ORIGINAL ARTICLE

Factors Influencing Depression in Older Adults with Non-Communicable Diseases in Nonthaburi, Thailand

Walaya Tupanich, MS[1], Pramote Wongsawat, PhD[1], Hathaipat Settanachok, MD[2]

[1] Faculty of Public Health, Naresuan University, Phitsanulok, Thailand; [2] Sainoi Hospital, Nonthaburi, Thailand

Background: Depression is a widespread problem among older adults with non-communicable diseases (NCDs) who lack strength, independence, and self-esteem. It makes them hesitant to take part in social activities. The result is loneliness, unhappiness, and depression. If untreated, depression could lead to suicide. Therefore, depression risk factors should be used to identify at-risk groups.

Objective: To examine the factors influencing depression in older adults with NCDs.

Materials and Methods: The entire sample consisted of older adults aged 60 years with NCDs. A cluster sampling method was used to collect data in Nonthaburi Province, Thailand. Data were collected between January and March 2023, using an interview form with a Cronbach's alpha coefficient of 0.708 to 0.903. The data obtained were analyzed by using descriptive statistics and binary logistic regression.

Results: Of the 608 participants enrolled, 23.8% were found the risk of depression. The factors influencing depression were alcohol use (AOR 23.14, 95% CI 1.43 to 37.59, p=0.027), no education (AOR 11.14, 95% CI 1.38 to 90.06, p=0.024), insufficient sleep (AOR 7.61, 95% CI 2.16 to 26.82, p=0.002), activities of daily living (ADL) (AOR 4.10, 95% CI 1.23 to 13.70, p=0.022), inadequate diet (AOR 2.59, 95% CI 1.14 to 5.91, p=0.024), loneliness (AOR 2.36, 95% CI 1.26 to 4.42, p=0.007), diabetes mellitus (AOR 2.02, 95% CI 1.11 to 3.67, p=0.022), widowhood (AOR 1.87, 95% CI 1.04 to 3.34, p=0.036), hobbies (AOR 0.17, 95% CI 0.05 to 0.57, p=0.004), and psychological well-being (AOR 0.15, 95% CI 0.07 to 0.31, p<0.001).

Conclusion: The results of the present study could be used to develop activity programs or guidelines to monitor and prevent depression among older adults with NCDs by public health personnel, village health volunteers, community leaders, neighbors, family members, or elder-care providers.

Keywords: Depression; Older adults; Non-communicable diseases; Nonthaburi; Thailand

As the older adult population ages, the age structure increases. In 2021, the global population was 7.875 billion, with 1.080 billion over 60 or 14.0%. In 2022, Thailand had 12.6 million older adults or 19.2%. From good health to poor health, older adults experience a decline in physical, mental, emotional, social, and spiritual aspects affecting their daily lives[1,2]. In Thailand, most older adults have non-communicable disease (NCD). The most common diseases are hypertension at 46.06%, diabetes mellitus at 21.12%, and stroke at 2.43%[3]. Thus, age can negatively affect mental health, especially in older adults who are dependent or disabled. Depression is generally associated with a lack of happiness, a sense of discouragement, hopelessness, and worthlessness. The psychiatric disorder rate is 43.7%, and the depression rate is 7.9% to 17.0%, which can lead to suicide attempts when severe, while increasing family burdens and the risk of suicidal thoughts in the future[4].

In a study of depression among older adults in Thailand, physical illness was found to be the major determining factor among those with NCDs. Saen Suk, Chonburi Province, has a 29.73% prevalence of depression among chronic disease patients[5] and the Bueng Kham Phroi Health Promoting Hospital, Bueng Kham Phroi Subdistrict, Lam Luk Ka District, Pathum Thani Province, has reported a 17.2% rate of mild depression, a 6.3% rate of moderate depression, and a 3.1% rate of with severe depression[6]. Depression is more common in older adults with NCDs, such as those with diabetes mellitus, cancer, cardiovascular disease, and stroke, at rates of 25.0%, 18.0% to 20.0%, and 10.0% to 27.0%, respectively[4].

Correspondence to:

Tupanich W.

Faculty of Public Health, Naresuan University, 99 Moo 9, Phitsanulok 65000, Thailand.

Phone: +66-55-967444, **Fax**: +66-55-967333

Email: walayatupanich@gmail.com

In Thai patients with chronic diseases, depression is found at 30.2% to 42.0%, followed by cancer at 43.3%, diabetes mellitus at 30.7% to 39.6%, hypertension at 25.0%, and stroke at 10.8% to 35.6%[7,8]. As clinically defined, depression involves multiple emotions, including anger, fear, anxiety, despair, and guilt. Feelings of ennui and sadness can be diagnosed by a physician as depressive disorder. Symptoms vary, depending on severity, gender, and age. In addition to feeling depressed, anxious, lonely, hopeless, irritable, and disinterested in once exciting things, forgetfulness may also occur. Although rarely occurring, the emotions are intense and last longer than usual[9]. Consequently, the body can feel exhausted all the time with chronic pain, sleeping problems, weight gain loss, social isolation, inability to concentrate, loss of interest in enjoyable activities, and suicidal thoughts. Thus, NCDs in old age require long-term treatment as the elderly become dependent on others, which decreases their self-esteem, discourages them in life, and makes them feel weak. Lack of participation in social activities leads to loneliness, depression, and suicide as a result of lack of interaction with others.

