Original Article

Prevalence and Factors Associated with Depression among the Hill Tribe Elderly Population, Thailand

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Background: The elderly hill tribe people are one of the vulnerable populations who are facing the non-communicable disease in Thailand under the limitation to access health care services.

Objective: The present study aimed to assess the prevalence and factors associated with depression among the six main hill tribe elderly populations in Thailand.

***Materials and Methods*:** A cross-sectional study was conducted. Participants were recruited from 61 hill tribe villages in Chiang Rai province, Thailand who had been identified as one of six main hill tribe groups and age ≥ 60 years old. A validated questionnaire was developed and used for data collection. A geriatric depressive scale (GDS-15), physical health assessment forms, and quality of life assessing form were used for assessing the depression and physical health among the participants. A simple random method was used to select the participants. Logistic regression was used for evaluating the associations between variables at the significant level alpha = 0.05.

Results: Total of 717 participants were recruited into the study with mean age at 70.07 years (SD = 7.53), 50.3% were women, 6.1% had no Thai national identification card, 71.1% were Buddhist. 94.1% were illiterate, 93.7% were living alone, 37.4% had no occupation, and 88.8% had income less than 5,000 baht/month (165$US). The health assessment showed 14.5% had BMI at underweight level, 14.8% drank alcohol, and 20.1% smoked, 31.4% had HT, 10.2% had DM, 3.5% had heart disease, 43.0% had oral problem, 25.7% had gout, 19.7% had problem of cognitive impairment, and 51.1% had overall low level of quality of life. The overall prevalence of depression was 32.9%. The multiple logistic regression model showed that two variables were associated with depression among the hill tribe elderly population; tribe and smoking behaviors. Akha tribe had a greater chance to develop depression than Hmong with OR = 2.06 (95%CI = 1.18 - 3.60, p-value = 0.011), Lahu had a greater chance to develop depression than Hmong with OR = 1.81 (95%CI = 1.02-3.20, p-value = 0.041), and Lisu had a greater chance to develop depression than Hmong with OR = 1.77 (95%CI = 1.01-3.11, p-value = 0.046). The hill tribe elderly who quit smoking had a greater chance to develop depression than those who did not smoke with OR = 1.53 (95%CI = 1.02-2.34, p-value = 0.049).

Conclusion: One-third of hill tribe elderly population have depression, therefore Thailand needs to develop a standard tool for assessing depression in the hill tribe elderly, and also needs to develop the health promotion program to improve this problem in these particular populations.

Keywords: Depression, Hill tribe, Elderly, Prevalence

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World Health Organization (WHO) estimated that depression will be the most important single cause of disability in all people in both developed and developing countries, particularly among the elderly population by 2020[1]. Although depression is a common mental health problem in the aging population, the estimates for the prevalence of depression in the elderly are greatly different which is related to sex, age, socioeconomic status etc.[2]. Previous studies reported that many factors associated with depression such as sex, underlying diseases, disability or functional limitation, lower educational attainment, perceived income inadequacy, and alcohol abuse were possible risk factors for geriatric depression[3-5].

The hill tribes have been identified by the Thai government as a minority lived in rural northern Thailand, consisted of six main groups: Akha, Lahu,

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Karen, Yao, Hmong, and Lisu[6]. In 2016, WHO estimated that 2.5 million of the hill tribe people lived in Thailand especially northern provinces such as Chiang Rai, Chiang Mai, and Pha-Yao. Approximately 250,000 hill tribe people lived in Chiang Rai province in 2015 in 527 villages along 18 sub-districts. They are living in a disadvantaged situation and have become a new vulnerable group for many health problems in Thailand. The hill tribe people have their own specific unique culture and life style. Most of them have been classified as living under the national poverty line in Thailand, with their economy depending on traditional and uneconomic crops[7]. As a result, they have limited access to all public services, such as educational and health care services. They are also less opportunity to engage in professional jobs, and getting adequate nutrition. Due to living in remote areas and low level to access educational system, a large proportion cannot communicate in Thai especially the elderly population[8]. Regarding access to health care service, the hill tribe elderly are not facing only limited communication in Thai, but also facing a problem of transportation from the village to a hospital in need, particularly in raining season with poor road condition. Previous studies presented that many factors were associated with depression among the elderly population[9,10], however; the findings were different from population to population, country to country, and region to region[11]. Depression is also defined as a major health problem among the elderly population and induced a low quality of life[12,13], and leading to the burden on health care service worldwide by the year 2020[1]. However, there is little information available on the prevalence and factors associated with depression among the hill tribe elderly in Thailand.

