Disability and Late-Life Depression: A Prospective Population-Based Study

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Background: *Previous researches in developed countries have established depression as a risk factor for disability in the elderly, but little has focused on disability as a contributor to depression.*
Objective: *The present study aims: 1) to describe the 3-month incidences of depression among Thai elders with and without disability and 2) to investigate the prospective relationship between the disability and depression.*
Material and Method: *A 3-month prospective population-based cohort study of 358 elders (142 severe, 89 moderate 127 mild or non-disabled people), aged 60 years and older and living in rural and urban communities, was conducted. Depression was assessed by Euro-D Thai version at baseline and 3 months follow-up. Disability was assessed by World Health Organization Disability Assessment Schedule (WHODAS-II). Impairment was assessed by a modified version of the Burvill Physical Illness Scale. Logistic regression modeling was used to determine whether impairment and disability were independently associated with the onset of late-life depression.*
Results: *The 3-month incidences were 5%, 14.29% and 22.61% among the elders with no/mild, moderate and severe disability, respectively. Both severe disability and a high number of impairments were each significantly associated with risk of depression (RR3.25 95%CI 1.29-8.18 and RR2.33 95%CI 1.15-4.73, respectively), independently of age, gender and socioeconomic status.*
Conclusion: *Disability is one of the main contributors in depression in late-life. Improving community and public facilities and accessing to health services (e.g., medical rehabilitation) for disabled older people may not only help to enhance their quality of life but also help to prevent depression.*

Keywords: *Aging, Depression, Disability, Cohort study, Thailand*

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WHO's International Classification of Functioning, Disability and Health[1] defines disability as "the negative aspects of the interaction between an individual (with a health condition) and that individual's contextual factors (personal and environmental factors)". Interactions are specified as impairments (affecting the body), activity limitations (affecting actions or behavior) and participation restrictions (affecting experience of life). According to the Global Burden of Disease estimates for 2004[2], 68% of the 751 million years lived with disability (YLD) worldwide are attributable to chronic non communicable diseases and 84% of this burden of chronic-disease disability arises in countries with low and middle incomes. About 23% of the disability burden caused by chronic disease in countries with low and middle incomes occurs in people aged 60 years and older. However, it is set to increase sharply. Between 2010 and 2050, the number of people aged 60 years and older will increase by 224% in the least developed regions. The accompanying epidemiological transition will greatly increase the burden of chronic non-communicable diseases, especially in the most rapidly developing regions[3].

Despite its public health importance, disability in low and middle income countries such as Thailand remains little studied. Apart from its link with many physical difficulties, disability is also associated with mental health problems. According to the Global Burden of Disease study, depression is the leading

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worldwide cause of disability in adults[4]. In 2004 depression was ranked third and contributed to 4.3% of total disability-adjusted life years (DALYs). It was expected to rise to become the top disease burden (6.2% of the total DALYs) in 2030[5]. Depression itself is therefore disabling. In addition, depression causes increased disability from other medical conditions, either by increasing the risk for these conditions or by poorer health behaviors in depressed individuals with these medical conditions[6]. Previous longitudinal researches in developed countries have provided evidence for such mechanisms (for example, see[7,8]).

Much evidence is available on depression as a significance risk factor for disability in the elderly[9,10]. However, much less is known about the possibility of disability as a risk factor for depression. The current study aims at: 1) describe the 3-month incidence of major depression among Thai elders with and without disability and to 2) investigate the prospective relationship between their disability and depression.

Material and Method

Setting

A catchment area called Khlong Luang district, part of Pathumthani Province, was selected. All the addresses in Khlong 6 sub district and 20 communities of Khlong Luang Municipality (1,236 houleholds) were approached to identify eligible older people living in the areas. Khlong 6 subdistrict was a largely rural area, consisting of rice fields and villages. Khlong Luang Municipality was typical of many suburban metropolis districts, consisting of predominantly residential and mixed-use communities.