Among older adults with NCDs attending NCD clinics and community hospitals in Nonthaburi Province, 15.3% reported depression. Depression is influenced by several factors among older adults with NCDs, including personal factors such as gender, age, marital status, education level, occupation, income, family history of depression, NCDs, and caregiver, intra-personal factors such as health perception, self-esteem, psychological well-being, spiritual well-being, cognitive performance, coping abilities/stress, and loneliness, health factors such as continuous treatment, complications, and activities of daily living (ADL), health behaviors such as diet, exercise, sleep, smoking, alcohol use, and hobbies, and family and social factors such as social support, family relationships, and care/caring[10]. Many people are not screened for depression risks. As part of the fiscal year 2021, depression risk was assessed by using 2Q and depression was screened by using 9Q[11]. Older adults accounted for 24.97% and 54.9%, while chronic disease patients accounted for 24.6% and 42.4%[3]. When depression is detected, patients receive continuous treatment. Moreover, undetected risk groups are excluded from the care system, increasing their chances of becoming depressed and suicidal. Current depression prevalence and influencing factors in older adults with NCDs may differ from those found in the earlier studies.

Therefore, the researcher is interested in studying the factors influencing depression in older adults with NCDs, then developing a model for preventing depression among older adults with NCDs based on these factors. Preventing depression at its earliest stage is the ultimate goal. In this way, older adults with NCDs who are at risk of depression will receive timely, appropriate, and proper care, which will benefit them, their families, communities, and the public health system.

Materials and Methods
Study design and setting
The present study design was cross-sectional. Population-based data were collected in Nonthaburi, Thailand. Researchers used the concept of health determinants to study the factors influencing depression in older adults with NCDs in Nonthaburi Province. There were four factors that affected depression among older adults with NCDs, 1) personal factors, 2) intra-personal factors, 3) health factors and health behaviors, and 4) family and social factors[12]. Data was collected between January and March 2023.

Ethical Considerations: The present research was initiated at a Naresuan Human University research workshop in January 2023, IRB No. P3-0100/2565. In conducting the research, the researcher adhered to the principle of protecting rights, such as introducing herself and clarifying the research objectives. The subjects had the option to decline or voluntarily participate in the study. Information collected through questionnaires was kept confidential. No sample names were specified on the interview forms, which were kept confidential and only accessible by the researcher. The data would be destroyed after a year had passed following data analyses and report writing. Publication and presentation of these overviews would not identify the sample.

Participants (sample size)
The population for the study was 17,831[13] older adults aged 60 years and up with NCDs living in Nonthaburi Province. The sample size for the present study was calculated by using the population proportion estimation formula (p=0.239)[14], which yielded 608 participants. The selection was conducted using cluster sampling. The research exclusion criteria excluded older adults who had serious, sudden illnesses preventing them from providing information, and those who were not in the area at the time of the present study.

