogulan as a medicinal herb dates back to 1578, when the renowned Chinese herbalist, Li Shi-Zhen, featured it in his Compendium of Materia Medica. The entry on Jiaogulan is accompanied by a detailed illustration and a description of its therapeutic applications for maladies such as hematuria, edema, pharyngeal pain, cervical heat, neck edema, tumors, and trauma.[8] *G. pentaphyllum* is used widely in Taiwanese traditional medicine as a popular remedy for ailments such as hepatitis, hypertension, and cancer.[9]
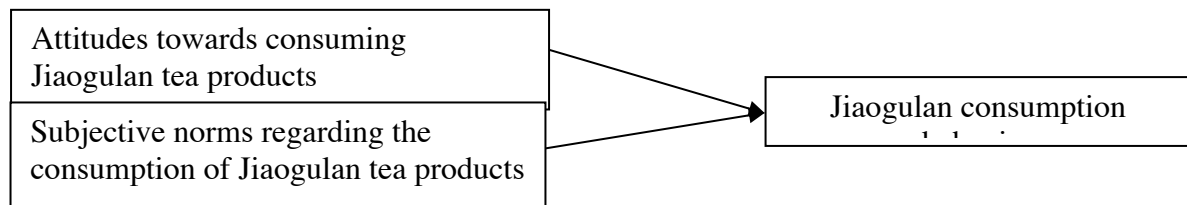
Gynostemma pentaphyllum comprises over 20 chemical constituents, including gynostemma saponins, and dammarane saponins, along with quercetin, sitostero[10–13], flavonoids[14], and polysaccharides.[15] Current pharmacological studies have demonstrated the anti-inflammatory[16,17], anti-hyperlipidemic[18], anti-diabetic[19], anti-obesity[20,21], antitumor[22], immunomodulatory[23], and antioxidant properties [13,16,24] of this plant, in addition to its role in regulating liver function.[25]

Previous studies have indicated that consumer attitudes, perceived behavioral control, and social comparison significantly and positively influence the intention to consume tea.[26] The Theory of Planned Behavior (TPB) is a framework for predicting and understanding consumer consumption behavior.[27] Moreover, TPB postulates that an immediate determinant of behavior is the intention to engage in that behavior, and depends on the relationship between intention and behavior. Intention is influenced directly by two independent determinants: attitude towards the behavior and perceived subjective norms related to the behavior.[27] Figure 1 presents the conceptual framework. Previous studies have indicated that the application of TPB contributes to an understanding of consumers' consumption and purchasing behavior regarding caffeine and supports the validity of the extended TPB in developing a more comprehensive understanding of consumer behavior.[28] However, little is known about Jiaogulan tea consumption in Thailand.[11] Furthermore, government agencies currently emphasize the importance of supporting and promoting tea consumption.

This study aimed to investigate Jiaogulan herbal tea consumption and its relationship with participant characteristics and sources of information related to Jiaogulan herbal tea in Phayao Province, Northern Thailand, as it is the region that promotes the cultivation of tea in highland

areas and encourages tea consumption for its health benefits. This study also focused on Jiaogulan consumption behaviors using the TPB as a framework. The findings will help promote local tea consumption and serve as a guideline for the continued promotion of the health benefits of Jiaogulan tea products.

| Attitudes towards consuming Jiaogulan tea products |
| Subjective norms regarding the consumption of Jiaogulan tea products |

Jiaogulan consumption

Figure 1. Conceptual framework based on the Theory of Planned Behavior (TPB)

MATERIALS AND METHODS

Study Design

To examine the factors associated with Jiaogulan herbal tea consumption among the study participants, this cross-sectional study purposively selected a research area in Phayao Province that included Mueang Phayao District and Pong District due to their natural tea plantations and distribution centers. The study was conducted between December 2023 and March 2024.

Participants

The study employed the convenience sampling technique due to the feasibility of research participation. The inclusion criteria consisted of (1) individuals aged 20 years and above, (2) residing in Phayao province for at least one year, (3) the ability to read and write in the Thai language, and (4) a willingness to participate in the study by signing informed consent to participate in it. The sample size was determined using a formula for calculating sample size for populations of an unknown number $[Z^2pq/e^2]$.[29] The formula for calculating sample size specified the maximum variability at p = 0.5 and q = 0.5, with a confidence level of 95% (Z = 1.96), and an allowable error of 5% (e = 0.05). Thus, the sample size was calculated to be 384 individuals. An additional 5% of the sample size was added, resulting in a total sample of 404 individuals.