Sampling

In the first round of the survey in January 2009, the authors first enumerated the selected area populations by knocking on the doors of all households, identifying older people aged 60 or over. There were no exclusion criteria. All people aged 60 or over were eligible. However, in the event that there was more than one eligible resident in a given household, the authors selected one at random to be interviewed using systemic random sampling. By doing so, the authors first ranked all eligible elders in order of age in the household. Then the procedure went as follows: The oldest elder was selected from the first household, the second oldest person was selected from the second household and the third oldest from the third household and so on. However, if it happened that the next household had two or more eligible people but still fewer people than the previous one, the authors' would redo the process by having the oldest person selected. If the selected eligible person was not at home at the time of the first approach for interview, substitution was not permitted. The authors ensured that repeated visits on at least three occasions were made to interview the selected person in order to reduce non-response. In the first round, 1,231 elders living in the households were identified and approached. A total number of 1,170 elders agreed to participate in the present study (a response rate of 99.64%). The authors then performed the index assessment, screening the participants for depression (using Euro-D[11]) and assessing their levels of disability (using WHODAS-II Thai version[12]). Only those who were screened negative for depression, 896 elder from first screen, were randomly selected for the follow up interview 3 months later. The selected elders were then classified into 3 levels of disability, namely severely, moderately and mildly or non-disabled. Each of the three subgroups was randomly sampled by a random table[13], yielding 155 non-depressed elders with severe disability, 117 non-depressed elders with moderate disability and 167 non-depressed elders with mild or no disability. In the second round, the authors performed the follow-up assessment with the three subgroups. The selected elders were invited for the follow-up interview by telephone and, if they accepted, appointments were then made. The interviews were conducted at the elders' homes or other places where they felt more convenient. In the same manner as we approached the eligible participants in the first round, for those who that couldn't be interviewed at the first appointment, substitution was not permitted. Repeated visits were made on at least three occasions on different dates to reduce non-response.

Interview

Ten trained interviewers interviewed the selected individuals during March 2009 (index assessment) and June 2009 (follow-up assessment). The present study protocol was approved by the Ethics Committees of Thammasat University.

Measures

Dependent variables

Depression was assessed by the Thai version of the Euro-D scale, a structured scale of depressive symptoms designed for detecting major depression in older populations. Its items cover 12 symptom domains including fatigue, appetite, sleep, concentration, interest, irritability, depression, tearfulness, enjoyment,

pessimism, guilt and wishing death[14]. In studies from developing countries, the Euro-D has a similar factor structure to that in European countries[15]. Euro-D Thai version was translated and validated in an out-patient setting against the Thai version of the Mini International Neuropsychiatry Interview (MINI), which is a standardized clinical diagnostic interview for DSM-IV axis-I disorders. At a cut-point of 5/6 of Euro-D, the sensitivity for major depressive episodes was 84.3%, specificity was 58.6%, the kappa was 0.4 and internal consistency for the total scale measured by Cronbach's alpha was 0.72[16].

Independent variables

Physical impairment: A modified version of the Burvill physical illness scale was used to rate impairment[17]. Thai version of those was used one time in the elders at Kanchanburi, Thailand[12]. Participants were asked about the presence of 13 common impairments, including breathlessness, faints, arthritis, weakness/loss of limb, skin problems, hearing problems, persistent cough, heart trouble, eye sight problems, gastrointestinal problems, high blood pressure, diabetes and pain. The respondents were classified as having an impairment when they also answered 'yes' to a question asking if such impairment 'disturbed their daily activities a lot'. The numbers of impairment were summed to produce a score and the score was then categorized into 4 levels of 0, 1, 2 and 3 or more impairments.

Disability: The brief Thai version[12] of the World Health Organization Disability Assessment Schedule (WHODAS-II) was used to rate disability over the past 30 days[18,19]. Its domains included understanding and communicating with the world, moving and getting around, self-care, getting along with people, participation in society and life activities. Each item was self-rated on a 5-point scale from no problem with carrying out the activities to total/extreme inability. The total disability score, simple scoring[20] (range12-60) was categorized into tertiles (based on the scores at the index assessment on 1,170 elders): no or mild disability referred to the scores of 12-14, moderate disability 15-22, and severe disability 23-60.