Research instrument

Data were collected from the interview form containing five parts, items 1 to 4 were the interview on the factors influencing depression in older adults with NCDs and were specifically designed on the basis of a literature review. First, the questions on the interview form asked about personal factors such as gender, age, religion, marital status, education level, occupation, treatment entitlements, income, family history of depression, NCDs, period between illnesses, comorbidities, household type (cohabitation), number of family members, and number of caregivers. The questions were checklists and completion items. Second, the study examined interpersonal factors among older adults with NCDs. These factors included health perception, self-esteem, psychological well-being, spiritual well-being, cognitive performance and coping abilities/ stress. In these questions, there were five levels of estimation and four levels of loneliness[15]. The content validity indices ranged from 0.67 to 1.00, and the Cronbach's alpha coefficients were 0.708, 0.893, 0.898, 0.888, 0.827, 0.775, and 0.870, respectively. Third, the present study focused on health factors and health behaviors, such as continuous treatment, complications, illness, ADL[16], diet, exercise, sleep, smoking, alcohol use, and hobbies. The questions were check list types with blank spaces that could be filled in as appropriate (completion items). Among healthy behaviors were eating, exercising, sleeping, meditating, abstaining from smoking and alcohol, and engaging in hobbies. Content validity was 0.67 to 1.00, and Cronbach's alpha coefficient was 0.903. Fourth, the following family and social factors influencing the health of older adults with NCDs were evaluated, social support, family relationships, and care/caring. The content validity indices of this questionnaire ranged from 0.67 to 1.00, and the Cronbach's alpha coefficients were 0.878, 0.715, and 0.788, respectively. In the interview Form Parts 2 to 4, all variables were rated on five-point rating scales. Scores were interpreted at three levels based on Bloom's criteria[17]: high (more than 80%), moderate (60% to 79%), and low (less than 60%). Loneliness was measured by using a four-level rating scale with three categories of loneliness scores with most lonely (61 to 80 points), moderately lonely (41 to 60 points), and least lonely (20 to 40 points)[15]. Finally, 2Q and 9Q were used to measure depression. The interview form was developed by the Department of Mental Health, Ministry of Public Health, Thailand. If the answer was "no" to both questions, depression was not suggested. If the answer was "yes" to either question, it suggested depression might be present. Further evaluation could be done with the 9Q depression assessment form. A cut-off score of 7 or more means high sensitivity and specificity[11]. The interview was accurate in terms of diagnosing depression based on the criteria and had been used in studies on geriatric depression in Thai communities with a Cronbach's alpha coefficient equal to 0.931. In the present study, the questionnaire consisted of 30 self-rated items. The presence and severity of depression were assessed according to the following scores: 0 to 12 points indicated no depression, 13 to 18 points indicated mild depression, 19 to 24 points indicated moderate depression, and 25 to 30 points indicated severe depression.

Data collection

Data collection assistance was requested by Naresuan University to be forwarded to the public health unit responsible for the sample area to coordinate requests. The research assistant and researcher held a workshop on data collection for the purpose of clarifying and practicing skills as research assistants, then becoming data collectors between January and March 2023.

Data analysis

The data were analyzed by using IBM SPSS Statistics for Windows, version 26.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics, including frequency, percentage, arithmetic (mean), standard deviation (SD), maximum, and minimum. Inferential statistics were analyzed by using binary logistic regression models to identify significant factors influencing depression in older adults with NCDs (odds ratio (OR) and 95% confidence interval (CI)). Statistics significance was accepted for p-values of less than 0.05.

Results

Among the 608 participants, the overall prevalence of depression was 23.8%, while 26.9% of participants had mild depression, 5.5% had moderate depression, and 2.8% had severe depression.

The prevalence of depression in older adults with NCDs. In the personal factors, there were more men than women at 24.5% and 23.5%, respectively, aged of 80 years old or older at 26.2%, diploma for 47.1%, no occupation for 25.4%, adequacy left for savings for 26.5%, and having family history of depression for 26.3%. Kidney disease and cancer were the most

Table 1. Describes the Factors influencing depression in older adults with NCDs (n=608)

Factors	Depression (n=145) n (%)	Non-depression (n=463) n (%)	p-value
Personal factors			
Sex			0.786
• Male	50 (24.5)	154 (75.5)	
• Female	95 (23.5)	309 (76.5)	
Age (year)			0.841
• 60 to 69	72 (23.8)	230 (76.2)	
• 70 to 79	51 (23.0)	171 (77.0)	
• ≥80	22 (26.2)	62 (73.8)	
Marital status			0.014
• Single	11 (14.9)	63 (85.1)	
• Married/stay together	64 (21.0)	241 (79.0)	
• Marital separation	12 (34.3)	23 (65.7)	
• Widowed	58 (29.9)	136 (70.1)	
Education level			0.078
• No educated	4 (44.4)	5 (55.6)	
• Elementary school	98 (24.3)	306 (75.7)	
• Junior high school	14 (21.5)	51 (78.5)	
• High school	13 (22.0)	46 (78.0)	
• Diploma	8 (47.1)	9 (52.9)	
• Bachelor's degree or higher	8 (14.8)	46 (85.2)	
Occupation			0.235
• No occupation	104 (25.4)	306 (74.6)	
• Agriculture	3 (9.4)	29 (90.6)	
• Work for hire	16 (24.6)	49 (75.4)	
• Trade/own business	22 (22.7)	75 (77.3)	
Income			0.643
• Inadequacy	70 (22.4)	243 (77.6)	
• Adequate but no savings	49 (24.9)	148 (75.1)	
• Adequacy left to save	26 (26.5)	72 (73.5)	
Family history of depression			0.798
• No	140 (23.8)	449 (76.2)	
• Yes	5 (26.3)	14 (73.7)	
NCD			
• Hypertension	93 (25.2)	276 (74.8)	0.330
• Hyperlipidemia	74 (22.4)	256 (77.6)	0.369
• Diabetes mellitus	58 (29.3)	140 (70.7)	0.029
• Osteoarthri	40 (26.5)	111 (73.5)	0.380
• Cardiovascular disease	23 (32.9)	47 (67.1)	0.060
• Kidney disease	12 (36.4)	21 (63.6)	0.083
• Stroke	10 (26.3)	28 (73.7)	0.712
• Cancer	8 (36.4)	14 (63.6)	0.161
• Obesity	6 (35.3)	11 (64.7)	0.261
• Chronic respiratory disease	3 (21.4)	11 (78.6)	0.830
Care giver			0.322
• No	62 (42.8)	166 (35.9)	
• Yes	83 (57.2)	297 (64.1)	
Intra-personal factors			
Health perception			0.006
• Low (6 to17 points)	65 (31.0)	145 (69.0)	
• Moderate (18 to 23 points)	63 (21.6)	229 (78.4)	
• High (24 to 30 points)	17 (16.0)	89 (84.0)	
(continued)			

