



Research article

Prevalence of and factors associated with depression among hill tribe individuals aged 30 years and over in Thailand



Chalitar Chomchoei^a, Tawatchai Apidechkul^{b,c,*}, Vivat Keawdounglek^c, Chanyanut Wongfu^c, Siriyaporn Khunthason^{b,c}, Niwed Kullawong^c, Ratipark Tamornpark^b, Panupong Upala^b, Fartima Yeemard^b

^a Chulabhorn Royal Academy, Bangkok, Thailand

^b Center of Excellence for the Hill Tribe Health Research, Mae Fah Luang University, Chiang Rai, Thailand

^c School of Health Science, Mae Fah Luang University, Chiang Rai, Thailand

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ABSTRACT

Background: Depression is a silent health problem that can lead to severe and sometimes fatal outcomes if individuals are not diagnosed and treated properly; this is particularly true in populations with limited education, low economic status and several barriers to accessing health services, such as the hill tribe people in Thailand.

Methods: This cross-sectional study aimed to explore the prevalence of and factors associated with depression among hill tribe individuals aged 30 years and over. A validated questionnaire and the Patient Health Questionnaire-9 (PHQ-9) were used for data collection in an interview format in a private and confidential room. Logistic regression was used to detect the associations of variables with depression at a significance level of $\alpha = 0.05$.

Results: A total of 2,552 participants were recruited for the analysis; 65.9% were females, 79.9% were married, 35.8% were aged 50 years and over, and 54.2% were Buddhist. The majority were uneducated (76.7%), were agriculturalists (48.4%), and had a low family income (71.2%). The overall prevalence of depression was 12.0%. In the multivariate analysis, eight variables were found to be significantly associated with depression among hill tribe adults aged 30 years and over in Thailand. Being female, 50 years or older, married, and Christian; living with a relative; smoking; using opium; and having moderate and high stress levels were associated with depression.

Conclusion: Effective public health interventions should be considered to reduce the burden of depression in the hill tribe population by focusing on individuals who are female, 50 years or older, married, Christian, and stressed and those who abuse substances.

1. Introduction

Depression is a major mental health problem in all age categories and leads to the loss of life due to suicide [1, 2]. Different factors influence the development of depression, particularly social and economic disparities, in both developed and developing countries [3]. The World Health Organization (WHO) reported that 264 million people in all age categories suffer from depression globally, and more than 800,000 people die due to suicide every year, accounting for 1.5% of all deaths worldwide [4]. Approximately 27.0% of the total population with depression lived in South East Asia (SEA), and females accounted for a greater proportion than males. The total years lived with disability (YLD) associated with

depression was reported to be 724/100,000 people [5]. Although highly effective drugs and treatments are available for depression, people living in low- and middle-income countries face several barriers to accessing drugs and other treatments [6, 7]. It is also well known that depression results from complex interactions among different factors, including personal characteristics, interpersonal relationship skills, family relationships, brain injury, medical conditions, drug use, and other biological factors, such as chemical imbalances in the brain [8].

In Thailand, less than half (48.5%) of people with depression accessed health care services in 2016 [9]. The prevalence of depressive disorder among the Thai population aged 15 years and over was 2.4% [9]. There is little information available on the prevalence and factors

* Corresponding author.

E-mail address: Tawatchai.api@mfu.ac.th (T. Apidechkul).

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associated with depression in different subgroups in the Thai population. Almost all hospitals, including community health care centers in Thailand, have a mental health and counseling clinic that is operated by psychiatric nurses [10]. However, some remote community hospitals and health care centers lack health care professionals who have been trained to provide psychiatric and mental health support, especially in hill tribe villages.

There are six main groups of hill tribes living in Thailand: Akha, Lahu, Hmong, Yao, Karen and Lisu, with a total population of approximately 3.5–4.0 million people [11]. The hill tribes have their own cultures and lifestyle habits, including some particular perceptions and social norms, such as the male domination of decisions within the family [12], education [13, 14], financial management [12], etc. Approximately 30.0% of hill tribe individuals in Thailand are not granted Thai citizenship for various reasons under the relevant laws and regulations [14]. Thai citizenship is shown on the Thai identification card (ID card), which is used to access to all public services, including health care services and education [15]. However, having a Thai ID card is not a guarantee that individuals will seek treatment because people who have mental health problems are often likely to utilize health services due to the substantial stigmatization of mental health problems in Thai populations, including the hill tribe populations [16]. In the context of human resource shortages, particularly in regard to mental health, very little information about major mental health problems, including depression, among the hill tribe populations is available. Moreover, the individual, familial, social, and economic contexts of the hill tribe people could act as factors influencing the development of depression. This study aimed to estimate the prevalence of and factors associated with depression among individuals aged 30 years and older in the hill tribes in Thailand.