Therefore, it is not clear whether symptoms of depression and anxiety in hill tribes population, or whether there is type specificity of depression or anxiety symptoms, which could have implicated for etiology and treatment. The purpose of the present study was to assess the prevalence and to identify the risk factors for depression among the hill tribe elderly by the geriatric depressive scale.

Materials and Methods

Study design

A cross-sectional study was conducted to elicit the essential information from the hill tribe elderly population using the standard tool in Chiang Rai, Thailand in 2016.

Study setting

In 2016, there were 647 hill tribe villages in Chiang Rai; 243 Akha villages, 316 Lahu villages, 56 Hmong villages, 63 Yao villages, 36 Karen villages, and 35 Lisu villages[6]. Total of, 61 villages were selected to study by a simple random method, 10 villages in each tribe.

Study population

The hill tribe elderly who lived in the study settings were identified as the study population.

Eligible population

The hill tribe elderly who met the following criteria were the eligible population; a) identified themselves as one of the six main tribes, b) aged more than 60 years old which identified by asking, c) living at the study setting for at least 1 year. There was no issue with Thai language skills of the selected subjects because the four research assistants could speak the 6 hill tribe languages had been recruited and trained for 3 days before commencement of the project.

Research instruments

The research instruments consisted of three parts; i) a-12 item for collecting general information and medical history, ii) a-15 item of geriatric depression scale (GDS-15), iii) and a-12 item of SF-12 (The 12-Item Short Form Health Survey).

A-12 item questionnaire had been tested among 15 participants in the pilot step with obtaining the Cornbrash's alpha = 0.82 before using of collecting general information and medical history of the participants. The questions consisted of age, sex, religion, income, education, etc. The questions also extended to ask about medical history such as: having hypertension, diabetes, gout, etc.

A 15-item geriatric depression scale (GDS-15) was used to gather the information from the participants to assess depression[14]. It had been tested for reliability and validity in different populations and in different countries[15]. It also had been used and evaluated in Thai populations with a 0.89 on sensitivity, and 0.85 on a Cronbach's alpha coefficient. Regarding the interpretation, if a GDS-15 score is more than 6, it is generally considered to represent depression[16].

The third part of the questionnaire was used for detecting quality of life, the authors used the 12-Item Short Form Health Survey (SF-12) consisted of 2 sessions: i) physical component score (PCS; physical functioning, role physical, body pain and general

health), and ii) mental component score (MCS; vitality, social functioning, role emotional and mental status) [17]. The modified quality of life questionnaire translated into Thai was used in the study. At a 50 score was used as the cut-off point for separating the high and low quality of life after conversing to:

[The cut-off point of SF-12 = (100/rang difference of score) x (raw score – min score)]

The Mini-Mental state examination (MMSE) was used as the last part of the questionnaire. MMSE was used for detecting the cognitive impairment in the elderly population. The cut-off point for having a cognitive impairment among the illiterate is less than14 (sensitivity = 0.35 and specificity = 0.81), less than 17 for those who graduated a primary school (sensitivity = 0.57 and specificity = 0.94), and less than 22 for those who graduated a high school the educated people (sensitivity = 0.92 and specificity = 0.93)[18].

Data collection procedures

A simple random method from the list of the six hill tribe village roasters was done for selecting 10 villages from each tribe. An official letter was sent to the village headman for appointment. On the day of the meeting of the research team and selected village headmen and village's committee, all essential information related to the research project was provided. After getting the acceptance from the village headman, 10 elderly people who met the eligible criteria were selected by a simple random method from the list of the people aged more than 60 years old. An appointment was made for interview on the next day.

Before starting interview, all essential information regarding the project was provided again to the participants, and informed consent form was obtained from all participants by fingerprint. Participants who could not speak Thai were interviewed by a trained research assistant. All interviews were conducted in a private room. Each interview lasted for 30 minutes.

Data analysis

Descriptive and inferential statistics were used for analysis. Continuous data with normal distribution were described by mean and standard deviation, while categorical data were presented in form of percentages. Logistic regression was used for testing the association between variables at the significant level at alpha = 0.05. All analyses were performed using SPSS version 20.0 (SPSS Inc., Chicago, IL, USA).