Data Collection

Before conducting the research, a preparatory meeting was held with the research assistants to explain the research objectives, data collection methods, and the questionnaire administration process to ensure mutual understanding. The researchers and research assistants collected data at various locations, including public places, educational institutions, community areas , and health centers. After obtaining written consent from the participants, the researchers and assistants distributed self-administered questionnaires. Completing the questionnaires took participants 15 to 20 minutes.

Research Instruments

The tools used for quantitative data collection were derived from a literature review to identify the variables, and were modified to suit the study population in the research area.[30,31] The questionnaire consisted of four sections as follows: Section 1 included questions related to personal attributes such as age, gender, marital status, education, occupation,

income sufficiency, health status, receipt of information about Jiaogulan herbal tea for health, and consumption of Jiaogulan herbal tea products in the three months prior to the study. Section 2 comprised 10 items that assessed attitudes towards consuming Jiaogulan tea products.[30,31] Examples of the questions include: 'Do you think tea is beneficial to you?', 'Do you think the properties of tea help boost the immune system?', and 'Do you believe that tea can reduce the risk of diabetes and hypertension?'. Section 3 dealt with subjective norms regarding the consumption of Jiaogulan tea products, and comprised 10 items, such as 'Do your parents drink tea?', 'Do your friends drink tea?', and 'Do your siblings drink tea?'. Sections 2-3 employed a rating scale with response options including "Agree," "Uncertain," and "Disagree." Scores ranged from 0 to 30 points. Section 4 assessed the Jiaogulan tea consumption behavior of the participants and comprised eight items. This section was designed to evaluate consumption behavior over the three months prior to the study, using a rating scale divided into four levels: Regular practice (≥ 6 times a week), Occasional practice (4-5 times a week), Infrequent practice (1-3 times a week), and Never practiced. The total score ranges from 0 to 24 points. This questionnaire employs the Item-objective congruence (IOC) technique to assess the validity of all the questionnaire items. Additionally, three external experts in relevant fields (pharmacognosy and herbal medicine, traditional medicine, and public health) were consulted. Questionnaire items that scored between 0.5-0.69 were revised and improved based on suggestions from the experts, while items that scored above 0.7 were considered acceptable. The questionnaire was then administered as a tryout to a sample group consisting of 30 individuals similar to the population under study. The analysis of Sections 2-4 yielded Cronbach's alpha coefficients of 0.80, 0.78, and 0.84, respectively.

Statistical Analysis

Data analysis was conducted using SPSS software. Descriptive statistics, such as frequency, percentage, mean, and standard deviation (SD) were used to describe the population's socio-demographic data. The Chi-square test was used to examine the association between participants' characteristics and their consumption of Jiaogulan tea. Binary logistic regression was used to assess the association between obtaining information about Jiaogulan herbal tea for health and consuming it, after adjusting for some socio-demographic factors. Spearman's correlation coefficient (r_s) was used to investigate the correlation between attitude, subjective norms, and participants' behavior toward the consumption of Jiaogulan tea products. Statistical significance was determined at $p < 0.05$.

RESULTS

Participants characteristics

Table 1 presents the characteristics of the 404 study participants. Just over one in four participants (25.7%) consumed Jiaogulan herbal tea in the three months prior to the study. Over half were married women. The mean age of participants ranged from 20 to 76 years. The majority were students, and most had a bachelor's degree or higher. Just over half said they were experiencing financial difficulties, and nearly a third had an underlying health condition, including hypertension, dyslipidemia, and diabetes mellitus. The Chi-square test revealed that Jiaogulan tea consumption was significantly associated with age group (p=0.006), marital status (p<0.001), occupation (p=0.004), perceived income sufficiency (p=0.037), and underlying disease (p=0.008). These variables were used for adjustment in the regression analysis.