Factors	Depression (n=145) n (%)	Non-depression (n=463) n (%)	p-value
Self-esteem			<0.001
• Low (7 to 20 points)	45 (39.5)	69 (60.5)	
• Moderate (21 to 27 points)	73 (23.9)	233 (76.1)	
• High (28 to 35 points)	27 (14.4)	161 (85.6)	
Psychological well-being			<0.001
• Low (5 to 14 points)	100 (36.8)	172 (63.2)	
• Moderate (15 to 19 points)	28 (10.8)	231 (89.2)	
• High (20 to 25 points)	17 (22.1)	60 (77.9)	
Spiritual well-being			0.005
• Low (7 to 20 points)	18 (27.7)	47 (72.3)	
• Moderate (21 to 27 points)	90 (28.3)	228 (71.7)	
• High (28 to 35 points)	37 (16.4)	188 (83.6)	
Cognitive Function			<0.001
• Low (8 to 23 points)	106 (29.8)	250 (70.2)	
• Moderate (24 to 31 points)	36 (16.0)	189 (84.0)	
• High (32 to 40 points)	3 (11.1)	24 (88.9)	
Coping abilities/stress			0.001
• Low (10 to 29 points)	68 (32.1)	144 (67.9)	
• Moderate (30 to 39 points)	68 (20.8)	259 (79.2)	
• High (40 to 50 points)	9 (13.0)	60 (87.0)	
Loneliness			<0.001
• Low (20 to 40 points)	44 (15.0)	250 (85.0)	
• Moderate (41 to 60 points)	90 (32.5)	187 (67.5)	
• High (61 to 80 points)	11 (29.7)	26 (70.3)	
Health factors and health behaviors			
NCD treatment			0.575
• Non-continuous treatment	60 (41.4)	170 (36.7)	
• Continuous treatment	85 (58.6)	293 (63.3)	
NCD complications			0.200
• No	131 (90.3)	437 (94.4)	
• Yes	14 (9.7)	26 (5.6)	
Activities of daily living			0.010
• Bedridden group (0 to 4 points)	125 (22.0)	444 (78.0)	
• Home group (5 to 11 points)	18 (54.5)	15 (45.5)	
• Social group (12 points or more)	2 (33.3)	4 (66.7)	
Health behaviors			0.020
• Low (8 to 23 points)	28 (23.3)	92 (76.7)	
• Moderate (24 to 31 points)	79 (28.7)	196 (71.3)	
• High (32 to 40 points)	38 (17.8)	175 (82.2)	
Family and social factors			
Social support			0.025
• Low (15 to 44 points)	37 (33.3)	74 (66.7)	
• Moderate (45 to 59 points)	76 (22.8)	257 (77.2)	
• High (60 to 75 points)	32 (19.5)	132 (80.5)	
Family relationships			0.014
• Low (5 to 14 points)	21 (30.4)	48 (69.6)	
• Moderate (15 to 19 points)	74 (27.8)	192 (72.2)	
• High (20 to 25 points)	50 (18.3)	223 (81.7)	
Care/caring			0.001
• Low (21 to 62 points)	51 (33.8)	100 (66.2)	
• Moderate (63 to 83 points)	78 (22.3)	271 (77.7)	
• High (84 to 105 points)	16 (14.8)	92 (85.2)	

NCD=non-communicable disease

common types of NCDs for 36.4% and those with caregivers for 57.2%. Diabetes mellitus and marital separation were associated with higher depression prevalence among older adults with NCDs at 34.3% and 29.3%, respectively. For the intrapersonal factors, in older adults with NCDs with low perception of health, low self-esteem, low psychological well-being, moderate spiritual well-being, low cognitive function, low coping abilities/stress and moderate levels of loneliness, depression prevalence rates were 31.0%, 39.5%, 36.8%, 28.3%, 29.8%, 32.1%, and 32.5%, respectively, and were higher than those of other groups. For the health factors and health behaviors, the prevalence of depression among older adults with NCDs who are continuously being treated for them was 58.6%, and do not have complications for 90.3%. ADL (home group) and moderate health behaviors were associated with a higher prevalence of depression among older adults with NCDs at 54.5% and 28.7%, respectively. For the family and social factors, among older adults with NCDs with low levels of social support, family relationships, and care, depression prevalence was 33.3%, 30.4%, and 33.8%, respectively (Table 1).

