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## Research Article

# Predictors of Depression among Thai Family Caregivers of Dementia Patients in Primary Care - ๓

Chalothorn Chaobankrang, Thunyarat Anothaisintawee, Krisana Kittichai and Chitima Boongird\*

*Department of Family Medicine, Ramathibodi Hospital, Mahidol University, Bangkok, Thailand*

**\*Address for Correspondence:** Chitima Boongird, Department of Family Medicine, Ramathibodi Hospital, Mahidol University, Rama VI Road, Bangkok, Thailand 10400, Tel: +166-220-114-86; Fax:+166-220-114-86; E-mail: chitima.amo@mahidol.ac.th; chitima.bg111@gmail.com

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## ABSTRACT

**Background:** The numbers of caregivers burdened by dementia is increasing. Depression is also found more in this group and causes higher morbidity. The aim of this study was to investigate the predictors of depression among Thai family caregivers in order to develop effective interventions in primary care.

**Methods:** A total of 177 participants were recruited in primary care setting. They were assessed for sociodemographic data, health status, caregiver burden and depressive symptoms measured by Charlson's Comorbidities (CCI), Zarit Burden Interview (ZBI) and Patient Health Questionnaire (PHQ-9), respectively. The data for dementia patients included severity and functional status. Depression was defined as PHQ-9  $\geq$  9. Multivariate linear regression model was applied to assess the independent relationship between possible risk factors and risk of depression.

**Results:** Thirty-three caregivers (18.64%) scored  $\geq$  9 in PHQ-9. High burden and time of care > 8 hours per day were the main predictors of depression. However, the protective factors were regular exercise and good family support.

**Discussion:** Our research highlights the important of assessing caregivers for both burden and depression in primary care. Further research should investigate effective interventions including exercise and facilitating care within the family.

**Keywords:** Dementia; Depression; Family Caregivers; Primary care

## INTRODUCTION

There were an estimated 35 million people with dementia in 2010 and this figure is likely to be doubled every 20 years [1]. In 2030, it was estimated to increase up to 65 million and more than 60% of people with dementia live in a developing country [1]. One main difference between the developing and developed world are the living arrangements. Persons with dementia in the developing world live in much larger households and extended families [2]. In Thailand, the care of people with dementia is generally provided by family caregivers [3]. The negative aspects of caring for dementia patients tend to receive the most attentions, but caring has also been associated with positive feelings and outcomes. Family caregivers have reported feeling motivated to provide care for several reasons: a sense of love or reciprocity, spiritual fulfilment, sense of duty, guilt and social pressures [4]. Meanwhile, family caregivers face many obstacles to balance their other roles including child-rearing, careers and relationships. The effects on caregivers are very complex. Numerous studies report that caring for a person with dementia is more stressful than caring for a person with physical disability [5].

Family caregivers have increased risk of depression and anxiety [6]. A systematic review on depressive disorder in caregivers of dementia patients found a high prevalence (22.3%) compared with the prevalence in general population, which is around 10% [7]. The presence of depressive disorders tends to compromise the ability of caregivers to maintain their role. A study in a mental health hospital in Thailand [8] reported that family caregivers of dementia patients had rates for depression at 12% and anxiety at 8%, and factors such as low income and disinhibited behavior in patients were associated with depression.

Given that the number of caregivers of dementia patients will increase considerably over the next decades, it is important to assess the prevalence and factors related to their risk for depression. Adequate knowledge is necessary to estimate the need for services in primary care setting and to further develop specific treatments adapted to the needs of this target group. The aim of the present study was to investigate the prevalence and predictors of depression among Thai family caregivers of dementia patients.

## METHODS

### Study design and setting

This was a cross-sectional study conducted between August

2016 and October 2017 recruiting from two primary care clinics (family medicine and internal medicine), ambulatory home care and a memory clinic at Ramathibodi Hospital, Mahidol University, Thailand.