Ethical consideration

The research project including tools used in the present study had been approved by the Institutional Review Board and Ethics Committee of Mae Fah Luang University (REH-58088). All information obtained from the interview was kept in a secure file which only the researchers could access by a specific password. All participants were given a small gift of appreciation.

Results

Demographic characteristics

Total of 717 participants having valid information were included in the analysis. The mean age of participants was 70.07 years (SD = 7.53) and 50.3% were women, 6.1% had no Thai national identification card, 17.4% were Hmong, 16.6% were Akha, 16.0% were Lahu, 16.2% were Yao, 17.2% were Karen, and 16.6% were Lisu, 66.9 were married, 71.1% were Buddhist, 94.1% were illiterate, 93.7% were living alone, 37.4% had no occupation, 88.8% had income less than 5,000 baht/month, 14.5% had BMI at underweight level, and 45.7% had BMI at overweight level, 14.8% drank alcohol, 20.1% smoked, 2.1% used opium. Regarding to the health condition, 31.4% had HT, 10.2% had DM, 3.5% had heart disease, 43.0% had oral problem, 25.7% had gout.

Regarding to the cognitive impairment and quality of life, 19.7% had problem of cognitive impairment (MMSE), 51.1% had overall low quality of life (SF-12 < 50), 73.9% had low level of quality of life in the physical aspect, and 45.6% had the low level of quality of life in the mental aspect.

The overall prevalence of depression among the hill tribe elderly population was 32.9% (Table 1).
In the simple logistic regression to find the association between independents variables including personal characteristics, socio-demographic, health conditions, and also quality of life with the occurrence of depression (Table 2). Four variables had shown the association with depression; tribe, smoking habit, cognitive impairment, and quality of life. Regarding to the tribe, Akha had a greater chance to develop depression than Hmong 2.09 times (90CI% = 1.31 - 3.33), Lahu had a greater chance to develop depression than Hmong 1.98 times (90%CI = 1.23 - 3.17), Lisu

Table 1. Prevalence of depression in the hill tribe elderly

Score	n	%	95 % CI
No depressive symptom (GDS <6)	386	72.1	68.6 to 74.3
Depression (GDS ≥ 6)	236	32.9	

Table 2. Simple logistic regression analysis identifying the factors associated with depression in the hill tribe elderly population

Characteristics	n (%)	Depression		OR	90% CI	*p*-value
		Yes (%)	No (%)			
Gender						
Male	356 (49.7)	120 (33.7)	236 (66.3)	1.07	0.83 to 1.40	0.654
Female	361 (50.3)	116 (32.1)	245 (67.9)	1.00		
Age (years)						
60-69	370 (51.6)	127 (34.3)	243 (65.7)	1.00		
70-79	254 (35.4)	75 (29.5)	179 (70.5)	0.80	0.60 to 1.07	0.209
80 and above	93 (13.0)	34 (36.6)	59 (63.4)	1.10	0.74 to 1.64	0.686
Nationality						
Thai	673 (93.9)	218 (32.4)	455 (67.6)	1.00		
Non-Thai	44 (6.1)	18 (40.9)	26 (59.1)	1.45	0.86 to 2.44	0.246
Tribe						
Hmong	125 (17.4)	29 (23.2)	96 (76.8)	1.00		
Akha	119 (16.6)	46 (38.7)	73 (61.3)	2.09	1.31 to 3.33	0.009*
Lahu	115 (16.0)	43 (37.4)	7 2(62.6)	1.98	1.23 to 3.17	0.017*
Yao	116 (16.2)	37 (31.9)	79 (68.1)	1.55	0.96 to 2.50	0.132
Karens	123 (17.2)	39 (31.7)	84 (68.3)	1.53	0.96 to 2.57	0.134
Lisu	119 (16.6)	42 (35.3)	77 (64.7)	1.81	1.13 to 2.89	0.039*
Religion						
Baddish	510 (71.1)	168 (32.9)	342 (67.1)	1.00		
Christian	207 (28.9)	68 (32.9)	139 (67.1)	0.99	0.75 to 1.33	0.981
Education						
Illiterate	675 (94.1)	223 (33.0)	452 (67.0)	1		
Primary school or higher	42 (5.9)	13 (31.0)	29 (69.0)	0.91	0.52 to 1.60	0.780
Marital status						
Single	14 (2.0)	7 (60.0)	7 (50.0)	1.78	0.72 to 4.44	0.293
Marriage	80 (66.9)	80 (25.9)	143 (64.0)	1		
Separate/Divorce	223 (31.1)	149 (31.0)	331 (69.0)	0.81	0.61 to 1.07	0.204
Living						
With family	45 (6.3)	218 (32.4)	454 (67.6)	1.00		
Alone	672 (93.7)	18 (40.0)	27 (60.0)	1.39	0.83 to 2.33	0.298
Occupation						
Yes	449 (62.6)	85 (31.7)	183 (68.3)	1.00		
No	268 (37.4)	151 (33.6)	298 (66.4)	0.92	0.70 to 1.20	0.598
Income (Bath)						
None	65 (9.1)	2 (3.1)	63 (96.9)	2.36	0.83 to 6.67	0.177
≤ 5000	637 (88.8)	23 (3.6)	614 (96.4)	1.28	0.48 to 3.37	0.679
>5000-10000	15 (2.1)	0 (0.0)	15 (100)	1.00		
BMI						
Under weight	104 (14.5)	32 (30.8)	72 (69.2)	0.88	0.58 to 1.31	0.588
Normal	285 (39.7)	96 (33.7)	189 (66.3)	1.00		
Obese	328 (45.7)	108 (32.9)	220 (67.1)	0.97	0.73 to 1.28	0.843
Alcohol use						
Yes	106 (14.8)	38 (35.8)	68 (64.2)	1.10	0.76 to 1.60	0.659
Quit	126 (17.6)	35 (27.8)	91 (72.2)	0.76	0.53 to 1.10	0.214

