

# The use of herbal medicines among chronic disease patients in Thailand: a cross-sectional survey

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**Background:** The study aimed to assess the prevalence and correlates of herbal medicine use among chronic disease patients in health care settings in Thailand.

**Methods:** In a cross-sectional study, 1374 adult chronic disease patients (median age 60 years) were consecutively sampled from health care facilities in Thailand. Logistic regression was used to estimate the independent predictors of herbal medicine use in the past 12 months.

**Results:** The prevalence of herbal medicine use in the past 12 months was 35.9%. Of participants who were using herbal medicine in the past 12 month, 53.7% used it for treating a long-term health condition, 40.0% used herbal medicine in order to improve well-being and 6.3% for treating an acute illness. More than half of the herbal medicine users (57.2%) rated their herbal medicine use as very helpful, 33.3% as somewhat helpful and 6.5% not at all helpful or do not know. In adjusted logistic regression analysis, having Grade 6 to 12 education (Odds Ratio-OR: 1.71, Confidence Interval-CI: 1.04, 2.82), rural residence (OR: 0.76, CI: 0.60, 0.97), other religion (OR: 0.57, CI: 0.35, 0.97), anxiety (OR: 1.64, CI: 1.25, 2.16), low quality of life (OR: 0.42, CI: 0.31, 0.56) and having multiple chronic conditions (OR: 1.82, CI: 1.30, 2.56) were associated with past 12-month herbal medicine use. Further, in adjusted logistic regression analysis, having arthritis, asthma, cancer, cardiovascular disease, dyslipidaemia, gastrointestinal disease, dyslipidaemia were positively and hypertension negatively associated with past 12-month herbal medicine use.

**Conclusions:** The study found a high prevalence of herbal medicine use among chronic disease patients in Thailand. Several factors (education, rural residence, anxiety, low quality of life and multiple chronic conditions) associated with herbal medicine use were identified. This knowledge will support health care providers and policy makers in decision making on the use of herbal medicine.

**Keywords:** herbal medicine, utilization, chronic disease patients, Thailand

## Introduction

A large group of the population in “Association of Southeast Asian Nations (ASEAN)” states utilize traditional medicine.<sup>1</sup> The World Health Organization<sup>2</sup> highlights the relevance of studying the prevalence and correlates of traditional, including herbal medicine use.

Traditional herbal medicines are naturally occurring, plant-derived substances with minimal or no industrial processing that have been used to treat illness within local or regional healing practices.<sup>3</sup>

Under the Universal Health care Coverage Scheme of the National Health Security Office in Thailand, the treatment and rehabilitation with traditional herbal medicines or traditional recipes composing of medicinal plant materials is included.<sup>4</sup>

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Although many populations in ASEAN countries reported to use herbal medicine to improve their health, there is limited data on Thailand.<sup>2,5</sup>

In Thailand, 10% of patients attending public health facilities receive various forms of Thai traditional medicine, including traditional herbal medicines.<sup>6</sup> In a study among hospital patients in Bangkok, 28.6% had used herbal medicines.<sup>7</sup> Among 200 medical in- and out-patients in Bangkok, 52.5% had used at least one form of alternative medicine (mostly herbal medicine).<sup>8</sup> In a household survey in Bangkok, the prevalence of past 6-month herbal and dietary supplement use was 52.0%.<sup>9</sup> Several studies in Thailand found a high prevalence of herbal medicine use in patients with specific chronic conditions, eg, among 50 admitted and 50 walk-in gynaecologic cancer patients 27.0% used herbal medicines,<sup>10</sup> past 12-month use of 31.1% in cancer patients undergoing radiotherapy,<sup>11</sup> among diabetes patients past 3-month use of 20.1% took herbal medicine,<sup>12</sup> past 12-month use of 27.3% in Thai outpatients with chronic kidney disease,<sup>13</sup> and among persons living with HIV, 32% had ever taken herbal treatment.<sup>14</sup> We did not find any study in Thailand investigating the prevalence and correlates of herbal medicine in chronic disease patients in general. Some investigations found that herbal medicine users were more likely to have one or multiple chronic conditions.<sup>15</sup>