### Participants

Participants were eligible if they were at least 18 years of age, provided care at home for a relative who had been diagnosed with dementia for at least 1 month, lived in the same household with the patients, had not been diagnosed with or received treatment for cognitive impairment or psychotic illness, were able to speak and understand Thai, and were willing to participate in the study. The study was approved by the ethics committee at Ramathibodi Hospital, Mahidol University, Thailand (Approval number: 12-59-47). All participants provided written informed consent before taking part in the study.

### Sample size estimation

The required sample size for this study was 177 according to the sample size calculation based on a previous prevalence study as follows.

$$n = \frac{z^2(p(1-p))}{d^2}$$

From this equation, the expected prevalence ( $P$ ) was set at 13.2% according to the finding from a previous study. The allowable margin of error ( $d$ ) was 5% and  $Z$  was 1.96 as we used 95% confidence interval (CI) for estimation of the uncertainty of the prevalence.

## MEASUREMENTS

### Caregivers' baseline characteristics

Caregivers were interviewed in person. The Principal Investigator asked caregivers to report demographic information including age, gender, education, marital status, career and income. To assess the caregivers' comorbidity, the Charlson Comorbidity Index (CCI) [9] was administered by weighting the scores for each of 17 the comorbidities. It was classified as  $> 3$  and  $\leq 3$ . To Interpret the CCI, if it was  $> 3$ , the percentage of patients who died from a comorbid disease would be more than 50% [10]. Assessing life style behaviors included exercise, smoking, and alcohol consumption. As for the relationship between caregivers and patients, the family caregivers were interviewed and their family position and the quality

of relationship to the patient (classified as good, not good and bad) were recorded. The family caregivers were also asked about their caregiving, including the average number of hours per week and their burdens was assessed using the Thai version the Zarit Burden Interview (ZBI) [11]. This 12-items ZBI consists of two dimensions, which are personal strain and role strain. Total scores range from 0-48 with a higher score indicating higher burden. Example items include: "Do you feel your relative is depended on you?" (Personal strain) and, "Do you feel that caring for your relatives causes a negative relationship with your own family and friends?" (Role strain). For the total score, 0-10 was defined as no to mild burden, 11-20 as mild to moderate burden and  $\geq 20$  as high burden. We also assessed the satisfaction of social support from sources. The first was the support from the primary health care system, the second was social service facilities, such as financial help and public services. The satisfaction in each category was rated using the likert scales. Regarding the family support in caregiving activities of daily living for dementia patients, the caregivers also rated their satisfaction by using likert scales.

### Caregiver depression

The Thai version of the Patient Health Questionnaires [12] (PHQ- 9) was used to measure symptoms of caregivers with the cut off  $\geq 9$  symptoms indicating the presence of depression. The total score ranges from 0 to 27, with high scores suggesting greater severity of depressive symptoms. Scores ranging 0-8 indicated no depression. The scores were classified as mild (9-14), moderate (15-19) and severe (20-27).

### Dementia patients

Information on patient age, gender, marital status, education, living situation and income was collected. Each patient's functional status was assessed by asking the caregiver if the patients had difficulty with each of the ten Activities of Daily Living (ADL): feeding, transfer, grooming, toilet use, bathing, mobility, stairs, dressing, bowel and bladder. The ADLs were measured using the Barthel index [13] which ranged from independent (95-100), mild disabled (75-90), moderate disabled (50-70), severe disabled (25-45) and very severe disabled (0-20). To assess each patient's cognitive status, the Clinical Dementia Rating scale (CDR) [14] was used to interview caregivers. Cognitive function is rated across six domains: memory, orientation, judgement and problem solving, community affairs, home and hobbies, and personal care. Each domain is rated on a 5-point scale as follows: 0, no impairment; 0.5, questionable impairment; 1, mild impairment; 2, moderate impairment; and 3, severe impairment. The Global CDR score is obtained by summing each of the domain scores, ranging from 0-18. It is categorized as very mild (0-4.5), mild (5.0-9.0), moderate (9.5-15.5), and severe (16-18).