The researcher analyzed the factors influencing the risk of depression among older adults with NCDs. A binary logistic regression analysis was conducted using the enter method. All independent variables are imported together into the logistic regression equation at once. The results showed the factors influencing depression were alcohol use (AOR 23.14, 95% CI 1.43 to 37.59, p=0.027), no education (AOR 11.14, 95% CI 1.38 to 90.06, p=0.024), insufficient sleep (AOR 7.61, 95% CI 2.16 to 26.82, p=0.002), ADL (AOR 4.10, 95% CI 1.23 to 13.70, p=0.022), inadequate diet (AOR 2.59, 95% CI 1.14 to 5.91, p=0.024), loneliness (AOR 2.36, 95% CI 1.26 to 4.42, p=0.007), diabetes mellitus (AOR 2.02, 95% CI 1.11 to 3.67, p=0.022), widowhood (AOR 1.87, 95% CI 1.04 to 3.34, p=0.036), hobbies (AOR 0.17, 95% CI 0.05 to 0.57, p=0.004), and psychological well-being (AOR 0.15, 95% CI 0.07 to 0.31, p<0.001). The statistically significant level was set at 0.05 and all 10 variables were able to predict depression risk among older adults with NCDs 41.2% of the time and correctly predict at 85.0%. The researchers explained the findings of the analyses of factors influencing depression risk among older adults with NCDs (Table 2).

Discussion

The present study found that the following ten

Table 2. Multiple logistic regression analysis to identify the factors associated with the risks of depression among older adults with NCDs (n=608)

Variable	Risks of depression among older adults with NCDs				
	B	Adjusted odds ratio	95% CI		p-value
			Lower	Upper	
Marital status					
Married/stay together		Ref.			
Single	−0.349	0.71	0.29	1.74	0.450
Marital separation	1.060	2.89	0.94	8.85	0.063
Widowed	0.623	1.87	1.04	3.34	0.036
Education level					
Bachelor's degree or higher		Ref.			
No Education	2.410	11.14	1.38	90.06	0.024
Elementary school	0.835	2.31	0.81	6.57	0.118
High school	0.107	1.11	0.32	3.93	0.869
Diploma	0.350	1.42	0.37	5.52	0.613
NCDs					
Other		Ref.			
Diabetes mellitus	0.701	2.02	1.11	3.67	0.022
Psychological well-being					
High		Ref.			
Moderate	−0.018	0.98	0.31	3.20	0.976
Low	−1.933	0.15	0.07	0.31	<0.001
Loneliness					
Low		Ref.			
Moderate	0.859	2.36	1.26	4.42	0.007
High	1.099	3.00	0.897	10.04	0.075
Activities of daily living					
Social group		Ref.			
Home group	1.412	4.10	1.23	13.70	0.022
Bedridden	1.433	4.19	0.39	44.89	0.236
Inadequate diet					
No		Ref.			
Yes	0.952	2.59	1.14	5.91	0.024
Inadequate sleep					
No		Ref.			
Yes	2.029	7.61	2.16	26.82	0.002
Alcohol consumption					
None		Ref.			
Frequent	3.142	23.14	1.43	37.59	0.027
Hobbies					
No		Ref.			
Yes	−1.771	0.17	0.05	0.57	0.004

Percentage correct=85.0, Nagelkerke R^2=0.412

NCDs=non-communicable diseases; CI=confidence interval

variables influenced depression risk among older adults with NCDs, widowhood, no education, diabetes mellitus, psychological well-being, loneliness, ADL, home group, inadequate diet, inadequate sleep, alcohol, and hobbies. All ten factors predicted the

risk of depression among older adults with NCDs at 41.2%. The predictive factors are described below.

Among personal factors, marital status, education level, and NCDs were significantly related to depression. Depression is more common among widowed older adults with NCDs. When people are married, they feel as though they have a friend, someone to care for them when they are sick, a mentor and no loneliness. Dining, traveling, and earning money are some of the activities couples do together. Marriage is a context of intimate ties. In marriage, the spouses' roles and responsibilities complement each other. In addition to jointly dealing with problems in life, being in a relationship can help relieve depression. In contrast, widows or widowers who have lost a partner cannot participate in activities together, leading to loneliness and sadness[18,19]. Consequently, widowed older adults are at risk of developing depression and need to be closely monitored, screened, and cared for to prevent them from developing depression. Having no education poses a higher depression risk than having a bachelor's degree or higher. People who are educated gain a greater amount of academic knowledge. Through this knowledge, they are able to develop themselves and live a quality life in the context of their careers and daily lives. Due to lack of education, older adults may have difficulty reading, writing, or finding knowledge from a variety of sources. Older adults with higher level of education, however, may have better knowledge about self-care, treatment strategies, self-management techniques and better mental health care, which may prevent depression, based on their knowledge about self-care[19]. Consequently, older adults with lower levels of education are at risk of depression, which require further screening, surveillance, and treatment. Diabetes mellitus poses a greater risk of depression than other NCDs. The depression rate among Thai older adults with type 2 diabetes mellitus was 32.3%. Diabetes mellitus was the most influential predictor, indicating feelings of anxiety and discouragement about managing the disease and requiring support and/or care[18,20]. As a result, screening policies for older ill adults are essential, so the discomforts caused by diseases can be detected, plans can be developed for support/care, while prevention of mental health problems can be developed, especially for mild and moderate depression patients, to reduce the severity of the illness and help those grieving severely.