Table 1. Participant characteristics classified by Jiaogulan tea consumption (n=404)

Variable	Total (n = 404)	No consumption (n = 300)	Consumed (n = 104)	P-value
Sex				0.883
Male	122 (30.2%)	90 (73.8%)	32 (26.2%)	
Female	282 (69.8%)	210 (74.5%)	72 (25.5%)	
Age (years)				0.006
20 – 24	169 (41.8%)	137 (81.1%)	32 (18.9%)	
25 – 34	69 (17.1%)	49 (71.0%)	20 (29.0%)	
35 – 44	47 (11.6%)	36 (76.6%)	11 (23.4%)	
45 – 54	40 (9.9%)	23 (57.5%)	17 (42.5%)	
55 – 64	42 (10.4%)	25 (59.5%)	17 (40.5%)	
≥ 65	37 (9.2%)	30 (81.1%)	7 (18.9%)	
Mean ± SD	35.72±16.61	34.53±16.46	39.15±16.65	
Marital status				< 0.001
Single/Widowed/Divorced/Separate	246 (39.1%)	198 (80.5%)	48 (19.5%)	
Married	458 (60.9%)	102 (64.6%)	56 (35.4%)	
Education				0.114
Primary school or lower	55 (13.6%)	38 (69.1%)	17 (30.9%)	
Secondary school	117 (29.0%)	95 (81.2%)	22 (18.8%)	
Bachelor or higher	232 (57.4%)	167 (72.0%)	65 (28.0%)	
Occupation				0.004
Unemployed	36 (8.9%)	29 (80.6%)	7 (19.4%)	
Employed	119 (29.5%)	75 (63.0%)	44 (37.0%)	
Student	249 (61.6%)	196 (78.7%)	53 (21.3%)	
Perceived income sufficiency				0.037
Insufficient	218 (54.0%)	171 (78.4%)	47 (21.6%)	
Sufficient	186 (46.0%)	129 (69.4%)	57 (30.6%)	
Underlying health condition				0.008
No	279 (69.1%)	218 (78.1%)	61 (21.9%)	
Yes	125 (30.9%)	82 (65.6%)	43 (34.4%)	
• Diabetes mellitus (DM)	27 (6.7%)	21 (77.8%)	6 (22.2%)	0.665
• Hypertension (HT)	53 (13.1%)	34 (64.2%)	19 (35.8%)	0.071
• Dyslipidemia (DLD)	42 (10.4%)	24 (57.1%)	18 (42.9%)	0.007

Sources of information on the health benefits of Jiaogulan tea

Approximately 32% of respondents had ever received information about the health attributes of Jiaogulan herbal tea (Table 2). The internet was the most common source of information (20%), followed by radio/TV/loudspeaker (13%), and a family member (8.2%). According to the Chi-square test, there was a strong association between Jiaogulan tea consumption and the acquisition of information about the tea (p<0.001). There were significant associations for obtaining information through a family member (p<0.001), neighbors/community members (p=0.009), radio/TV/ loudspeaker (p<0.001), the internet (p<0.001), and print media (p=0.001).

Table 2. Obtaining and sources of information on the health benefits of Jiaogulan tea among participants (n=404)

Variable	Total (n = 404)	No consumption (n = 300)	Consumed (n = 104)	P-value
Getting information about Jiaogulan herbal tea for health				< 0.001
- Never	275 (68.1%)	242 (88.0%)	33 (12.0%)	
- Ever	129 (31.9%)	58 (45.0%)	71 (55.0%)	
Source of information				
1. Health officer/health volunteer	19 (4.7%)	11 (57.9%)	8 (42.1%)	0.109*
2. Family member	33 (8.2%)	12 (36.4%)	21 (63.6%)	< 0.001
3. Neighbors/community members	28 (6.9%)	15 (53.6%)	13 (46.4%)	0.009
4. Radio/TV/loudspeaker	54 (13.4%)	29 (53.7%)	25 (46.3%)	< 0.001
5. Internet	81 (20.0%)	38 (46.9%)	43 (53.1%)	< 0.001
6. Print media	21 (5.2%)	9 (42.9%)	12 (57.1%)	0.001

* Exact test

Association between Jiaogulan tea information sources and consumption

Table 3 presents the association between information sources related to Jiaogulan tea and Jiaogulan consumption among participants, using binary logistic regression. Participants' consumption of Jiaogulan tea products was significantly associated with the information they had received about this tea from a family member (OR = 3.85, 95% CI = 1.58–9.42) and the internet (OR = 3.44, 95% CI = 1.83–6.46), after controlling for age group, marital status, occupation, perceived income sufficiency, and underlying disease (Nagelkerke R^2 = 0.25).