The prevalence of past 12-month herbal medicine use among chronic disease patients in Cambodia was 44.5%,<sup>16</sup> in Lao PDR 21.3%,<sup>17</sup> in Malaysia 24.9%,<sup>18</sup> Myanmar 53.2%,<sup>19</sup> and Vietnam 43.6%.<sup>20</sup> Factors associated with herbal medicine use may include sociodemographic and well-being factors. Sociodemographic factors include, women,<sup>21,22</sup> younger or older age,<sup>20-22</sup> higher socioeconomic status,<sup>21,22</sup> lower education,<sup>16</sup> married,<sup>21</sup> and urban residence.<sup>20</sup> Well-being factors include, perceived poor health status,<sup>20,21</sup> neither poor nor good quality of life,<sup>16</sup> anxiety,<sup>23</sup> depression,<sup>23</sup> multiple chronic conditions,<sup>20,22</sup> arthritis,<sup>23</sup> hypertension,<sup>16</sup> and gastrointestinal diseases.<sup>16</sup>

Commonly used herbal medicines utilized by chronic disease patients in Lao PDR included “*Moringa pterygosperma*, *Curcuma longa* L., *Curcuma xanthorrhiza*, *Centella asiatica* L. Mushroom’s Linchi, *Morinda citrifolia* L.”<sup>17</sup> in Myanmar “*Ganoderma lucidum*, *Menispermum dauricum*, *Garcinia mangostana*, *Asiatic Penny-wort*, *Aloe Vera* L.”<sup>19</sup> Vietnam “*Curcumin*, *Gynostemma pentaphyllum*, *Ganoderma lucidum*, *Aloe Vera*, *Artichoke*, *Globe artichoke* *Cynara scolymus* L., 1753,– *Asteraceae* and *Styphnolobium japonicum*.”<sup>20</sup> Among hospital patients in Thailand commonly used herbal medicines included “*Zingiber officinale*, *Andrographis*

*paniculata*, *Zingiber cassumunar*, *Capsicum frutescens* and *Curcuma longa*”.<sup>7</sup> In a household survey in Bangkok, herbal medicines used included “*Andrographis paniculata*, *Curcuma Longa*, *Moringa spp.*, *Aloe vera*, and *Boersenbergia spp.*”<sup>9</sup> and among Thai chronic kidney disease patients commonly used herbs included “*Andrographis paniculata*, *Curcuma longa*, and *Moringa oleifera*”.<sup>13</sup> The Ministry of Public Health in Thailand has included “71 herbal medicinal products into the National List of Essential Drugs.”<sup>23,24</sup>

The study aimed to assess the prevalence and correlates of herbal medicine use among chronic disease patients in health care settings in Thailand.

## Methods

### Design

In a cross-sectional survey, out-patients with chronic diseases in rural and urban health facilities in Thailand were interviewed.

### Sample and procedure

Using consecutive sampling, chronic disease patients (21 years and older) were recruited from conveniently selected seven district hospitals across the whole country, more details have been described.<sup>5</sup> Briefly, health facility staff conducted screening of two inclusion criteria (minimum age of 21 years and who had been treated in the past 12 months for any of 20 chronic conditions) and referred all eligible patients to the interviewers for data collection.<sup>5</sup> Trained research assistants conducted interviews with the patients at the health care facilities, using structured questionnaires.<sup>5</sup> The questionnaire was pre-tested for validity on a sample of 20 patients, which did not form part of the final sample. Written informed consent was obtained from each participant, and privacy and confidentiality of the respondents were strictly protected. The “Committee of Research Ethics (Social Sciences) of Mahidol University (COA. No.: 2014/193.0807)” approved the study protocol. The World Medical Association Declaration of Helsinki regarding ethical conduct of research involving human subjects was followed. The sample size included at least 1300 chronic disease patients, for an estimated prevalence of 25% herbal use with precision of  $\pm 2\%$ .