2. Methods

A cross-sectional study was performed to collect information from the participants living in hill tribe villages in Chiang Rai Province, Thailand. There are six main hill tribe populations living in Chiang Rai Province, with a total of 749 hill tribe villages and approximately 300,000 people in 18 districts [17].

Six villages in each tribe were randomly selected, and a total of 36 villages were included in the study. People who belonged to one of the six main hill tribe groups and who were 30 years or older on the date of data collection met the inclusion criteria and were invited to participate in the study. This age group was selected because they have unique lifestyle characteristics that are aligned with traditional patterns and differ from those of younger age groups. Those who did not identify as a member of a hill tribe or could not provide all information essential for the analysis were excluded from the study.

The sample size was calculated based on the standard formula for a cross-sectional design: $Z_{\alpha/2} = 1.96$, $P = 0.32$ [18], $Q = 0.68$, and $e = 0.05$. A sample size of 2,007 was calculated. After adding 10.0% for potential missing data or loss to follow-up, at least 2,207 participants were needed for the analysis.

A questionnaire was developed, and its validity and reliability were assessed before use. The item objective congruence (IOC) technique was used to detect the validity of the content by three experts in the field: one psychiatrist, one public health specialist, and one community psychiatric nurse. Questions with scores equal to or less than 0.5 were excluded from the questionnaire, questions with scores of 0.5–0.7 were revised according to the comments of the experts and included in the questionnaire, and questions with scores equal to or greater than 0.71 were revised based on the comments, if necessary, and included in the questionnaire.

The questionnaire was piloted in a sample of 15 similar individuals in Mae Fah Laung District. Questions 1–3 were used to determine the feasibility and order of the questions, while the questions in part 5 were used to determine the feasibility, ordering and reliability, with a Cronbach's alpha of 0.71.

In the final version of the questionnaire, there were six (6) parts. In part one, eleven questions were used to collect the general information of the participants: sex, age, religion, education, occupation, etc. In part two, 5 questions were used to collect information on relationships and crises in the lives of the participants, such as family relationships, conflict with community members, severe injury, and a history of head or brain surgery. The question regarding life crises pertained to events resulting in severe difficulties, such as experiencing a disaster with total or partial property damage or the death of an immediate family member. Severe injury referred to experiencing any injury that necessitated admission to a hospital for more than 5 days or admission to the intensive care unit (ICU) in a hospital. In part three, 8 questions were used to collect information on risky behaviors such as smoking, alcohol use, amphetamine use, and opium use. Part four was the standard test for stress, the stress test-5 (ST- 5) [19]. This test consisted of 5 questions, with four answer choices for each question: 0, 1, 2, and 3. The maximum score was 15, and the minimum score was 0. Those who had scores from 0 to 4 were classified as having low stress levels, those with scores from 5 to 9 had moderate stress levels, and those with scores from 9 to 15 had high stress levels. In part five, 20 questions were used to assess the knowledge and attitudes regarding depression prevention and care, with ten questions for each topic. In the knowledge section, scores equal to or less than 5 indicated a low level of knowledge, scores from 6 to 8 indicated a moderate level of knowledge, and scores of 9 and 10 indicated a high level of knowledge. Another 10 questions were used to detect attitudes toward depression prevention and care; those with scores equal to or less than 5 were defined as having a negative attitude, those with scores from 6 to 8 were defined as having a neutral attitude, and those with scores of 9 and 10 were defined as having a positive attitude. In part six, the Patient Health Questionnaire-9 (PHQ-9) was used to evaluate depression among the participants [20]. The PHQ-9 has been validated for use in the clinic and certain fields in different studies [21, 22]. Participants with scores of 1–4 were classified as having minimal depression or no depression, those with scores of 5–9 were classified as having mild depression, those with scores of 10–19 were classified as having moderate depression, and those with scores of 20–27 were classified as having severe depression.