Correlation between attitude, subjective norms, and consumption behavior

Participants who consumed Jiaogulan tea products had mean scores (± SD) of 22.3 ± 2.5 points for attitude, 23.2 ± 2.1 points for subjective norms, and 8.1 ± 5.2 points for consumption behavior. Spearman's rank correlation coefficient test found a positive correlation between attitude and subjective norms (r_s = 0.377, p<0.001) and between subjective norms and consumption behavior (r_s = 0.220, p=0.025), but no correlation between attitude and consumption behavior (Table 4).

Table 3. Association between information sources related to Jiaogulan tea and its consumption among participants (n=404)

Jiaogulan tea information sources	B	S.E.	p-value	Adjusted OR[†]	95% CI
Health officer/health volunteer	-.64	0.64	0.319	0.53	0.15, 1.86
Family member	1.35	0.46	0.003	3.85	1.58, 9.42
Neighbors/community members	-0.16	0.52	0.757	0.85	0.31, 2.34
Radio/TV/loudspeaker	0.36	0.38	0.335	1.44	0.69, 3.03
Internet	1.24	0.32	<0.001	3.44	1.83, 6.46
Print media	0.36	0.56	0.525	1.43	0.47, 4.32

[†]Adjusted for age group, marital status, occupation, perceived income sufficiency, and underlying health condition.

Table 4. Spearman's rank correlation between attitude, subjective norms, and consumption behavior of Jiaogulan tea products among individuals who consumed them (n=104)

	Correlation coefficient (r_s)	p-value
Attitude vs Subjective norms	0.377	<0.001
Attitude vs Behavior	0.159	0.107
Subjective norms vs Behavior	0.220	0.025

DISCUSSION

The study findings from the application of TPB indicate the ability to predict tea consumption behavior among the population in Phayao province, Northern Thailand. The focus of this study identified the relationships of various variables with the consumption behavior of people who drink Jiaogulan herbal tea to promote health. The questionnaire results showed that three out of four individuals in the sample population were unfamiliar with Jiaogulan herbal tea and its properties. This may be because the tea is not well-known among the local population and is available or promoted primarily only in tourist areas. Our observation indicates that little effort is made to promote tea and its health benefits among the population in Phayao province. Although this tea grows naturally and is readily available in the highlands of Phayao, the population is unaware of its scientific properties and herbal benefits and continues to adhere to their traditional cultural beliefs. However, different tea-drinking behaviors, such as tea types, preparation methods, amount consumed, and various added flavors, may vary among populations and countries.[32,33] Therefore, consumers who lack knowledge about Jiaogulan tea and its brewing methods should be educated about the tea's health-promoting properties.[33]

Regarding the sample group's consumption behavior towards Jiaogulan herbal tea, the study found that attitudes were significantly related to adherence to reference groups' products. The answers in the questionnaires showed that the majority of participants held negative attitudes toward tea consumption. In fact, several participants believed that drinking tea leads to stomach upset and is a waste of money. The results of this study align with the model and framework of the Theory of Planned Behavior (TPB), which reflects the importance of beliefs, attitudes, subjective norms, and experiences in influencing individuals' decision-making behavior.[34] In this context, attitudes are indicative of the psychological characteristics of individuals, including their beliefs (cognitive component) and feelings (affective component), which, when combined with accumulated knowledge and experiences, drive tendencies towards specific behaviors (behavioral component).[35] Similar to a study in Taiwan, our study found that consumers' attitudes and perceptions of behavior control impact their intentions to purchase environmentally friendly products through personal and social benefits.[36] Consistent with previous studies using the TPB framework to explain the intentions of the sample group, attitudes, subjective norms, and perceived behavioral control contributed significantly to the increased use of traditional Chinese medicine in the sample group.[37]

Simultaneously, the study's analysis of the relationship revealed that subjective norms are significantly associated with the consumption of Jiaogulan herbal tea products. When considering high-scoring items such as following a group of friends who drink tea,

loved ones/friends intending to drink tea, and family members intending to drink tea, it is clear that subjective norms serve as a mechanism controlling individual behavior, leading to intentions, motivations, and subsequent behaviors. Consumers' attitudes, in particular, reveal whether their evaluations are positive or negative, and individuals will manifest behaviors accordingly.[35] Similar to previous studies, our findings suggest that subjective norms from siblings/friends influence the decision to consume a product and exhibit desirable eating behaviors (P < 0.001).[38] Consistent with other studies, our study found that subjective norms and health consciousness significantly influenced the intention of members of the sample group to purchase vitamins for health and to prevent the spread of COVID-19.[39] Another study in Indonesia found that its sample group started consuming vitamins in large quantities because they were influenced by subjective norms circulating in the community. The study highlighted that subjective norms influenced individual interest in purchasing vitamins for health reasons.[40] Similarly, a Chinese study, using TPB to explain the intention to receive vaccines found that subjective norms influenced intention and could predict the acceptance of COVID-19 vaccinations among university students in China.[41] Overall, this study's findings demonstrate that SN influences intention in the context of tea consumption behavior in a community in Northern Thailand.