Potential confounding variables

The analysis took into account a number of possible confounding variables (sociodemographic characteristics) in the relation between disability and subsequent depression. Variables assessing sociodemographic status included age, gender and socioeconomic status. Socioeconomic status (SES) was assessed by number of household assets (such as ownership of a refrigerator, television set, phone, microwave oven, etc.). The household asset index as a proxy measure of SES was created by principal component analysis[21] . The asset index in the present study was dichotomously classified as high and low SES according to whether an individual's index scores was above or below the median index score.

Statistic analysis

Statistical analyses were performed with STATA version 10.0. Each variable were report in real number and weighted percent which took account of the total number of eligible elders in the household. Relative risks and 95%CIs were reported for the associations between impairment, disability and the onset of depression were calculated by Poisson logistic regression with and without adjustments for potential confounders, using svy commands to take account of the survey design.

Results

Participants

At the 3-month follow-up the authors were able to interview 358 of the 439 elders (81.54%), who had been drawn from the participants in the first round. Over the 3-month period 2 subjects had died. Five participants refused to participate in the second assessment, 10 had moved out of the area, 40 repeatedly failed to turn up at the appointed times and 24 could not be contacted. The mean age of the non-responders was 69.35 (SD 7.01) and did not significantly differ from that of the responders (mean 69.55 SD 7.38) ($p > 0.05$). All in all, there were 127 elders with no or mild disability, 89 with moderate disability and 142 with severe disability completing the follow-up interviews (response rates were 81.93%, 76.07% and 85.03% respectively). There were 228 females (62.77%) in the sample and 189 living in Khlong-Luang Municipality (52.67%). Nearly half (42.97%) of the households had only one older resident, 54.65% had 2 and the remaining had 3 or more.

Sociodemographic characteristics and associations with depression

Being older (69 years and over) was associated with the onset of depression (RR: 2.43, 95%CI: 1.33-4.46). Female gender and low socioeconomic status were not associated with higher risk for depression (Table 1).

Depression

The 3-month incidence of depression was 14.26%. The three most common symptoms reported were negative thought, sleep disturbance and restlessness.

Impairment and disability

The three most common impairments reported at the index assessment were arthritis (13.49%) pain (11.49%), eye sight problems (6.14%) (n = 358). Three months later, the two of three most common impairments remained in pain (16.83%) and arthritis (13.47%) but eye sight problems was replaced by diabetes mellitus (5.34%). Only gastrointestinal problems, heart trouble, pain and arthritis had 1.5 times or higher the risk for developing depression, although all the relative risks were not statistically significant. The 3-month incidences of depression among those with GI problems, heart trouble, pain and arthritis were 40% (1/3), 33.33% (2/7), 23.21% (9/41) and 20.59 (10/49), respectively. Relative risks for the associations between individual impairments and the onset of depression were described in Table 2.

Eighteen out of 89 elders (33.31%), who reported one or more impairments, developed depression at the follow-up, compared with 36 out of 269 elders (12.5%), who had no impairment. Thirty six elders (22.61%) with severe disability developed

Table 1. Sociodemographic characteristics and depression

Potential confounders	n	Depression		
		n (weight %)	Relative risk (95% CI)	p-value
Age (years)				
60-68	181	14 (8.43)	1	
69 up	177	40 (20.49)	2.43 (1.33-4.46)	0.004*
Gender				
Male	130	17 (13.29)	1	
Female	228	37 (14.82)	1.11 (0.63-1.96)	0.706
Socio-economic status				
High	179	31 (17.00)	1	
Low	179	23 (11.62)	0.68 (0.40-1.17)	0.164

Table 2. Incidence of depression and prospective associations between individual impairments and the onset of depression