For data collection, access to selected villages was granted by the district government office. Village headmen were contacted and provided with all essential information regarding the study, and their agreement was obtained. All villagers who met the criteria were listed by the village headman. Appointments were made 5 days in advance with all participants who met the eligibility criteria. On the date of data collection, all participants provided the relevant information and signed an informed consent form before starting the interview. All interviews were voluntary. Six research assistants who were fluent in both Thai and one of the hill tribe languages were recruited and trained for 3 days, which included a pilot test. During the interview process, those who could speak Thai were interviewed by the researcher, but those who could not speak Thai were interviewed by a research assistant. The interview was executed in a private and confidential room, and each interview lasted 25 min.

Data were double entered into Excel sheets. The two Excel sheets were checked for errors, particularly inconsistent items. Afterward, the completed data file was transferred to SPSS (version 24, Chicago, IL). The data were analyzed. Continuous data are described as the means and SDs, while categorical data are presented as proportions. Logistic regression was used to detect the associations between variables and depression at the $\alpha = 0.05$ significance level. For the final model, Pseudo R^2 and the Hosmer-Lemeshow chi-square test were used to fit the model before interpretation.

2.1. Ethical consideration

All the study protocols were approved by the Mae Fah Luang University Research Ethics Committee on Human Research (No. REH-6100).

Before starting the interview, all participants were provided with the relevant essential information. An informed consent form was signed on a voluntary basis before starting each interview. Moreover, all questionnaires were destroyed properly after the data were coded and entered into the Excel sheet, and no data could be traced back to any individual.

3. Results

A total of 2,552 participants were recruited for the study: 65.9% were females, 79.9% were married, 35.8% were 50 years and older (mean age was 54.1 years, SD = 13.0, min = 30, max = 108), and 54.2% were Buddhist. The majority were uneducated (76.7%), were agriculturalists (48.4%), and had low family incomes (71.2%).

Among the participants, 28.0% were Akha, 16.0% were Karen, and individuals from the four other tribes accounted for similar proportions between 11.1–15.3%. Regarding the ability to communicate in Thai, 27.9% could not speak Thai, 26.4% could not understand spoken Thai, 71.4% could not read Thai, and 71.9% could not write in Thai.

Regarding health behaviors, 24.3% smoked, 23.4% used alcohol, 2.9% used opium, 1.6% used amphetamines, 0.7% used heroin, and 60.8% did not exercise. One-third of the participants had chronic diseases (33.7%), and 18.6% had moderate to high stress levels. The prevalence of depression among hill tribe people aged 30 years and over was 12.0% (Table 1).

In the univariate analysis, 15 variables were found to be associated with depression among the hill tribe population aged 30 years and over: age, sex, marital status, tribe, religion, education, family income, cohabitation with relatives, family relationships, experience of a life crisis, smoking, opium use, amphetamine use, stress, and chronic disease.

In the multivariate model, 8 variables remained associated with depression: sex, age, marital status, religion, cohabitation with relatives, smoking, opium use, and stress. Females were 1.50 times (95% CI = 1.05–2.14) more likely to have depression than males. Those aged 50–59, 60–69, and 70–79 years were 1.93- (95% CI = 1.11–3.35), 3.79- (95% CI = 2.17–6.63), and 3.08-fold (95% CI = 1.62–5.85) more likely to have depression, respectively, than those aged 30–39 years. Those who had ever been married were 2.73 times (95% CI = 1.17–6.37) more likely to have depression than those who were single. Those who were Christian were 1.86 times (95% CI = 1.38–2.52) more likely to have depression than those who were Buddhist. Those who were living with relatives were 4.55 times (95% CI = 1.87–11.09) more likely to have depression than who lived alone. Those who smoked were 1.68 times (95% CI = 1.17–2.41) more likely to have depression than those who did not. Those who used opium were 2.71 times (95% CI = 1.36–5.39) more likely to have depression than those who did not. Those who had moderate and high stress levels were 20.18- (95% CI = 14.63–27.84) and 48.10-fold (95% CI = 27.40–84.44) more likely to have depression than those who had low stress levels (Table 2).