However, the analysis revealed that attitude was not correlated with participants' consumption of Jiaogulan herbal tea products. This may be because the sample group was still unfamiliar with the properties of this type of tea, and exhibited a neutral attitude towards tea consumption. For example, the participants were uncertain whether the tea tasted good or smelled pleasant. They were also unsure about the immune-boosting properties of tea and its health benefits. Consistent with

the concept that human behavior is goal-directed or planned, human behavior can be controlled volitionally. Furthermore, personal factors or attitudes towards behavior are the sum of beliefs about salient behavior, which evaluates the pros and cons of various aspects when engaging in that behavior. If individuals lack experience or understanding, it can affect their decision-making in performing or exhibiting behaviors.[42]

Upon analyzing the variables, the study found that age, marital status, occupation, income, medical history (cholesterol levels), and information exposure were statistically significantly related to tea consumption. Furthermore, it was found that variables such as family members and obtaining information from the internet were significantly associated with the consumption of Jiaogulan herbal tea. This aligns with the TPB concept that states subjective norms, influenced by family members or access to information, affect behavioral intentions. These intentions, in turn, influence individuals to engage or increase their behaviors.[42] The majority of the sample group intending to consume tea were wage earners who believed that drinking tea is beneficial for health. This belief was particularly pronounced among those with medical conditions such as high cholesterol. These participants believed Jiaogulan herbal tea had properties to control and prevent high cholesterol levels. The literature review indicates that the inclination towards sustainability is positively linked to purchasing tea for personal consumption. Moreover, the review suggests cultural diversity influences tea-drinking decisions,[43] and that tea-drinking behavior reflects cultural and societal characteristics.[44] Consistent with studies conducted in Vietnam, monthly income and perceptions of health status were found to be significantly correlated with the use of herbal medicine for general illness during the COVID-19 pandemic outbreak.[45]

Consistent with the study findings, more than four out of five participants (89.3%) reported consuming herbal tea at least once in the past two years, indicating a high consumption rate. Most participants used tea primarily for the prevention and treatment of COVID-19, malaria, and typhoid fever.[46]

This study also has limitations. The convenience sampling method may not fully represent the entire population due to the high proportion of young people in the sample. Accordingly, our findings need to be interpreted with caution regarding the sample group. The cross-sectional research design used in this study is beneficial for accessing a larger, more diverse population, but it does not allow for establishing causal relationships. Additionally, the study does not specifically target particular health conditions. It gathers data broadly, which increases the possibility of bias regarding social desirability since the consumption of herbal tea is considered an attitude and the behavior of individuals regarding their lifestyle. While this study applies the TPB, there is a lack of investigation regarding tea knowledge. Therefore, future studies could explore people's knowledge of the health benefits of tea, and how such knowledge influences their decision to consume tea. However, the research findings are particularly significant as they provide data and insights from participants regarding the use of herbal tea and inform authorities on various aspects that facilitate the formulation of strategies for promotional campaigns and integrating them with healthcare systems to achieve success tailored to the local context.

CONCLUSIONS

Sources of information about Jiaogulan tea are associated with its consumption, while subjective norms are correlated with consumption behavior. This indicates that groups such as family and friends, as well as online media, may influence the intention to drink tea, support the decision to choose it, and lead to health-oriented tea-consumption behavior. Therefore, relevant health agencies should advocate for policies that promote the cultivation of tea at the household level for consumption and self-care. Emphasis should be placed on raising awareness and promoting positive attitudes based on the effectiveness and safety of tea consumption. Additionally, continuous public relations efforts should highlight the benefits and properties of local herbal teas, which will enable individuals to make informed decisions regarding their consumption and cultivate local herbal wisdom that will engender sustainable health in rural areas.

ETHICAL APPROVAL

The study was conducted in accordance with the Declaration of Helsinki and approved by the Human Ethics Committee of University of Phayao (HREC-UP-HSST 1.2/157/66, 03 November 2023).

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CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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