Impairment	Incidence exposure among		Relative risk (95%CI)	p-value
	Weighted % (No of cases of depression /total)			
	Non-cases	Cases		
Arthritis	13.33 (44/308)	20.59 (10/49)	1.54 (0.80-2.98)	0.19
pain	19.67 (45/316)	23.21 (9/41)	1.76 (0.89-3.45)	0.09
diabetes	14.17 (52/347)	18.75 (2/10)	1.32 (0.34-5.14)	0.68
eye sight problems	13.98 (50/334)	19.35 (4/23)	1.38 (0.53-3.62)	0.51
weakness/loss of limb	14.29 (53/352)	16.67 (1/5)	1.17 (0.18-7.61)	0.87
hearing problems	14.29 (53/351)	16.67 (1/6)	1.17 (0.19-7.18)	0.87
breathlessness	14.49 (54/353)	(0/4)	Cannot approximate	
faints	14.44 (53/350)	10 (1/7)	0.69 (0.10-4.87)	0.71
persistent cough	14.34 (54/356)	(0/1)	Cannot approximate	
skin problems	14.26 (53/353)	20 (1/4)	1.40 (0.22-9.07)	0.72
heart trouble	13.97 (52/350)	33.33 (2/7)	2.39 (0.72-7.84)	0.15
gastrointestinal problems	14.06 (53/354)	40 (1/3)	2.84 (0.63-12.72)	0.17
high blood pressure	14.23 (52/349)	18.18 (2/8)	1.27 (0.33-4.98)	0.72

depression 3 months later, compared with 12 elders (14.29%) with moderate disability and 6 elders (5%) with no/mild disability.

Those with disability and a high number of impairments were at increased risk for depression at follow-up. Elders with moderate and severe disability were at higher risk than those with no/mild disability (RR 2.86 95% CI 1.06-7.74 and RR 4.52 95% CI 1.86-10.95, respectively, p-value = 0.0028) (Table 3). There were significant trends for those who had a higher level of disability (p = 0.0002, F = 14.19, df = 357) and a greater number of impairments to be at higher risk for depression (p = 0.0504, F = 3.85, df = 357).

Multivariable analyses

Disability

The crude relative risks for the associations of moderate and severe disability with depression were 2.86 (95% CI 10.6-7.74) and 4.52 (95% CI 1.86-10.95). However, the association between severe disability and depression dropped to 3.71 when adjustment for age, suggesting that older age confounded the association. After further adjustments for gender and socioeconomic status, the associations of both moderate and severe disability only slightly changed.

Impairment

Table 3 showed that there was a significant association between reporting 3 or more impairments and depression, after adjustment for age, gender and SES.

Discussion

To the authors knowledge, this is the first prospective cohort community study in Thailand to examine the incidence of depression among elders with and without disability and their risks of developing depression after a certain period, taking account of potential confounders including age, gender and socioeconomic status. The longitudinal design allowed assessment of direction of causality and reduce information bias. The authors used Euro-D which was a validated instrument specially developed to screen for major depression in old age, rather than depressive symptoms. Unlike most studies in the past, the present study used WHODAS 2.0, a widely used measure with a universal metric that is capable of assessing disability across regions, cultures and disorders. WHODAS 2.0 covers 6 dimensions; cognition, mobility, self-care, getting along, life activities and participation. It thus has advantages over previous studies that used disability measures focusing on physical functioning (such as the Barthel index, Katz Index of ADL). The present study sample was drawn from populations of older residents living in rural and urban settings and the response rate was satisfactorily high.

The 3-month incidences of depression in the no or mild, moderate and severe disabled group were 5%, 14.28% and 22.61%, respectively. There were no previous comparable studies examining the 3-month incidence of depression. Available evidence comes from studies which used different depression screening measures and different follow-up periods. A community

Table 3. Prospective associations of disability and impairments with the onset of depression

	n	Depression			
		n (weight %) (95% CI)	Unadjusted relative risk (95% CI) [a]	Adjusted relative risk	Adjusted relative risk (95% CI)[b]
Disability					
No and low	127	6 (5)	1	1	1
Moderate	89	12 (14.29)	2.86 (1.06-7.72)	2.59 (0.93-7.25)	2.61(0.95-7.22)
Severe	142	36 (22.61)	4.52 (1.87-10.94)	3.71 (1.48-9.29)	3.76 (1.54-9.17)
Impairment					
No	269	36 (12.5)	1	1	1
1	40	7 (16.67)	1.33 (0.60-2.95)	1.38 (0.62-3.11)	1.35 (0.61-2.99)
2	30	6 (17.95)	1.44 (0.62-3.35)	1.41 (0.63-3.15)	1.45 (0.66-3.18)
3 or more	19	5 (28.57)	2.29 (0.99-5.27)	2.33 (1.15-4.72)	2.12 (1.05-4.26)