No	485 (67.2)	163 (33.6)	322 (66.4)	1.00		
Smoking						
Yes	144 (20.1)	50 (34.7)	94 (65.3)	1.22	0.88 to 1.71	0.321
Quit	134 (18.7)	53 (39.6)	81 (60.4)	1.51	1.10 to 2.11	0.046*
No	439 (61.2)	133 (30.3)	306 (69.7)	1.00		
Opium						
Yes	15 (2.1)	5 (33.3)	10 (66.7)	1.19	0.21 to 6.69	0.868
Quit	48 (6.7)	15 (31.3)	33 (68.8)	1.11	0.40 to 3.08	0.864
No	654 (91.2)	216 (33.0)	438 (67.0)	1.00		
Regularly exercise						
No	78 (10.9)	129 (33.8)	253 (66.2)	1.00		
Yes	257 (35.8)	24 (30.8)	54 (69.2)	0.87	0.56 to 1.36	0.608
Physical activity	382 (53.3)	83 (32.3)	174 (67.7)	0.94	0.71 to 1.24	0.698
Hypertension						
Yes	225 (31.4)	72 (32.0)	153 (68.0)	0.94	0.71 to 1.25	0.724
No	492 (68.6)	164 (33.3)	328 (68.0)	1.00		
Diabetes						
Yes	73 (10.2)	23 (31.5)	50 (68.5)	0.93	0.60 to 1.44	0.787
No	644 (89.8)	213 (33.1)	431 (66.9)	1		
Heart						
Yes	25 (3.5)	7 (28.0)	18 (72.0)	0.79	0.37 to 1.66	0.595
No	692 (96.5)	229 (33.1)	463 (66.9)	1.00		
Oral problem						
Yes	308 (43.0)	102(33.1)	206(66.9)	1.02	0.78 to 1.32	0.920
No	409(57.0)	134(32.8)	275(67.2)	1.00		
Gout						
Yes	393 (25.7)	137 (34.9)	256 (65.1)	1.22	0.93 to 1.58	0.222
No	324 (45.2)	99 (30.6)	225 (69.4)	1.00		
Numb						
Yes	184 (25.7)	64 (34.8)	120 (65.2)	1.20	0.83 to 1.51	0.532
No	533 (74.3)	172 (32.3)	361 (67.7)	1.00		
Cognitive impairment (n=608)						
Yes	141 (19.7)	56 (39.7)	85 (60.3)	1.42	1.02 to 1.97	0.078*
No	467 (65.1)	148 (31.7)	319 (68.3)	1		
Overall Quality of Life (n=331)						
Low level	169 (51.1)	54 (32.0)	115 (68.0)	1.22	0.82 to 1.81	0.407
High level	162 (48.9)	45 (27.8)	117 (72.2)	1.00		
Physical aspect in QoL (n=331)						
Low level	244 (73.9)	75 (30.7)	169 (69.3)	1.22	0.77 to 1.93	0.486
High level	86 (26.1)	23 (26.7)	63 (73.3)	1.00		
Mental aspect in QoL (n=331)						
Low level	151 (45.6)	5 5(36.4)	96 (63.6)	1.77	1.19 to 2.64	0.018*
High level	180 (54.4)	44 (24.4)	136 (75.6)	1		