4. Discussion

The hill tribe people in Thailand live in poor economic conditions and are often illiterate. The overall prevalence of depression was 12.0%, and the proportion of patients with depression increased with increasing age. A variety of substances were used by members of the hill tribes; however,

few people had experienced severe injuries, including head and brain surgery. A large proportion of the population had chronic diseases and stress. Many factors were associated with depression, such as sex, age, marital status, religion, cohabitation with relatives, smoking, opium use, and stress.

The prevalence of depression among the hill tribe population aged 30 years and over in Thailand was greater than the global prevalence, which was 4.4%, according to the WHO [5]. The proportion of people living in SEA who had depression was reported to be 27.0% [4], which was greater than the proportion in our study. However, a study conducted with data collected cumulatively between 1994 and 2014 in 30 countries found that the prevalence of depression at a single point of estimation was 12.9% and that females had a higher prevalence than males [23]. A study among Thai adults at an outpatient department (OPD) reported that the overall prevalence of depression was 11.5% [24]. A study in the elderly hill tribe population in Thailand reported that the prevalence of depression was 32.9% and that the quality of life was generally low [18].

Being female and relatively older were associated with a greater chance of developing depression than being male and relatively younger. This is supported by a study by Albert, who reported that females had a greater chance of developing depression than males [25]. Moreover, in a cohort study conducted among opposite-sex twin pairs in 2014, it was clearly demonstrated that females had a significantly greater risk of depression than males [26]. This finding was also supported by a meta-analysis conducted in 2017 that reported that females had a greater risk of developing depression than males, particularly during adolescence [27]. Tearne et al. [28] reported that female sex and a relatively older age were associated with a significantly greater risk of depression than male sex and a relatively younger age. A study conducted in a rural elderly Thai population found a greater prevalence of depression among females (35.8%) than males (19.3%) [29]. Apidechkul et al. [14] clearly demonstrated that in some hill tribes in Thailand, such as Akha and Lahu, females live under the control of their husbands, who make all family decisions, including those related to seeking medical care. Moreover, polygamy was also commonly found in the Akha population, which might result in females having less power in their families [30].

In this study, Christianity was one of the factors associated with the development of depression among the hill tribe adult and elderly populations. A study in India found that the Hindu religion had a greater impact on many mental illnesses, including depression, compared to the impacts of other religions [31]. Fruehwirth et al. [32] also reported that religion had a large impact on the development of depression, particularly during adolescence. A prospective cohort study also showed that people who regularly attended religious services were less likely to develop depression than those who did not [33]. A study in married rural Thai women showed that Buddhist women were at a significantly lower risk of depression than women of other religions [34]. However, there have been no studies on whether Christians have a greater chance of depression than individuals of other religions. A more in-depth investigation of socioeconomic status showed that Christians had a lower education level and annual income than Buddhists. These factors might lead to differences in the incidence of depression among people of different religions.

In our study, marital status and living with relatives were factors associated with depression among hill tribe people aged 30 years and over in northern Thailand. A national survey including data collected between 1996 and 2013 in Canada reported that married individuals had greater odds of developing depression than married individuals [35]. A study among Korean women found that being married was a significant risk factor for depression development [36]. However, Nieder et al. [37] reported that there was no significant difference in the development of depression between married and single patients who received palliative radiology. A study among the elderly population living in rural villages in Thailand reported that having ever been married and living with relatives were predictors of the development of depression [38]. Moreover, Apidechkul et al. [14] reported that most hill tribe families and

Table 1. Prevalence of depression among the hill tribe population aged 30 years and over.

| Depression | n | % |
|------------|-------|------|
| No | 2,245 | 88.0 |
| Yes | 307 | 12.0 |
| Low | 289 | 11.3 |
| Moderate | 11 | 0.4 |
| Severe | 7 | 0.3 |

Table 2. Univariate and multivariate analyses identifying factors associated with depression among hill tribe people aged 30 years and over.