### Measures

The “*International questionnaire to measure use of complementary and alternative medicine*” (I-CAM-Q)<sup>25</sup> was used to assess the prevalence, purpose and benefits of past 12-month herbal medicine use. In addition, they were

“asked about the names of herbal medicines they are using, their purpose, form, usage and how obtained.”<sup>13</sup>

*Chronic diseases* were assessed from a list of 22 conditions, such as diabetes and hypertension.<sup>5,26</sup>

*Sociodemographic variables* included sex, age, educational level, marital status, religious affiliation, and residence status.<sup>5</sup>

*Anxiety and depression* was assessed with the “Hospital Anxiety and Depression Scale (HADS)”, and participants scoring 11 or more on the HADS were classified as having moderate to severe anxiety and depression, respectively.<sup>27</sup> ( $\alpha$  anxiety: 0.90;  $\alpha$  depression: 0.71).

*Problem drinking* was assessed with the “Alcohol Use Disorder Identification Test (AUDIT)-C”, with scores of four or more defining problem drinking.<sup>28</sup> ( $\alpha$  0.72).

*Health related quality of life (HRQoL)* was assessed with the “World Health Organization Quality of Life (WHOQoL)-8,”<sup>29</sup> and grouped into low, moderate and high HRQoL. ( $\alpha$  0.87).

*Anticipated stigma* was measured with the 12-item Chronic Illness Anticipated Stigma Scale (CIASS).<sup>30</sup> The 12 CIASS items (range from 1=very unlikely to 5=very likely) are added up, and dichotomized based on a median score of 21 or more representing anticipated chronic disease stigma.<sup>31</sup> ( $\alpha$  0.92).

## Data analysis

Frequencies, means, medians, standard deviations, and interquartile range were calculated to describe the sample. Chi-square tests were used to assess differences in proportion. Logistic regression was used to estimate the independent predictors (age, gender, marital status, residence type, religious affiliation, anxiety, depression, problem drinking, quality of life, number of chronic diseases and chronic disease stigma) of herbal medicine use in the past 12 months. Variables found significant ( $P<0.05$ ) in bivariate analysis were subsequently included in the multivariable regression model.  $P<0.05$  was considered significant. Statistical procedures were conducted using “IBM SPSS Statistics for Windows” (Version 25.0. Armonk, NY: IBM Corp.).

## Results

### Sample characteristics

Of 1416 participants approached, 1396 agreed to take part in the study (98.6% response rate) and 1374 had complete information on herbal medicine use. The median age of participants was 60 years (interquartile range=16 years, range 21–99 years), 60.8% were women, 61.6% had less

than Grade 6 education, 94.7% were Buddhist and 50.4% resided in rural areas. About one in four of the participants (26.6%) had anxiety, 20.3% depression, 4.5% problem drinking, and 48.9% had high quality of life. Respondents had been treated in the past 12 months for hypertension (61.0%), followed by diabetes mellitus (34.9%), dyslipidaemia (29.7%), gout and other musculoskeletal conditions, such as chronic backache (15.0%), cardiovascular disorder (12.9%), arthritis (4.8%), asthma (4.2%) migraine or frequent headaches (4.1%), gastrointestinal disease (2.9%), thyroid disease (2.8%), kidney disease (2.5%), chronic obstructive pulmonary disease (2.3%), Parkinson’s disease (2.1%), mental disorder (1.9%), liver disease (1.5%), cancer (1.2%), and epilepsy (0.6%). About one-third of the participants (30.5%) had one chronic disease, 30.2% two and 39.3% three or more chronic diseases. The prevalence of past 12-month herbal medicine use was 35.9%. Of participants who were using herbal medicine in the past 12 month, 53.7% used it for treating a long-term health condition (>one month), 40.0% used herbal medicine in order to improve well-being and 6.3% for treating an acute illness (<one month). More than half of the herbal medicine users (57.2%) rated their herbal medicine use as very helpful, 33.3% as somewhat helpful and 6.5% not at all helpful or do not know. In bivariate analysis, gender ( $P=0.003$ ), education ( $P=0.018$ ), marital status ( $P=0.042$ ), residence ( $P=0.008$ ), religious affiliation ( $P=0.009$ ), anxiety ( $P<0.001$ ), quality of life ( $P<0.001$ ) and number of chronic conditions ( $P<0.001$ ) were associated with past 12-month herbal medicine use (see Table 1).