[a] Adjusted for age

[b] Adjusted for gender, socioeconomic status and age

survey of 1,390 elderly people living in 4 districts of Bangkok, using a Thai version of Geriatric Depression Scale, reported a 1-year incidence of 7.27%[22]. In a hospital setting, a study reported the cumulative one year incidences of depressive disorders, assessed by Clinical Interview Schedule-Revised, of 12.0% among patients after stroke and of 5.1% among those with Parkinson's disease[23].

The three physical impairments which had strongest 3-month prospective associations with depression were gastrointestinal problems, heart trouble and pain, whereas a study in Kanchanaburi Province, Thailand showed strongest cross-sectional associations with faints, persistent cough and breathlessness[12]. Our findings were more in line with those of the Gospel Oak study that reported strongest 1-year prospective associations with hypertension, severe pain and breathlessness[19]. However, in a recent prospective community study on pain and depression in Thailand, it showed that the longer time it took to follow the participants, relative risk of depression in participants with chronic musculoskeletal pain would tend to increase (RR = 1.06 (95% CI 0.38-2.94) and 2.39 (95% CI 0.50-11.52) at 3- and 6-month follow-up, respectively). On the other hand, subsided pain could also reduce the risk of developing depression[24]. Therefore the relative risk of the associations between physical impairments and depression in the present study could have changed or strengthened if the authors' had followed the participants some time longer.

The present study showed the prospective association between disability, impairment and depression. In the severe disability group, the relative risk of depression was strong and statistically significant, even after adjustment for age, gender and SES. A prospective community-based study in the UK[19] of 889 residents aged 65 years or over living in an electoral ward in London, using SHORT-CARE to screen for depression and Katz type Activities of Daily Living Scale for disability, also found that disablement, especially handicap, was the chief cause of onset of depression in late-life. In a 1-year prospective community-based study in Alameda country in the US that followed-up 2,219 elderly people aged 50-95 years old, found that Activity Daily Living (ADL) disability at baseline predicted the occurrence of depression later[25]. A 2-year prospective study in the north-central Bronx community in the US following 1,457 elderly people also showed that increasing disability and declining health preceded the emergence of depression[26]. As for impairment, only elders that had at least 3 impairments had higher risk than those with no impairment. A 1-year prospective study in Thailand by Thongtang[22] also reported that physical illness was the one of major contributing factors in late-life depression.

There are many possible mechanisms linking disability and depression. Disability is a major stressor that leads to loss of perceived control and lower self-esteem[27,28]. Physical disability may also bring about a higher number of negative life events[29], lead to social and leisure activity restriction[30], isolation and reduced quality of social support[31], all of which are potential precipitants of depression. It is also possible that disability and depression increase risk for each other. For example, two 8-year cohort studies in Beijing, China suggested that disability among elderly people significantly increased the risk for depressive symptoms[32] and depression increased the risk for prevalent disability[33]. It proposed that disability is a negative life event and, in turn leads to depression. On the other hand, depression increases risk for several physical impairments such as heart attack, stroke and hip fracture, which are major sources of disability in the elderly.

Conclusion

The 3-month incidences were 5% in mild or non disability, 14.29% in moderated disability and 22.61% in severe disability. Disability is one of the main contributors to depression in late-life.

Limitation

There are several limitations in the present study. Firstly, the study sample was not large enough to detect possible significant prospective associations between impairments and depression. Secondly, the follow-up time was rather short. The three-month period may not be long enough to establish the effects of disability, impairment and some confounding variables (such as gender, SES and social support) in depression. Depression should also be measured frequently because its remission and recurrence can occur several times over a certain period. Besides, other factors, such as education level, should also be considered.