* Significant at = 0.10

had a greater chance to develop depression than Hmong 1.81 times (90%CI = 1.13 - 2.89). The hill tribe elderly who quit smoking group had a greater chance to develop depression than those in no smoking with OR = 1.51 (90%CI = 1.10 - 2.11), and those who had cognitive impairment had a greater chance to develop depression than those who did not with OR = 1.42 (90%CI = 1.02 - 1.97), and those who had low level of the mental aspect in the quality of life had a greater chance of depression development than those who had high level with OR = 1.77 (95%CI = 1.19 - 2.64). In the multiple logistic regression, after control for all possible confounder factor, it was found that two variables were associated with depression among the hill tribe elderly; tribal and smoking behaviors. Akha tribe had a greater chance to develop depression than Hmong with OR = 2.06 (95%CI = 1.18 - 3.60), Lahu had a greater chance to develop depression than Hmong with OR = 1.81 (95%CI = 1.02 - 3.20), and Lisu had a greater chance to develop depression than Hmong with OR = 1.77 (95%CI = 1.01 - 3.11). The hill tribe elderly who quit smoking had a greater chance to develop depression than those who did not smoke with OR = 1.53 (95%CI = 1.02 - 2.34) (Table 3).

Discussion

The findings from the present study in the hill tribes elderly were mostly in agreement with previous studies, i.e.: quit smoking and cognitive impairment were found to be risk factors of depression in the elderly but not significant. Ethnicity or tribal is an important risk factor of depression in the hill tribe elderly in the present study. The authors found that depression in hill tribe community of Thailand is a common condition: one of half subjects 60 - 69 years is affected. Osborn et at[4] In United Kingdom, found the age > 75, people in long-term care had moderate/severe cognitive impairment. The 15-item geriatric depression scale was administered. At an identical cut-off (>6), the prevalence rate of 27.9 % was higher than that in the English study (7.7%). With regard to the total population of the elderly in both studies, depression rates are probably underestimated;[5] reported the prevalence rates of depression found among non-demented primary care attenders were three to four times higher than in the community-dwelling elderly. Community–based studies indicated that depression rates among the old age were significantly higher among women compared to men[3]. Reppermund et al [19] supported the difference of depression rates between genders was caused by the fluctuation of hormone particularly in the menopausal stage. This was in contrast with the present study which found that there was no significant difference of depression between genders among the hill tribe elderly population. Osborn et al[4] also found that after controlling for potential risk factors, there was no significant correlation between female gender and depression disease.

The tribal effect on depression rate which was significantly higher in the hill tribes elderly, could also be confirmed by results of the present study. However, after controlling for all variables, this association was no longer significant. Univariate analysis revealed significant associations between depression and tribal (Akha, Lahu, and Lisu), smoking, cognitive impairment, and mental QOL, at first led one to presume a risk effect for subjects. However, the association was no longer significant

Table 3. Multiple logistic regression analysis for assessing the factors associated with depression in the hill tribe elderly population

Characteristics	Depression % (n /total)	OR_{Adj} (95% CI)	*p*-value
Tribe			
Akha	38.7 (46/119)	2.06 (1.18 to 3.60)	0.011*
Lahu	37.4 (43/115)	1.81 (1.02 to 3.20)	0.041*
Yao	31.9 (37/116)	1.44 (0.81 to 2.55)	0.219
Karens	31.7 (39/123)	1.32 (0.74 to 2.37)	0.347
Lisu	35.3 (42/119)	1.77 (1.01 to 3.11)	0.046*
Hmong	23.2 (29/125)	1.00	
Smoking			
Yes	34.7 (50/144)	1.23 (0.82 to 1.85)	0.316
Quit	39.6 (53/134)	1.53 (1.02 to 2.34)	0.049*
No	30.3 (133/439)	1.00	

* Significant at α= 0.05

after adjustment for gender and age. A previous study showed a similar trend with regard to marital status, a lesser number of depression disorders found among married subjects[20,21].