Among interpersonal factors, psychological well-being and loneliness were significantly related to depression. The authors findings showed that depression is less likely to occur in people with high psychological well-being than those with low psychological well-being. In older adults with NCDs, psychological well-being is a protective factor against depression.

On the other hand, illness adversely affects quality of life for older adults in the long run. Having a different way of life or a difficult lifestyle due to deterioration of the body, such as weak limbs, paralysis, blurred vision, disability can make it impossible to travel in the same way as when physically healthy. A lack of psychological well-being can lead to feeling unhappy, boredom, inactivity, sadness, discouragement, hopelessness, and depression[20,21]. Thus, it is necessary to promote the psychological well-being of older adults, especially those with chronic diseases and lower levels of psychological well-being. Older adults with moderate levels of loneliness are at greater risk of developing depression than those with lower levels of loneliness. Loneliness is a condition in which a person feels isolated, abandoned, and separated from society, all of which can cause depression. Older adults are at an age with deterioration of the body, illness, and chronic disease. As a result, the ability to do activities independently is reduced. Anxiety about having to rely on family members, together with poor health conditions, limit participation in social activities and interaction with others. Older people with low perceptions of health are more likely to become lonely[18,22]. Therefore, there should be plans to prevent loneliness that may occur in the older adults with NCDs, such as organizing club activities with community activities to focus on emotional and social interactions among group members.

For health factors and health behaviors, ADL, diet, sleep, alcohol consumption, and hobbies are significantly related to depression. The authors found that older adults stuck at home have a higher risk of depression than older adults in the socially interactive group. ADL performance is associated with depression. When becoming old age, various changes occur at the same time, especially on the physical side where the reduced ability to do daily activities affects a person's perspective and loss of self-reliance. This can lead to psychological problems, particularly depression. In addition, the decreased ADL of the patients may be a result in elderly patients suffering from various chronic diseases accompanied by loss of potential to perform various duties. Decreased ADL performance, therefore, can

make patients feel bored and hopeless or indifferent to the environment, frequently thinking that they are a burden on their families and causing depression[19,23]. Consequently, public health personnel need to consider ADL as well as planning, preventing, and controlling ADL performance to develop guidelines for organizing activities for seniors with varying levels of ADL abilities. Older adults with inadequate diets are at greater risk of depression than those who eat sufficiently. Older people may have difficulty shopping and preparing meals when living alone with disabilities or food limitations[24]. Dietary choices should include fruits and vegetables, fish, and whole grains. Mediterranean diets rich in colorful plant foods and fish may reduce the risk of depression by 30%[25]. Chicken eggs produce serotonin, which improves sleep and causes positive emotions when transformed into melatonin. A banana containing potassium and tryptophan can lower blood pressure, decrease stress levels, and reduce anxiety. The high selenium content of mushrooms induces the production of happy hormones, which help reduce frustration. Dietary items to avoid include saturated fat, refined carbohydrates, processed foods, foods high in sugar and caffeine products such as tea, coffee, and caffeinated soft drinks, which can lead to insomnia[25,26]. Thus, older adults with NCDs and caregivers should be informed about the importance of adequate nutrition to reduce the risk of depression. Insufficient sleep is one of the reasons older adults with NCDs are at higher risk of depression. Many older adults with NCDs suffer from insomnia, sleep problems and difficulty staying asleep. Exhaustion affects the mind and can lead to depression or anxiety issues. Insomnia is often caused by worrying about life's problems and can also be caused by congenital disorders or medication side effects. Older patients suffering from more physical ailments have more insomnia. Disease and abnormalities that affect sleep are associated with depressive symptoms. Symptoms of asthma include frequent waking from breathing difficulties, while ischemic heart disease causes chest pain, and diabetes mellitus causes frequent urination at night. Medicines can cause sleep problems. Cognitive stimuli can also affect how long it takes to fall asleep and wake up during the night[27,28]. Therefore, it is essential to provide knowledge and understanding of insomnia to older adults with NCDs, as well as to adjust daily routines such as taking a warm bath before going to bed, meditating, stretching muscles, sleeping in a dark, quiet, warm, and well-ventilated bedroom, and engaging in regular exercise,