| Factor | n (%) | OR | 95% CI | p-value | OR _{adj} | 95% CI | p-value |
|---|----------------------|------------|------------|------------|-------------------|------------|------------|
| Total | 2,552 (100.0) | N/A | N/A | N/A | N/A | N/A | N/A |
| Sex | | | | | | | |
| Male | 870 (34.1) | 1.00 | | | 1.00 | | |
| Female | 1,682 (65.9) | 1.35 | 1.04–1.76 | 0.024* | 1.50 | 1.05–2.14 | 0.024* |
| Age (years) | | | | | | | |
| 30–39 | 368 (14.4) | 1.00 | | | 1.00 | | |
| 40–49 | 619 (24.3) | 1.46 | 0.31–2.33 | 0.117 | 1.51 | 0.87–2.63 | 0.142 |
| 50–59 | 649 (25.4) | 1.68 | 1.06–2.65 | 0.028* | 1.93 | 1.11–3.35 | 0.019* |
| 60–69 | 578 (22.6) | 2.39 | 1.52–3.75 | <0.001* | 3.79 | 2.17–6.63 | <0.001* |
| 70–79 | 271 (10.6) | 2.38 | 1.43–3.97 | 0.001* | 3.08 | 1.62–5.85 | 0.001* |
| ≥80 | 67 (2.6) | 1.02 | 0.38–2.75 | 0.907 | 0.93 | 0.28–3.14 | 0.907 |
| Marital status | | | | | | | |
| Single | 138 (5.4) | 1.00 | | | 1.00 | | |
| Married | 2,039 (79.9) | 1.35 | 0.72–2.55 | 0.348 | 1.44 | 0.65–3.18 | 0.371 |
| Ever married | 375 (14.7) | 3.23 | 1.67–6.27 | 0.001* | 2.73 | 1.17–6.37 | 0.020* |
| Tribe | | | | | | | |
| Akha | 714 (28.0) | 1.04 | 0.68–1.58 | 0.860 | | | |
| Lahu | 391 (15.3) | 1.56 | 1.00–2.43 | 0.048* | | | |
| Hmong | 389 (15.2) | 0.65 | 0.39–1.09 | 0.102 | | | |
| Yao | 368 (14.4) | 0.46 | 0.27–0.81 | 0.007* | | | |
| Karen | 408 (16.0) | 1.28 | 0.82–2.01 | 0.279 | | | |
| Lisu | 282 (11.1) | 1.00 | | | | | |
| Religion | | | | | | | |
| Buddhist | 1,383 (54.2) | 1.00 | | | 1.00 | | |
| Christian | 1,169 (45.8) | 1.75 | 1.37–2.22 | <0.001* | 1.86 | 1.38–2.52 | <0.001* |
| Education | | | | | | | |
| Illiterate | 1,957 (76.7) | 1.00 | | | | | |
| Primary school | 365 (14.3) | 0.75 | 0.52–1.09 | 0.134 | | | |
| Secondary school | 189 (7.4) | 0.43 | 0.23–0.79 | 0.007* | | | |
| High school | 41 (1.6) | 2.85 | 1.44–5.66 | 0.003* | | | |
| Occupation | | | | | | | |
| Unemployed | 628 (24.6) | 1.00 | | | | | |
| Agriculturist | 1,243 (48.7) | 0.87 | 0.65–1.17 | 0.346 | | | |
| Other | 681 (26.7) | 1.06 | 0.77–1.46 | 0.732 | | | |
| Annual income (baht) | | | | | | | |
| ≤50,000 | 1,816 (71.2) | 1.06 | 0.69–1.63 | 0.804 | | | |
| 50,001–100,000 | 527 (20.7) | 0.64 | 0.38–1.07 | 0.090 | | | |
| ≥100,001 | 209 (8.2) | 1.00 | | | | | |
| Family debt | | | | | | | |
| No | 1,764 (69.1) | 1.00 | | | | | |
| Yes | 788 (30.9) | 1.09 | 0.85–1.41 | 0.493 | | | |
| Family members (number of persons) | | | | | | | |
| ≥4 | 1,341 (52.5) | 1.00 | | | | | |
| 5–8 | 1,044 (40.9) | 1.29 | 1.01–1.65 | 0.044* | | | |
| ≤9 | 167 (6.5) | 1.05 | 0.63–1.75 | 0.848 | | | |
| Living with | | | | | | | |
| No one | 162 (6.3) | 1.00 | | | 1.00 | | |
| Spouse | 1,756 (68.8) | 1.41 | 0.77–2.59 | 0.268 | 1.75 | 0.79–3.87 | 0.171 |
| Child | 471 (18.5) | 2.44 | 1.29–4.62 | 0.006 | 1.69 | 0.77–3.73 | 0.195 |
| Relatives | 163 (6.4) | 4.07 | 2.04–8.09 | <0.001* | 4.55 | 1.87–11.09 | 0.001* |
| Family relationship | | | | | | | |
| Good | 1,477 (57.9) | 1.00 | | | | | |
| Neutral | 821 (32.2) | 2.01 | 0.97–4.02 | 0.092 | | | |
| Poor | 254 (9.9) | 2.33 | 1.08–4.56 | <0.001* | | | |
| Conflict with village members | | | | | | | |
| No | 2,227 (87.3) | 1.00 | | | | | |
| Yes | 325 (12.7) | 1.22 | 0.08–3.91 | 0.311 | | | |
| Life crisis | | | | | | | |