In correspondence to the results of De Mello et al[22], the authors found increased depression rates among subjects with impaired mobility, vision, or hearing, the extent of the relationship was modified by the variables age and gender, and in the further course also by the other potential risk factors, but remained significantly correlated with a depressive disorder for all functionally impaired groups in regular exercise was shown to be a protective factor for depression in the elderly with the support of some neurochemical action[5].

With regard to the relationship between lifestyle factors (consumption of nicotine) and depression, the results supported the findings reported by previous study: higher significant correlations between consumption of nicotine and depressive symptoms were found in both study; however, the correlations between quitting smoking and depressive symptoms were highly significant, even after controlling for potential risk factors[23-25]. Wongphom et al[8] also found that current smoking is associated with increased frequency and severity of depression.

Smoking has been identified as risk factor of depression in previous studies, which was confirmed in the present study[24-27]. Other studies described association between smoking and depression, therefore we can be quite sure that smoking was risk factor of depression in the elderly. And the memory or cognitive impairment is a risk factor of depression in the hill tribe elderly[21-24]. This finding is in accordance with several previous studies reporting an association of subjective memory impairment or cognitive impairment with depression. On the other hand, some author posited that depression causes subjective memory impairment or cognitive impairment.

Conclusion

In conclusion, depression is still one of the most important health problems among the hill tribe elderly population with a high prevalence compared to Thai general populations. However, the problem is presented at different levels among the different tribes, therefore there is need to develop a policy and set up a health system to improve the situation for this group of people. There is need to consider the different aspects of their cultures and lifestyles before developing the health system. Moreover, a specific tool for exploring the depression in this group is needed to get the real situation of depression. Finally, public health intervention for some specific tribe to improve the depression problem is urgently need as well.

What is already known on this topic?

Depression is the major health problem among the aging population. Many factors have been reported as the risk factors for the depression such as age, education, marital status, etc. However, they are different potential to be the risk factors in different studies, different population, and different countries. Even in Thailand, with different population, the results had been reported on different factors influencing in depression among the elderly, but the information in the hill tribe elderly population is not available.

What is this study added?

The prevalence of depression among the hill tribe elderly population in northern Thailand is 32.9%. Two variables are associated with depression; tribe and smoking behavior. Some tribe has been at risk than another tribes, and those having a history of quit smoking have a greater chance to develop depression among the hill tribe elderly.

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Potential conflict of interest

The authors declare no conflicts of interest.

References

1. World Health Organization. The Global strategy and action plan on ageing and health [Internet]. 2017 [cited 2017 May 26]. Available from: http://www.who.int/mental_health/publications/action_plan/en/.
2. Vink D, Aartsen MJ, Schoevers RA. Risk factors for anxiety and depression in the elderly: a review. J Affect Disord 2008; 106: 29-44.
3. Veer-Tazelaar PJ, van Marwijk HW, Jansen AP, Rijmen F, Kostense PJ, van Oppen P, et al. Depression in old age (75+), the PIKO study. J