all of which can improve sleep quality. In terms of alcohol consumption, older adults with NCDs who regularly drink alcohol have a higher risk of depression than those without alcohol consumption. Drinking behavior problems tend to increase and using alcohol to the point of addiction can lead to psychological problems and psychiatric disorders. Some patients use alcohol to relieve discomfort, but other patients may be at risk of suicide if they were addicted to alcohol and depressed. This has an impact on self, family, the economy, and society as a whole. Drinking regularly or every day can lead to poor mental and physical health outcomes as well as self-harm thoughts and attempts[29,30]. Therefore, depression screening should be conducted for groups at risk of alcohol consumption to provide timely assistance and care. Hobbies are protective factors against depression in older adults with NCDs. Mental health benefits from training the brain to stay alert. Stress can be reduced, depression can be relieved, and dementia can be slowed, while brain function can be improved. Hobbies such as sports, music, art, painting, history, books, poetry or writing books, websites, and blogs, stimulate the nervous system by engagement in activities[31]. Thus, older adults with NCDs should be encouraged to find personal hobbies and preferences, while families and communities can help reduce depression risk by supporting those activities.

The limitation of the present study was that the researcher interviewed older adults with NCDs, the end users who would benefit most from this research. Because this data came from older adults with NCDs, researchers in other populations of older adults need to consider its limitations. Second, data collection took place at the homes of the older adults with NCDs. The interviews were disrupted by environmental disturbances, family, neighbors, and customers. As a result, the interviews took longer than those with the older adults travelling to an appointment location, such as the tambon health promoting hospital where the authors were assessable to control the timing of the interviews. Finally, the obtained sample had a significantly higher proportion of females at 66.4%, so the results may have been different from those found in the whole older adult population with NCDs in Nonthaburi.

Conclusion

The findings showed that widowhood, no education, diabetes mellitus, psychological well-being, loneliness, ADL, inadequate diet, inadequate

sleep, alcohol consumption and hobbies are the variables associated with depression in older adults with NCDs. These ten factors were able to predict depression risk among older adults with NCDs at 41.2%. Accordingly, future studies should investigate other variables potentially affecting the risk of developing depression in order to find variables capable to co-predict the risk of increased depression because finding co-predictors of depression among older adults will allow public health personnel to determine how to prevent depression in older adults with NCDs.

What is already known on this topic?

Older adults with NCDs who cannot adapt may feel stressed and unhappy with low self-esteem, discouragement, and hopelessness. As a result, mental health problems, such as depression, can occur. Left unaddressed, these problems can lead to suicidal thoughts.

What does this study add?

In Nonthaburi, Thailand, older adults with NCDs had a 23.8% risk of depression. There are factors influencing depression among older adults with NCDs related to widowhood, no education, diabetes mellitus, psychological well-being, loneliness, ADL performance, inadequate diet, insufficient sleep, alcohol consumption, and hobbies.

Conflicts of interest

The authors declare no conflicts of interest.

References

1. Prasartkul P. Situation of the Thai elderly in 2021. Bangkok: Amarin Printing and Publishing; 2021.
2. United Nations. World population prospect: The 2019 revision [Internet]. Geneva: United Nations; 2019 [cited 2022 Dec 19]. Available from: https://population.un.org/wpp/Download/Standard/Population/.
3. Ministry of Public Health, Thailand. Health Data Center (HDC) [Internet]. Nonthaburi: 2019 [cited 2023 Dec 19]. Available from: https://nbi.hdc.moph.go.th/hdc/main/ index_pk.php.
4. Aspergillus and Aspergillosis. World mental health day 2017: chronic illness and depression [Internet]. 2017 [cited 2019 Dec 19]. Available from: https://www.aspergillus.org.uk/blogger/world-mental-health-day-2017-chronic-illness-and-depression/.
5. Klinwichit S, Klinwichit W, Incha P, Klinwichit P. Mental health evaluation of the elderly with chronic illness in community: Saensuk Municipality, Chon Buri, Thailand. BJM Burapha J Med 2015;2:21-33.
6. Saengkheawngarm S. Factors related to depression among the elderly with chronic non-communicable diseases in a Health Promoting Hospital Bueng Kham Phroi Subdistrict, Moo 11, Lam Luk Ka district, Pathum Thani Province. KKU J Public Health Res 2021;14:62-71.
7. Aniwattanapong D. Post-stroke depression. J Psychiatr Assoc Thai 2018;63:383-418.
8. Duangnate K. Prevalence and factor associated depression among NCD patients at primary care unit of Phukieo Chalermprakiat hospital. Med J Srisaket Surin Burirum Hosp 2021;36:13-24.
9. Arunpongpaisarn S, Wasiknanon S. Depression textbook. Khon Kaen: Klang Nana Wittaya Printing House; 2015.
10. Paungrod N. The study on depression in Nonthaburi province elderly. Princess of Naradhiwas Univ J Humanit Soc Sci 2015;2:63-74.
11. Department of Mental Health Ministry of Public Health, Thailand. Guidelines for depression at provincial level. Ubon Ratchathani: Phra Sri Mahaphot Hospital; 2017.
12. World Health Organization. A conceptual framework for action on the social determinants of health [Internet]. Geneva: WHO; 2010 [cited 2019 Dec 19]. Available from: https://iris.who.int/bitstream/handle/10665/44489/9789241500852_eng.pdf?sequence=1.
13. Thailand Information Center. Access to services for patients with depression [Internet]. Bangkok: Chulalongkorn University; 2021 [cited 2021 Nov 8]. Available from: https://www.dga.or.th/document-sharing/infographic/36119/.
14. Maneekeang N, Loahang P, Teamtip S, Tamdee D. Factors related to depression in patients with chronic illnesses at Baan Maelaoop Health Promoting Hospital, Kunlyanivadhana, Chaingmai. J Health Sci Scholarsh 2018;5:77-92.
15. Russell DW. UCLA Loneliness Scale (Version 3): reliability, validity, and factor structure. J Pers Assess 1996;66:20-40.
16. Committee to develop screening and health assessment tools for the elderly. Manual for screening and