(continued on next page)

Table 2 (continued)

| Factor | n (%) | OR | 95% CI | p-value | OR _{adj} | 95% CI | p-value |
|--|--------------|-------|-------------|---------|-------------------|-------------|---------|
| No | 2,271 (88.9) | 1.00 | | | | | |
| Yes | 281 (11.1) | 2.22 | 1.17–3.29 | <0.001* | | | |
| Severe injury | | | | | | | |
| No | 2,528 (99.1) | 1.00 | | | | | |
| Yes | 24 (0.9) | 1.39 | 0.67–3.12 | 0.331 | | | |
| History of head and brain surgery | | | | | | | |
| No | 2,541 (99.6) | 1.00 | | | | | |
| Yes | 11 (0.4) | 1.08 | 0.76–2.89 | 0.444 | | | |
| Smoking | | | | | | | |
| No | 1,932 (75.5) | 1.00 | | | 1.00 | | |
| Yes | 620 (24.3) | 2.20 | 1.72–2.83 | <0.001* | 1.68 | 1.17–2.41 | 0.005* |
| Alcohol use | | | | | | | |
| No | 1,955 (76.6) | 1.00 | | | | | |
| Yes | 597 (23.4) | 0.77 | 0.57–1.04 | 0.090 | | | |
| Opium use | | | | | | | |
| No | 2,479 (97.1) | 1.00 | | | 1.00 | | |
| Yes | 73 (2.9) | 3.10 | 1.84–5.22 | <0.001* | 2.71 | 1.36–5.39 | 0.005* |
| Amphetamine use | | | | | | | |
| No | 2,511 (98.4) | 1.00 | | | | | |
| Yes | 41 (1.6) | 2.41 | 1.17–4.96 | 0.017* | | | |
| Glue use | | | | | | | |
| No | 2,544 (99.7) | 1.00 | | | | | |
| Yes | 8 (0.3) | 2.45 | 0.50–12.18 | 0.274 | | | |
| Heroin use | | | | | | | |
| No | 2,534 (99.3) | 1.00 | | | | | |
| Yes | 18 (0.7) | 1.47 | 0.42–5.10 | 0.546 | | | |
| Exercise | | | | | | | |
| No | 1,551 (60.8) | 1.27 | 0.83–1.95 | 0.269 | | | |
| Sometimes | 719 (28.2) | 1.46 | 0.93–2.29 | 0.103 | | | |
| Regularly | 282 (11.1) | 1.00 | | | | | |
| Chronic disease | | | | | | | |
| No | 1,691 (66.3) | 1.00 | | | | | |
| Yes | 861 (33.7) | 2.33 | 0.77–3.58 | 0.189 | | | |
| Stress (ST-5) | | | | | | | |
| Low | 2,076 (88.0) | 1.00 | | | 1.00 | | |
| Moderate | 399 (15.6) | 18.76 | 13.96–25.21 | <0.001* | 20.18 | 14.63–27.84 | <0.001* |
| High | 77 (3.0) | 42.02 | 25.14–70.23 | <0.001* | 48.10 | 27.40–84.44 | <0.001* |
| Knowledge of depression prevention and care | | | | | | | |
| Low | 2,022 (79.3) | 2.77 | 0.86–4.56 | 0.261 | | | |
| Moderate | 417 (16.3) | 2.21 | 0.98–3.49 | 0.088 | | | |
| High | 113 (4.4) | 1.00 | | | | | |
| Attitude towards depression prevention and care | | | | | | | |
| Negative | 2177 (85.3) | 2.11 | 0.87–4.02 | 0.089 | | | |
| Neutral | 308 (12.1) | 1.38 | 0.55–2.89 | 0.331 | | | |
| Positive | 67 (2.6) | 1.00 | | | | | |