### Associations with herbal medicine use by sociodemographic and well-being factors

In adjusted logistic regression analysis, having Grade 6 to 12 education (Odds Ratio-OR: 1.71, Confidence Interval-CI: 1.04, 2.82) ( $P=0.036$ ), rural residence (OR: 0.76, CI: 0.60, 0.97) ( $P=0.026$ ), other religion (OR: 0.57, CI: 0.35, 0.97) ( $P=0.039$ ), anxiety (OR: 1.64, CI: 1.25, 2.16) ( $P<0.001$ ), low quality of life (OR: 0.42, CI: 0.31, 0.56) ( $P<0.001$ ) and having multiple chronic conditions (OR: 1.82, CI: 1.30, 2.56) ( $P<0.001$ ) were associated with past 12-month herbal medicine use (see Table 2).

### Associations with herbal medicine use by type of chronic disease

In adjusted logistic regression analysis, having arthritis (OR: 5.51, CI: 3.12, 9.73), asthma (OR: 2.15, CI: 1.24,

**Table 1** Sample characteristics

Variable	Sample	Herbal medicine use in the past 12 months		P-value
		Yes	No	
	All	Yes	No	
	N (%)	N (%)	N (%)	
<b>All</b>	<b>1374</b>	<b>489 (35.9)</b>	<b>885 (64.4)</b>	
Age (in years)				0.493
18–45	167 (12.2)	53 (31.7)	114 (68.3)	
46–60	555 (40.6)	204 (36.8)	351 (63.2)	
61–101	646 (47.2)	231 (35.8)	415 (64.2)	
Gender				0.033
Female	829 (60.8)	276 (33.3)	553 (66.7)	
Male	534 (39.2)	208 (39.0)	326 (61.0)	
Education				0.018
<Grade 6	844 (61.6)	280 (33.2)	564 (66.8)	
Grade 6–12	308 (22.5)	130 (42.2)	178 (57.8)	
Postsecondary	218 (15.9)	78 (35.8)	140 (64.2)	
Marital status				0.042
Married	978 (71.6)	331 (33.8)	647 (66.2)	
Never married	388 (28.4)	154 (39.7)	234 (60.3)	
Residence				0.008
Rural	692 (50.4)	270 (39.0)	422 (61.0)	
Urban	682 (49.6)	219 (32.1)	463 (67.9)	
Religious affiliation				0.009
Buddhist	1297 (94.7)	452 (34.8)	845 (65.2)	
Other religion	72 (5.3)	36 (50.0)	36 (50.0)	
Anxiety	361 (26.6)	174 (48.2)	306 (30.8)	<0.001
Depression	275 (20.3)	110 (40.0)	375 (34.8)	0.108
Problem drinking	59 (4.3)	20 (33.9)	39 (66.1)	0.782
Quality of Life				<0.001
Low	299 (21.9)	157 (52.5)	142 (47.5)	
Medium	399 (29.2)	122 (30.6)	277 (69.4)	
High	667 (48.9)	207 (31.0)	460 (69.0)	
Chronic diseases				<0.001
One	419 (30.5)	103 (24.6)	316 (75.4)	
Two	415 (30.2)	147 (35.4)	268 (64.6)	
Three or more	540 (39.3)	234 (43.4)	306 (56.6)	
Chronic disease stigma	1002 (74.4)	368 (36.0)	654 (64.0)	0.581

3.73), cancer (OR: 3.24, CI: 1.13, 9.26), cardiovascular disease (OR: 1.06, CI: 1.40, 2.76), dyslipidaemia (OR: 1.31, CI: 1.00, 1.70), gastrointestinal disease (OR: 4.82, CI: 2.33, 10.01), and migraine or frequent headaches (OR: 1.88, CI: 1.07, 3.31) were positively and hypertension (OR: 0.71, CI: 0.55, 0.91) negatively

associated with past 12-month herbal medicine use (see Table 3).