Affect Disord 2008; 106: 295-9.
4. Osborn DP, Fletcher AE, Smeeth L, Stirling S, Bulpitt CJ, Breeze E, et al. Factors associated with depression in a representative sample of 14 217 people aged 75 and over in the United Kingdom: results from the MRC trial of assessment and management of older people in the community. Int J Geriatr Psychiatry 2003; 18: 623-30.
5. Weyerer S, Eifflaender-Gorfer S, Kohler L, Jessen F, Maier W, Fuchs A, et al. Prevalence and risk factors for depression in non-demented primary care attenders aged 75 years and older. J Affect Disord 2008; 111: 153-63.
6. Apidechkul T, Wongnuch P, Sittisarn S, Ruanjai T. Health situation of Akha Hill Tribe in Chiang Rai Province, Thail;'and. J Pub Health Dev 2016; 14: 77-97.
7. Cole MG, Dendukuri N. Risk factors for depression among elderly community subjects: a systematic review and meta-analysis. Am J Psychiatry 2003; 160: 1147-56.
8. Wongpoom T, Sukying C, Udomsubpayakul U. Prevalence of depression among the elderly in Chiang Mai Province. J Psychiatr Assoc Thai 2011; 56: 103-16.
9. Alexopoulos GS. Depression in the elderly. Lancet 2005; 365: 1961-70.
10. Cole MG, Bellavance F, Mansour A. Prognosis of depression in elderly community and primary care populations: a systematic review and meta-analysis. Am J Psychiatry 1999; 156: 1182-9.
11. Imai H, Chen WL, Fukutomi E, Okumiya K, Wada T, Sakamoto R, et al. Depression and subjective economy among elderly people in Asian communities: Japan, Taiwan, and Korea. Arch Gerontol Geriatr 2015; 60: 322-7.
12. Bhamani MA, Khan MM, Karim MS, Mir MU. Depression and its association with functional status and physical activity in the elderly in Karachi, Pakistan. Asian J Psychiatr 2015; 14: 46-51.
13. Barcelos-Ferreira R, Nakano EY, Steffens DC, Bottino CM. Quality of life and physical activity associated to lower prevalence of depression in community-dwelling elderly subjects from Sao Paulo. J Affect Disord 2013; 150: 616-22.
14. Yesavage JA, Brink TL, Rose TL, Lum O, Huang V, Adey M, et al. Development and validation of a geriatric depression screening scale: a preliminary report. J Psychiatr Res 1982; 17: 37-49.
15. Edelstein BA, Drozdick LW, Ciliberti CM. Assessment of depression and bereavement in older adults. In: Lichtenberg PA, editor. Handbook of assessment in clinical gerontology. 2nd ed. San Diego: Academic Press; 2010: 3-43.
16. Colasanti V, Marianetti M, Micacchi F, Amabile GA, Mina C. Tests for the evaluation of depression in the elderly: a systematic review. Arch Gerontol Geriatr 2010; 50: 227-30.
17. Ware J Jr, Kosinski M, Keller SD. A 12-Item Short-Form Health Survey: construction of scales and preliminary tests of reliability and validity. Med Care 1996; 34: 220-33.
18. Boonkerd P, Assantachai P, Senanarong W, Pantumchinda K, Chantasirikarn S. Clinical practice guideline for dementia. Bangkok: Neuroscienc Institute; 2003. [in Thai]
19. Fischer P, Zehetmayer S, Jungwirth S, Weissgram S, Krampla W, Hinterberger M, et al. Risk factors for Alzheimer dementia in a community-based birth cohort at the age of 75 years. Dement Geriatr Cogn Disord 2008; 25: 501-7.
20. Polyakova M, Sonnabend N, Sander C, Mergl R, Schroeter ML, Schroeder J, et al. Prevalence of minor depression in elderly persons with and without mild cognitive impairment: a systematic review. J Affect Disord 2014; 152-154: 28-38.
21. Reppermund S, Brodaty H, Crawford JD, Kochan NA, Slavin MJ, Trollor JN, et al. The relationship of current depressive symptoms and past depression with cognitive impairment and instrumental activities of daily living in an elderly population: the Sydney Memory and Ageing Study. J Psychiatr Res 2011; 45: 1600-7.
22. De Mello MT, Lemos VA, Antunes HK, Bittencourt L, Santos-Silva R, Tufik S. Relationship between physical activity and depression and anxiety symptoms: a population study. J Affect Disord 2013; 149: 241-6.
23. Coulson CE, Williams LJ, Berk M, Lubman DI, Quirk SE, Pasco JA. Association between alcohol consumption and self-reported depression among elderly Australian men. Geriat Ment Health Care 2014; 2: 3-8.
24. Goodwin RD. Association between physical activity and mental disorders among adults in the United States. Prev Med 2003; 36: 698-703.
25. Heun R, Hein S. Risk factors of major depression in the elderly. Eur Psychiatry 2005; 20: 199-204.
26. Formagini TDB, Gomide HP, Perales J, Colugnati FAB. Prevalence and correlates of light and non-daily smoking in Brazil: Results from a nationwide

representative survey. Drug Alcohol Depend 2017; 178: 15-9.
27. Liew HP, Gardner S. The interrelationship between smoking and depression in Indonesia. Health Pol Tech 2016; 5: 26-31.