evaluating the health of the elderly. Nonthaburi: Ministry of Public Health; 2021.

17. Bloom BS. Taxonomy of educational objectives: The classification of educational goals, handbook II affective domain. London: Longman; 1964.

18. Keawsawang P. Factors related to depression in elderly with diabetes in Kantharalak District, Sisaket Province. The Office of Disease Prevention and Control 10th Journal 2021;19:36-48.

19. Chaiyasung P, Sutawatnatcha S, Intakan P, Lichanatein S. Perdictors of derpression among older adults with chronic disease in urban areas. J Nurs Educ 2013;6:27-37.

20. Thanakow K, Thinkan W, Khongkamnerd R. Depression among older adults with diabetes in Thailand. Nakhon Ratchasima: Suranaree University of Technology; 2015.

21. Thongsuk Y, Vatanasin D, Hengudomsub P. Factors influencing psychological well-being among older adults. J Psychiatr Nurs Ment Health 2019;33:95-110.

22. Rachadachan Y, Nintachan P, Rungruangsiripan M. The influences of gender, age, ability to perform activities of daily living, loneliness, and rumination on depression of older persons living in nursing home. J Psychiatr Nurs Ment Health 2021;35:1-22.

23. Suangpho P, Wongkpratoom S. Factors associated with depression among the older persons with stroke in Mueang District, Nakhon Ratchasima Province. J Boromarjonani Coll Nurs Suphanburi 2021;4:72-92.

24. Rafat R, Rezazadeh A, Arzhang P, Alipourr A. The association of food insecurity with sociodemographic factors and depression in the elderly population of Qarchak city–Iran. Nutr Food Sci 2021;51:114-24.

25. Ramsey D. What are the best foods to fight depression? The antidepressant food scale [Internet]. 2021 [cited 2022 Sep 20]. Available from: https://drewramseymd.com/depression-anxiety/heres-the-1-food-category-to-fight-depression/.

26. Pei Z, Zhang J, Qin W, Hu F, Zhao Y, Zhang X, et al. Association between dietary patterns and depression in Chinese older adults: A longitudinal study based on CLHLS. Nutrients 2022;14:5230.

27. Chirapongse J, Sunthornchaiya R. Factors related to insomnia among elderly patients with major depressive disorder. J Psychiatr Nurs Ment Health 2018;32:134-49.

28. Cong L, Dou P, Chen D, Cai L. Depression and Associated Factors in the Elderly Cadres in Fuzhou, China: A Community-based Study. Int J Gerontol 2015;9: 29-33.

29. Nortun J, Jenjai C, Ruengorn C. Prevalence and factors associated with suicidal behavior in patients with mental and behavioral disorder due to alcohol. J Health Syst Res 2016;10:137-51.

30. Aung TNN, Moolphate S, Koyanagi Y, Angkurawaranon C, Supakankunti S, Yuasa M, et al. Depression and associated factors among community-dwelling Thai older adults in Northern Thailand: The relationship between history of fall and geriatric depression. Int J Environ Res Public Health 2022;19:10574.

31. Department of Mental Health. "Depression" breaks your heart, check the list of causes and symptoms [Internet]. Nonthaburi: Ministry of Public Health, Thailand; 2021 [cited 2022 Nov 8]. Available from: https://dmh.go.th/news-dmh/view.asp?id=30114.