### Details of herbal medicines used

Most frequently specific herbal medicines used included a mixture of unspecified herbs for a range of problems (dia-

**Table 2** Associations with herbal medicine use by sociodemographic and well-being factors

Variable	AOR (95% CI)	P-value
<b>Gender</b>		
Female	1 (Reference)	
Male	1.27 (0.98, 1.61)	0.067
<b>Education</b>		
<Grade 6	1 (Reference)	
Grade 6–12	1.71 (1.04, 2.82)	0.036
Postsecondary	1.20 (0.93, 1.56)	0.163
<b>Marital status</b>		
Married	1 (Reference)	
Never married	1.28 (0.98, 1.66)	0.069
<b>Residence</b>		
Rural	1 (Reference)	
Urban	0.76 (0.60, 0.97)	0.026
<b>Religious affiliation</b>		
Other religion	1 (Reference)	
Buddhist	0.57 (0.35, 0.97)	0.039
<b>Anxiety</b>	1.64 (1.25, 2.16)	<0.001
<b>Quality of Life</b>		
Low	1 (Reference)	
Medium	0.47 (0.33, 0.66)	<0.001
High	0.42 (0.31, 0.56)	<0.001
<b>Chronic diseases</b>		
One	1 (Reference)	
Two	1.53 (1.11, 2.11)	0.010
Three or more	1.82 (1.30, 2.56)	<0.001

**Abbreviation:** AOR, Adjusted Odds Ratio.

betes, asthma, stroke, hypertension, muscle pain, etc.), *Andrographis paniculata* (Burm.f.) Wall.ex Nees for sore throat and diarrhoea, *Curcum longa* Linn for health tonic, digestive tonic and knee pain, *Curcuma xanthorrhiza* Roxb. for pre-menopause symptoms and leucorrhoea and *Zingiber officinale* for cold and gastrointestinal problems. The most frequent type of herbal medicine use was “crude herbs, capsules, pills, and powder”, which were mainly “swallowed and making it into a drink or food using hot water”. Herbal medicines were mainly obtained from own garden, hospital, folk remedy shop or stand and drug store (see Table 4).

## Discussion

Findings show a high prevalence of past 12-month herbal medicine use (35.9%) among chronic disease patients in Thailand, higher than in Lao PDR (21.3%)<sup>17</sup> and Malaysia (24.9%), and lower than in Vietnam (43.6%),<sup>20</sup> Cambodia (44.5%),<sup>16</sup> and Myanmar (53.2%).<sup>19</sup> This high prevalence of

past 12 month herbal medicine use among chronic disease patients in Thailand confirms findings of lifetime, 12-month and past 3-month herbal medicine use in different study populations in Thailand: hospital patients 28.6%,<sup>7</sup> gynaecologic cancer patients 27.0%,<sup>10</sup> cancer patients treated with radiotherapy past-12-month use of 31.1%,<sup>11</sup> diabetes patients past 3-month use of 20.1%,<sup>12</sup> and 42% taking herbal medicine together with modern medication,<sup>32</sup> chronic kidney disease patients past 12-month use of 27.3%,<sup>13</sup> and among persons living with HIV lifetime use of 32%.<sup>14</sup> Most chronic disease patients in this study reported that the use of herbal medicine was very or somewhat helpful (93.5%), which is similar to findings from a study among chronic disease patients in Jordan<sup>33</sup> and Malaysia.<sup>18</sup> The high herbal medicine use in Thailand may be related to promotion of the use of herbal medicines through the “National policy on Thai traditional medicine and the implementation” as well as the “Sufficiency Health System Strategic Plan”, with the