## STATISTICAL ANALYSIS

The prevalence of depression among caregivers of dementia patients was estimated according to the ratio of the numbers of caregiver who had a PHQ-9 score  $\geq 9$  and the total numbers participants. The binomial exact confidence interval was applied to calculate the 95% CI of prevalence of depression.

The data for continuous variables are presented as mean and Standard Deviation (SD), if the distribution of data was normal. Otherwise, the data are presented as median and range. For categorical variables, data are presented as frequency and percentage. A univariate logistic regression model was applied to assess the association between caregiver's characteristics (i.e. age, gender,

marital status, education, income, comorbidity, and health risk behaviors), burden of caring (i.e. score of caregiver burden, duration of care, social and family support, and relationship between patients and caregivers), dementia patient's characteristics (i.e. level of ADL and disease severity), and the risk of having depression in caregivers. Variables that had a  $p$ -value  $< 0.10$  were considered in the multivariate logistic regression model to determine an independent risk factor of depression in the caregivers of dementia patients.

A  $p$ -value  $< 0.05$  was set as the level of significance. All statistical analyses were performed using the STATA program version 15.

## RESULT

Overall, 177 family caregivers participated in the study, 117 (66%) were from two primary care clinics (family medicine and internal medicine). Forty-two participants (24%) were eligible from the memory clinic and 18 participants (10%) from ambulatory home care.

The baseline characteristics for all participants were shown in table 1. The mean age of family caregivers was 57.38 (SD = 10.80) years and 79% were women. Most were married (53%) and had a high educational level (46%). Nineteen percent of caregivers reported being unemployed. The majority of family caregivers were adult children (67.2%) with a mean age of 53.64 (SD = 8.54) years, followed by spouses (21.2%) with a mean age of 68.92 (SD = 9.18) years. The duration of caregiving ranged from 6 months to 30 years. Participants with PHQ-9 scores  $\geq 9$  reported average years of caring 6.44 (SD = 4.32), while duration of caregiving is slightly longer (6.99 years, SD = 6.45) in participants with PHQ-9 scores less than 9. The reported caregiver burden was mild to moderate (ZBI = 11-20) accounting for 74% of the sample. Most family caregivers reported very low satisfaction with the social support system (median/range = 1/1-5). Meanwhile they reported fair satisfaction of their own family support in caregiving for dementia patients in terms of ADLs (mean  $\pm$  SD = 3.02  $\pm$  1.10)

The baseline characteristics for the dementia patients were shown in table 2. There were 131 dementia patients with an average age of 80.72 (SD = 8.31) years. Approximately 53% had a severe cognitive status and 71.75% were ADL dependent.

### Prevalence of depression

Of the 177 family caregivers included in this study, 33 participants had PHQ-9 scores  $\geq 9$  indicative of depression (18.6%; 95% confidence interval (CI) = 13.2%-25.2%). Most (88%) ranged between 9-14 (mild) (Table1).

### Predictors of depression in family caregivers

Caregiver characteristics associated with caregiver depression included insufficient income, fair to poor quality of the relationship, hours of caregiving  $> 8$  hours a day, moderate to high burden. Whereas more time to rest ( $\geq 2$  days/week), family support in caregiving regarding the ADLs in patients and regular exercise of caregivers decreased the reported depression (Table 3).

In logistic regression model, controlling for both patients and caregiver characteristics, high burden (ZBI  $> 20$ ) was the greatest predictors of depression in family caregivers (odds ratio (OR) = 15.24; 95% CI = 3.71-62.57). This suggested that caregivers with a high burden had 15 times higher risk of having depression than caregivers with low or no burden. The following factor was caregiving being  $>$