Implications

Disability is one of the main contributors to depression in late-life. Improving community and public facilities and access to health services (*e.g.*, medical rehabilitation) for disabled older people may not only help to enhance their quality of life but also help to

prevent depression. Promoting self-dependency and facilitating and encouraging older people to participate in social and leisure activities should have a role in improving self-esteem and preventing depression.

Potential conflicts of interest

None.

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ภาวะทุพพลภาพ และโรคซึมเศร้าในผู้สูงอายุ: การศึกษาระยะยาวในประชากร

อรพินท์ จิตตวิสุทธิกุล, ตะวันชัย จิรประมุขพิทักษ์, เกษร สำเภาทอง

***ภูมิหลัง**: งานวิจัยที่ผ่านมาชี้ให้เห็นว่าโรคซึมเศร้าเป็นปัจจัยเสี่ยงต่อภาวะทุพพลภาพในผู้สูงอายุ แต่มีการศึกษาน้อยมากที่ศึกษาถึงผลของภาวะทุพพลภาพต่อโรคซึมเศร้า*

***วัตถุประสงค์**: 1) เพื่อศึกษาอุบัติการณ์ของการเกิดโรคซึมเศร้าในผู้สูงอายุไทยที่มี และไม่มีภาวะทุพพลภาพ เมื่อติดตาม 3 เดือน และ 2) เพื่อติดตามความสัมพันธ์แบบไปข้างหน้าระหว่างภาวะทุพพลภาพและโรคซึมเศร้า*

***วัสดุและวิธีการ**: การศึกษาอุบัติการณ์ 3 เดือนในชุมชนครั้งนี้ ทำการสัมภาษณ์ผู้สูงอายุจำนวน 358 คน (กลุ่มทุพพลภาพรุนแรง 142 คน ปานกลาง 89 คน และกลุ่มที่ไม่มีหรือมีภาวะทุพพลภาพน้อยจำนวน 127 คน) ที่มีอายุตั้งแต่ 60 ปีขึ้นไป อาศัยอยู่ในเขตเมืองและเขตชนบท ใช้แบบสอบถาม Euro-D ฉบับภาษาไทยเก็บข้อมูลโรคซึมเศร้า World Health Organization Disability Assessment Schedule (WHODAS-II) สัมภาษณ์ระดับภาวะทุพพลภาพ และวัดระดับความบกพร่องด้วยแบบวัดที่พัฒนาจาก Burvill Physical Illness Scale สถิติที่ใช้ในการศึกษาความสัมพันธ์ของความบกพร่องและภาวะทุพพลภาพต่อโรคซึมเศร้าคือ logistic regression*

***ผลการศึกษา**: อุบัติการณ์การเกิดโรคซึมเศร้าอยู่ที่ร้อยละ 5, 14.3 และ 22.6 ในกลุ่มที่ไม่มีภาวะทุพพลภาพหรือมีบ้างเล็กน้อย กลุ่มที่มีปานกลาง และกลุ่มที่มีภาวะทุพพลภาพรุนแรงตามลำดับ ภาวะทุพพลภาพในระดับรุนแรงและกลุ่มที่มีความบกพร่องในระดับสูงจะมีความสัมพันธ์กับความเสี่ยงต่อโรคซึมเศร้า (RR 3.25 95% CI 1.29-8.18 และ RR 2.33 95% CI 1.15-4.73 ตามลำดับ) โดยไม่ขึ้นกับอายุ เพศ และเศรษฐานะ*

***สรุป**: ภาวะทุพพลภาพเป็นหนึ่งในปัจจัยหลักหนึ่งที่ก่อให้เกิดโรคซึมเศร้าในผู้สูงอายุ การยกระดับการให้บริการทางสาธารณสุขทางภาครัฐและในชุมชน ตลอดจนการเพิ่มโอกาสการเข้าถึงบริการโดยเฉพาะด้านการฟื้นฟูในผู้สูงอายุนอกจากเป็นการส่งเสริมคุณภาพชีวิตแล้ว อาจสามารถป้องกันโรคซึมเศร้าได้ด้วย*