**Table 3** Associations with herbal medicine use by type of chronic disease

Chronic disease	Sample	Herbal medicine use	AOR (95% CI)	P-value
	N (%)	N (%)		
Arthritis	66 (4.8)	47 (71.2)	5.51 (3.12, 9.73)	<0.001
Asthma	57 (4.2)	28 (49.1)	2.15 (1.24, 3.73)	0.006
Cancer	16 (1.2)	10 (62.5)	3.24 (1.13, 9.26)	0.028
Cardiac failure, Stroke, Coronary artery disease, Cardiac arrhythmias	177 (12.9)	80 (45.2)	1.06 (1.40, 2.76)	<0.001
Chronic obstructive pulmonary disease (COPD)	31 (2.3)	14 (45.2)	1.58 (0.74, 3.36)	0.238
Diabetes mellitus	480 (34.9)	175 (36.5)	1.23 (0.95, 1.58)	0.110
Dyslipidaemia	408 (29.7)	158 (38.7)	1.31 (1.00, 1.70)	0.046
Epilepsy	8 (0.6)	1 (12.5)	0.23 (0.03, 2.07)	0.191
Gastrointestinal disease	40 (2.9)	29 (72.5)	4.82 (2.33, 10.01)	<0.001
Gout and other musculoskeletal conditions, such as chronic backache	206 (15.0)	86 (41.7)	1.39 (1.00, 1.93)	0.054
Hypertension	838 (61.0)	272 (32.5)	0.71 (0.55, 0.91)	0.007
Kidney disease	35 (2.5)	13 (37.1)	0.59 (0.27, 1.29)	0.185
Liver disease	21 (1.5)	11 (52.4)	1.88 (0.76, 4.68)	0.175
Mental disorder	26 (1.9)	7 (26.9)	0.71 (0.28, 1.84)	0.483
Migraine or frequent headaches	57 (4.1)	30 (52.6)	1.88 (1.07, 3.31)	0.027
Parkinson's disease	29 (2.1)	8 (27.6)	0.79 (0.33, 1.86)	0.584
Thyroid disease	38 (2.8)	16 (42.1)	0.97 (0.47, 1.97)	0.923

**Abbreviations:** AOR, Adjusted Odds Ratio; CI, Confidence Interval.

emphasis on the use of Thai traditional medical knowledge and being self-reliant.<sup>4</sup>

Several studies<sup>20–22</sup> found that being a woman and younger or older age were associated with herbal medicine use, while in this study only in bivariate analysis women had a higher prevalence of herbal medicine use than men had, and no age differences were found. This study found that having completed primary education increased the odds for herbal medicine use, while in a community survey in Turkey<sup>22</sup> higher education was positively and among chronic disease patients in Cambodia<sup>16</sup> was negatively associated with herbal medicine use. Consistent with some studies on traditional and complementary medicine utilization,<sup>17,19</sup> this study found that rural residence increased the odds for herbal medicine use. In this study, rural residents obtained herbal medicines more often from their own garden, folk remedy shop or stand and hospital than urban residents (analysis not shown). It is possible that herbal medicines are better accessible in rural than urban areas in Thailand. Other religion (mainly Muslim) was associated with a higher prevalence of herbal medicine use than Buddhist religion. Further research is needed to explore as to why Muslim communities rely more on herbal medicine use than Buddhist communities do.

Consistent with previous studies,<sup>20–23</sup> this study found that poorer well-being (low health related quality of life and anxiety) and having multiple chronic conditions were associated with herbal medicine use. Some of the reasons for these

findings could be a need for more frequent herbal medicine treatment, greater desire for better management of chronic conditions or greater availability of herbal medicines.<sup>16</sup> Other reasons could be that anxious patients are more likely to seek alternative, herbal medicine, treatment in an attempt to alleviate chronic disease symptoms.<sup>23</sup> Further, having specific chronic conditions, arthritis, asthma, cancer, cardiovascular disease, dyslipidaemia, gastrointestinal disease and migraine or frequent headaches, increased and having hypertension decreased the odds for past 12-month herbal medicine use. Previous studies also found an association between arthritis,<sup>20</sup> gastrointestinal diseases<sup>14</sup> cancer<sup>33</sup> and herbal medicine use. A previous study among chronic disease patients in Cambodia found a positive association but this study found a negative association between hypertension and herbal medicine use. It is possible that with better health care services in Thailand, Thai hypertensive patients rely more on modern than herbal medicine than their Cambodian counterparts.