**Table 1: Characteristics of family caregivers (n = 177).**

Characteristics	Number	Percent (%)
<b>Caregiver</b>		
Age mean (year-old)	57.38	0.80
<b>Gender</b>		
Female	140	79.1
Male	37	20.9
<b>Marital status</b>		
Single	59	33.33
Married	94	53.11
Divorced	15	8.47
Widow	9	5.08
<b>Education</b>		
No study	2	1.13
Primary school	17	9.60
Secondary school	30	16.94
Diploma	12	6.78
Bachelor degree	81	45.76
Higher than Bachelor degree	35	19.77
<b>Career</b>		
Government employee	72	40.67
Office employee	20	11.30
Business owner	38	21.47
Others	47	26.54
<b>Income</b>		
Sufficient	149	84.18
Insufficient	28	15.82
<b>Income</b>		
Not enough	149	84.18
Enough	28	15.82
<b>Charlson Comorbidity Index (CCI) (mean/SD)</b>		
≤ 3	80	45.00
> 3	97	55.00
<b>Smoking</b>		
Non-smoker	157	88.70
Smoker	20	11.30
<b>Alcohol drinking</b>		
Non-drinker	146	82.49
Drinker	31	17.51
<b>Exercise</b>		
Years of caregiving	6.44 (6-30)	
Hours of caregiving/day (median/range)	12 (1-24)	
<b>Family position</b>		
Spouse	38	21.47
Children	119	67.23
Grandchildren	9	5.08
Friend	1	0.56
Others	10	5.56
Spouse	38	21.47
Children	119	67.23
Grandchildren	9	5.08
Friend	1	0.56
	10	5.65
<b>Relationship with patient</b>		
Good	149	84.18
Not good	20	11.30
Bad	8	4.52
<b>Social support (median/range)</b>		
Primary Health Care supporting system	1 (1-5)	
Social services facilities	1 (1-5)	
<b>Family support of caregiving in ADLs (mean/SD)</b>		
	3.02 (1.10)	

<b>PHQ-9</b>		
<9 (no to very mild)	144	81.35
9-14 (mild)	29	16.38
15-19 (moderate)	3	1.69
20-27 (severe)	1	0.56
<b>Zarit Burden Intervention (ZBI)</b>		
No-mild burden (0-10)	57	32.20
Mild-Moderate burden (11-20)	74	41.81
High burden (> 20)	46	25.99

**Table 2: Characteristics of dementia patients (n = 131).**

Dementia patients	Number	Percent %
Age (year- old) (mean/SD)	80.72 (8.31)	
<b>Gender</b>		
Female	131	74.01
Male	46	25.99
<b>Clinical Dementia Rating scale (CDR)</b>		
very mild (0-4.5)	10	5.65
mild (5.0-9.0)	25	14.12
moderate (9.5-15.5)	47	26.55
severe (16-18)	95	53.67
<b>Barthel index, mean</b>		
Very severe disabled (0-20)	48	27.12
Severe disabled (25-45)	21	11.86
Moderate disabled (50-70)	34	19.21
Mild disabled (75-90)	24	13.56
Independent (95-100)	50	28.25

8 hours per day (OR =, 4.73; 95% CI = 1.44 to 15.56). The protective factors of depression were exercise and family support of caregiving in the ADLs of dementia patients (OR = 0.24; 95% CI = 0.09-0.62 and OR = 0.51; 95% CI = 0.31-0.85, P = 0.004 and P = 0.009, respectively) (Table 4).

## DISCUSSION

This cross-sectional study was conducted to analyze the prevalence and predictors of depression in family caregivers of dementia patients. It confirmed previous research documenting high rates of depression compared with other types of caregivers [7,15]. Thirty-three caregivers (18.6%) had a PHQ-9 score of 9 or higher, which in clinical settings is suggestive of a diagnosis of depression and is strongly associated with adverse outcomes such as functional declined and mortality [16,17]. The prevalence of depression in this study is lower than that reported in Ondee et al. [3] which was 27%. A possible explanation may be the different setting of the two studies. The participants in this study were mainly recruited from primary care practice whereas in Ondee et al, the family caregivers were recruited from memory clinic of three hospitals in Bangkok. According to Cuijpers [7] the prevalence of depression of family caregivers ranges from 15%-32%. Our study is within that range, which is considerably higher than in the community studies of older adults which was about 8-10% [5,18].