* Significance level at $\alpha = 0.05$.

communities were dominated by males and favored boys over girls. This is clearly reflected in the social norm of male domination, which is similar to the norm in Chinese society, where the ancestors of the hill tribes originally settled before moving south to Thailand [11]. Therefore, married women in hill tribe families are suppressed by the social norm while continuing to work hard to support their family members, particularly their husbands, making them more likely to develop depression.

The use of some substances was found to be associated with depression in the hill tribe population aged 30 years and over. Those who smoked and used opium were more likely to develop depression than those who did not smoke and did not use opium. A critical review of population-based studies showed that smokers were significantly more likely to develop depression than those who did not smoke [39]. Another

systematic review also reported that smoking increased the odds of developing depression in several countries and populations [40]. Moreover, a study in Thailand confirmed the association between smoking and the development of depression in the elderly members of the hill tribes in northern Thailand [18]. In terms of the association between opium use and depression, Semenkovich et al. [41] reported that there was a strong association between opium use and the development of depression. A study in Iran also clearly demonstrated that opium use significantly increased the incidence of severe depression [42]. Most hill tribe villages are located along the borders between Thailand, Myanmar and Laos, which are defined as the area that produces the most drugs in the world, making different drugs, such as amphetamine [12, 43], opium [44], and heroin [44], readily accessible.

In this study, it was found that stress was one of the factors associated with depression among hill tribe people aged 30 years and over. A study among a cohort of Australian nurses reported that stress was strongly associated with depression among the participants [45]. Tafet et al. [46] and Yang et al. [47] also demonstrated an association between stress and depression resulting from various factors and their interactions, such as genetics, neurotransmitters, and inflammatory processes. Moreover, Khan et al. [48] showed the impacts of chronic stress on the development of depression. Additionally, due to the lack of education and low socio-economic status among the hill tribe people, they may experience high levels of stress that lead to depression. Even if they experience stress or depression, their access to health care services in Thailand is very limited [49].

In our study, the tribe was not detected as a factor associated with depression. This means that the development of depression was equally distributed among people in different tribes. However, Chaiut et al. [18] reported that members of some tribes in Thailand had a greater chance of developing depression than those in other tribes. This difference might be influenced by cultural differences. Many studies [50, 51] reported that culture and social norms were major factors affecting the development of depression in different countries and populations.

During the data collection period, some limitations were found. Hill tribe people who were aged 50 years and over needed to have the questions repeated to ensure that they understood the context before they answered. Almost all of the participants aged 50 years and over needed help from trained local people. The context of some questions was not easy to explain to the hill tribe people because they do not have similar words or concepts in their languages; for example, depression is not a concept that is expressed in any of the hill tribe languages.

5. Conclusion

In total, 12.0% of the hill tribe people aged 30 years and over in Thailand have depression. The low economic status, limited education, conflict within family members, and conflict with community members experienced by hill tribe people contribute to the development of depression, and those who are female, relatively older, Christian and stressed and those who abuse substances are more likely than their counterparts to be affected by depression. There are two aspects to addressing the issue of depression in hill tribe populations. First, access to health services should be improved since depression is a treatable disease, and access to medical services at an early stage would be very beneficial for patients, especially with regard to preventing suicide. Second, a screening program should be implemented because none of the 307 participants (12.0%) who were identified in this study as having depression according to the PHQ-9 standard had ever been diagnosed. The aim of the screening program should be to identify the disease in the early stage and facilitate the effectiveness of treatment. Moreover, public health officers should reduce the stigmatization of mental health problems among the hill tribe people and the Thai population.

Declarations

Author contribution statement

C. Chomchoei, T. Apidechkul: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

V. Keawdunglek, C. Wongfu, S. Khunthason, N. Kullawong: Performed the experiments; Contributed reagents, materials, analysis tools or data.

R. Tamornpark: Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data.

P. Upala, F. Yeemard: Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

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Competing interest statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

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