Commonly herbal medicines used in this study included *Andrograhis paniculata* (Burm.f.) Wall.ex Nees, *Curcum longa* Linn, *Curcuma xanthorrhiza* Roxb. *Zingiber officinale*, *Boesenbergia rotunda*, *Aloe vera* (l.) Burm.f., *Centella asiatica*, some of which have also been commonly used among chronic disease patients in Jordan (*Zingiber officinale*),<sup>34</sup> in Lao PDR ("*Curcuma longa* L., *Curcuma xanthorrhiza*, *Centella asiatica* L."),<sup>17</sup> Vietnam (*Aloe vera*, *Curcuma longa* L.),<sup>20</sup> chronic kidney patients in Thailand (*Curcuma longa*,

Table 4 Details of herbal medicine used

Scientific name of herbal remedy	Local name of herbal remedy	Purpose of using it	Form <sup>a</sup>	Usage <sup>b</sup>	How obtained <sup>c</sup>	N
<i>Aloe vera</i> (L.) Burm.f.	Aloe Vera, Star Cactus	Body pain	6, 2	1	2	2
<i>Andrographis paniculata</i> (Burm.f.) Wall.ex Nees	Kariyat, The Great, Far talai jone	Sore throat, diarrhea	1,2,4,5,6	1,3	1,2,4,7	9
<i>Boesenbergia rotunda</i>	Allium, Garlic, Fingerroot,	Lower cholesterol, osteoporosis	6, 3	1,3	8, 5	3
<i>Caesalpinia sappan</i> Linn.	Sappan tree, Kan Fang	Diabetes, health tonic, erectile dysfunction	6	3	2,4,7	2
<i>Carissa carandas</i> Linn.	Carandas-plum, Ma moung how – ma now ho	Treat symptoms	6	1	7	3
<i>Carthamus tinctorius</i> L.	Safflower, Dok kam foi	Hypertension	4	3	4	1
<i>Centella asiatica</i> (L.) Urb	Gotu kola, Bai bua boke	Headache	6	1	7	1
<i>Centotheca lappacea</i> (L.) Desv.	Ya repair, Ya he-yum	Diabetes, wound	6	3	7	3
<i>Cissus Quadrangularis</i> Linn.	Ped sang kaid	Constipation, hemorrhoid	2	1	4	2
<i>Curcuma longa</i> Linn	Turmeric, Ka-mint	Health tonic, digestive tonic, knee pain	1,2	1	4, 2	6
<i>Curcuma xanthorrhiza</i> Roxb.	Van chak mod look	Pre-menopause symptom, leucorrhoea	1,2,6	1,3	1,4,7	4
<i>Ganoderma lucidum</i> (Curtis) P. Karst.	Lingzhi mushroom, Reishi mushroom	Improve brain function	2	1	4	1
<i>Garcinia mangostana</i> L.	Mangosteen peel	Health tonic, treat symptom	5	3	5	2
<i>Garcinia gummigutta</i>	Malabar tamarind, Brindle berry, Som kaek	Lower cholesterol	2	1	4	2
<i>Houttuynia cordata</i> Thunb.	Plu Kaow	Health tonic	6	1	7	1
<i>Moringa oleifera</i> Lam.	Moringa, Ma-room	Lower cholesterol	2,6	1	7, 2	2
<i>Murdannia loriformis</i> (Hassk.) R.S.Rao & Kammathy	Angel Grass, Ya tewada	Treatment	6	1	7	1
<i>Orthosiphon aristatus</i> Miq	Ya nuad maw	Kidney stone, gout	6	1,3	7, 2	3
<i>Phyllanthus emblica</i> Linn., <i>Phyllanthus amarus</i> Schumacher. & Thonn	Egg Woman, Makam pom	Low back pain, cough, Health tonic, gastritis	1,5,6	1,3	4,5,7	3
<i>Senna alexandrina</i> P. Miller	Alexandria senna, Makam Kaek	Constipation	1,4	1,3	1,2,4	3
<i>Thunbergia laurifolia</i> Linn.	Rang joed	Lower blood sugar, detoxification	2,4,6	3	1,4,7	3
<i>Tiliacora triandra</i> (Colebr.) Diels	Bai-ya-nang	Health tonic, Kidney detoxification,	6	1	7	2
<i>Zingiber officinale</i>	Ginger	Cold, Gastrointestinal problems	6	3	6	4
<b>Unspecified herbs</b>	Mixed herb	Diabetes, health tonic, asthma, stroke, finger lock, hypertension, muscle pain, women's health	1,2,4,5,6	1,3	1,2,4,5,6	28