The average age of caregivers in our study is 57 year olds, meaning they were closed to older adulthood themselves. However, the majority of participants (67.2%) were female adult children following by spouses (21.2%). The mean age of dementia patients

was around 80 years old. These findings demonstrated that family caregivers have to face significant burdens, not only regarding their own decreased physical reserves related to aging but also in their role of caregiving. However, our results demonstrated that neither the age of family caregivers nor the category of their family position had a statistically significant relationship with depression. Unlike the study by Covensky et al. [19], spouses especially wives, were associated with

**Table 3: Univariate analysis of family caregiver depression by caregiver and dementia patient's characteristics.**

Caregivers variables	Adjusted OR (95% CI)	p value
<b>Age (year-old)</b>		
31-55	1	0.834
56-65	0.84 (0.35-2.03)	
66-91	0.75 (0.28-2.00)	
<b>Gender</b>		
Male	1	0.177
Female	2.16 (0.71-6.57)	
<b>Marital status</b>		
Single	1	0.99
Married	1.03 (0.44-32.37)	
Widow	1.24 (0.23-6.84)	
<b>Education</b>		
High school or greater	1	0.48
Less than high school	1.42 (0.55-3.65)	
<b>Income</b>		
Sufficient	1	0.051
Insufficient	2.47 (0.99-6.10)	
<b>Relationship to patient</b>		
Children	1	0.968
Spouse	0.98 (0.39-2.47)	
<b>Quality of the relationship</b>		
Very good to Good	1	0.014
Fair to poor	3.04 (1.25-7.42)	
<b>Social support</b>		
Primary Health Care supporting system	0.87 (0.57-1.33)	0.518
Social services facilities	1.14 (0.87-1.51)	0.342
Family support of caregiving in ADLs	0.49 (0.33-0.74)	0.001
<b>Charlson comorbidity index</b>		
≤ 3	1	0.674
> 3	0.85 (0.40-1.81)	
<b>Life styles behavior</b>		
Non Smoking	1	0.441
Smoking	1.53 (0.52-4.57)	
Non-alcohol drinking	1	0.693
Alcohol drinking	0.81 (0.29-2.29)	
Non-Exercise	1	0.001
Exercise	0.24 (0.11-0.54)	
<b>Hours of caregiving/day</b>		
≤ 8 ηουρα	1	0.019
> 8 hours	3.36 (1.22-9.22)	
<b>Times of rest/month</b>		
≤ 2 διαυα	1	0.033
> 2 days	0.38 (0.15-0.93)	
<b>Caregiver burden (ZBI)</b>		
No-mild burden	1	<0.001
Moderate-high burden	7.56 (2.97-19.25)	
<b>Dementia patients variables</b>		
<b>Clinical dementia rating scale</b>		
Mild-moderate dementia	1	0.799
Severe dementia	1.13 (0.42-3.00)	
<b>Barthel index</b>		
Mild-moderate disability (0-60)	1	0.234
severe disability (61-100)	1.59 (0.74-3.40)	

**Table 4: Multivariate Analysis of family caregiver depression by caregiver and dementia patient's characteristics.**

Variables	Odds ratio (95%CI)	p-value
<b>Non-exercise</b>		
	1	
<b>Exercise</b>		
	0.24 (0.09-0.62)	0.004
<b>Family support of caregiving in ADLs</b>		
	0.51 (0.31-0.85)	0.009
<b>Hours of caregiving per day</b>		
≤ 8 hours	1	
> 8 hours	4.73 (1.44-15.56)	0.010
<b>Caregiver burden (ZBI)</b>		
No-mild burden (0-10)	1	
Mild-Moderate burden (11-20)	2.40 (0.56-10.24)	0.238
High burden (>20)	15.24 (3.71-62.57)	

having higher rates of depression. Further, we also did not find that the comorbidity of caregivers and patients' characteristics such as ADL dependency or severity of dementia, were related to depression in family caregivers.