Notes: <sup>a</sup>Form: Pills=1, capsules=2, tablets=3, powder=4, solution=5, crude herbs=6; <sup>b</sup>Usage: Swallow=1, Topical use=2, Make into a drink/food using hot water=3, Inhale=4, <sup>c</sup>How obtained: Drug store=1, Folk remedy shop/stand=2, Health food store=3, Hospital=4, Direct sale=5, Provided by their family/friends=6, Own garden=7

*Boesenbergia rotunda*, *Aloe vera*),<sup>11</sup> hospital patients in Bangkok (*Zingiber officinale*, *Andrographis paniculata*, *Curcuma longa*, *Centella asiatica*).<sup>5</sup> Some of the herbal medicines used in this study are included in the national list of essential medicines in Thailand.<sup>35</sup> *Aloe vera* (*L.*) *Burm.f.* (indication: burns), *Andrographis paniculata* (*Burm. f.*) *Wall. ex Nees* (diarrhea), *Centella asiatica* (*L.*) *Urb.* (wound healing) *Curcuma longa* *L.* (gastrointestinal symptoms), *Garcinia mangostana* *L.* (wounds), *Murdannia loriformis* (*Hassk.*) *R.S. Rao & Kammathy* (fever), *Orthosiphon aristatus* (*Blume*) *Miq.* (diuretic), *Senna alexandrina* *Mill.* (constipation), (*Thunbergia laurifolia* *Lindl.*) (fever), and *Zingiber officinale* *Rosc.* (prevent nausea and vomiting).<sup>35</sup> *Bosenbergia rotunda* (*L.*) *Mansf.* has anti-ulcerogenic and antioxidant effects.<sup>36</sup> According to 2012 statistics on herbal drug use at state hospitals nationwide in Thailand was 1.82% of the total drug spending.

The top three herbal drugs commonly used by the people were curcuma or turmeric drug for the relief of flatulence or upset stomach; *phlai or plai* drug for muscle pain, swelling, bruise and sprain; and *fa-thalai-jon* drug for respiratory tract infection, cold and sore throat.<sup>37</sup>

Results showed that the two most common sources through which herbal medicines were obtained included own garden and hospitals. Satsue et al.<sup>38</sup> found in a study in Thailand that health care provider's advice on herbal remedies and sourcing herbal medicines from hospitals were major factors contributing to herbal medicine use.

## Study limitations

The study was cross-sectional, so causal conclusions can be drawn. Further, the study was conducted in selected geographic locations in Thailand, and findings cannot be generalized to other areas in Thailand. The information assessed was by self-report and may have resulted in under- or over- reporting of herbal medicine use in the past 12 months. Some aspects of importance in herbal medicine utilization, such as patient-provider communication on herbal medicine use, was not assessed, and should be assessed in future studies. The study assessed anxiety and depression using screening questionnaires, which has its limitations in terms of a correct psychiatric diagnosis.

## Conclusions

The study found a high prevalence of herbal medicine use among chronic disease patients in Thailand. Several factors (education, rural residence, anxiety, low quality of life

and multiple chronic conditions) associated with herbal medicine use were identified. This knowledge will support health care providers and policy makers in decision making on the use of herbal medicine.

## Availability of data

The data used for this study cannot be made available in the manuscript or a public repository due to the ethical restriction. However, they can be accessed upon request from the Principal Investigator (Prof. Supa Pengpid) at supaprom@yahoo.com.

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## Disclosure

The authors report no conflicts of interest in this work.

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