Our results indicated that caregiver characteristics predicting depression included high burden (ZBI > 20), long hours spent on caregiving (> 8 hours per day). A poor relationship between caregivers and patients, and insufficient income were also found to be associated with depression in the univariate analysis but not in the multiple regression model. Other studies [8,19,20] have shown that low income, caregiver burden, and hours per week spent providing care predict depression, consistent with this study. Another important finding is the very low satisfaction with the social support system in Thailand. Most participants rated this as 1 out of 5 in terms of support from primary health care and social services. This indicates a current lack of resources provided for the family caregivers of dementia patients. The primary health care system, as well as social service organizations, needs to supply suitable aids for caregivers to cope with their stress and burden.

Given that some of the stress and burden in providing care for dementia patients can be attributed to depression in family caregivers, there were further interesting findings in this study. The family caregivers that had regular exercise and good family support showed significantly less depression. This suggests that the positive effects of exercise and support within the family can help caregivers to cope with their responsibilities. Many studies [21-24] have demonstrated that exercise and a high quality of social relationships can lower the incidence of depression in older adults. Biological evidence from Notarangelo et al. [25] demonstrated that exercise indirectly modulates the metabolism of kynurenines, an essential amino acid tryptophan that plays a major role in the pathophysiology of depressive disorder.

Our study has important strengths. It is one of a few studies using detailed data collected in person that focused on family caregivers during clinic visits in primary care setting. The results highlight several important intervention and research strategies for the future health care system. First, there is a need for interventions coordinating with other family members to help caregivers. For example, using media or networks to communicate in the community may help encourage relatives and other members in the family to get more involve in caring for dementia patients. Second, primary health care system also needs to improve the services that can easily be accessed by family caregivers. For example, hospital could host caregiver support groups or social networks, or establish specific assessments to address caregiver burden and screen depression in routine practice and thus deliver interventions according to the available resources.

We also found that regular exercise could be the protective factors of depression in family caregivers. This could be a target for both public health strategies and clinicians. In future research, exercise as an intervention for family caregivers could be tested in randomized controlled trials to determine its efficacy in this regard.

However, this study also has limitations. First, this is a cross-sectional analysis such that causative effects cannot be inferred. Second, as for the patients' characteristics, we did not assess behavioral problems owing to the time limitations of routine clinical practice (family caregivers were interviewed during patients' clinic visits). Many studies [3,8,19,26] have demonstrated that higher level of behavior problems in dementia patients indicate higher burdens on caregivers. Third, some dementia patients in this study had multiple caregivers, we did not record data only caregiver or multiple caregivers for analyzing if depressions could have occurred more in only caregiver group.

In conclusion, the prevalence of depression in family caregivers in this study was higher than in general. (18.64% vs 8-10%). Hours spent caregiving per day (> 8 hours) and high burden were the main predictors of depression in caregivers. However, the prevalence of depression was lower in caregivers undertaking regular exercise and those who had good support within the family. This study highlights several important interventions and a need for future research aiming to improve the support within the primary health care system, screening for depression in family caregivers, and investigating effective interventions to reduce the burden and depression of caregivers for dementia patients, including exercise, educations for caregivers to deal with the problems of dementia, and facilitating the coordination of providing care within the family.

## AUTHORS' CONTRIBUTIONS

Chalothorn Chaobankrang was the principal investigator secured funding. Chalothorn Chaobankrang and Chitima Boongird were part of the study design and concept. Chalothorn Chaobankrang, Krisana Kittichai managed the study and performed the data collection. Thunyarat Anothaisintawee, Chalothorn Chaobankrang and Chitima Boongird wrote this article and performed data analysis. Chitima Boongird, Chalothorn Chaobankrang and Thunyarat Anothaisintawee drafted the manuscript.

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