• Investigation •

Association between visual status and mental health status in Thai rural elderly: a community-based study

Pear Pongsachareonnont[1], Nopphawan Uramphorn[1], Nuchanad Hounnaklang[2]

[1]Retina Research Unit, Department of Ophthalmology, Faculty of Medicine, Chulalongkorn University and King Chulalongkorn Memorial Hospital, Thai Red Cross Society, Bangkok 10330, Thailand
[2]College of Public Health Sciences, Chulalongkorn University, Bangkok 10330, Thailand
Correspondence to: Pear Pongsachareonnont. Department of Ophthalmology, King Chulalongkorn Memorial Hospital, 1873 Payathai Rd., Pathumwan, Bangkok 10330, Thailand. pear.p@chula.ac.th
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Abstract

• AIM: To evaluate the association between visual impairment (VI) and mental health or social engagement in older adults living in rural Thailand.

• METHODS: Data for this cross-sectional study were drawn from a community survey conducted in 2015 in Saraburi Province, Thailand. Participants were 327 adults aged ≥50y. VI was assessed using presenting distance visual acuity. Mental health and social engagement were evaluated in face-to-face interviews using validated questionnaires. After determining the prevalence of VI and relevant sociodemographic characteristics, multivariate regression analysis was used to evaluate the impact of VI on mental health and social engagement.

• RESULTS: The prevalence of VI was 18.3%. Major causes were refractive error (58.3%) and cataract (35%). Factors associated with VI in the crude analysis were: older age [odds ratio (OR) 8.08], unemployment (OR 2.72), widowhood (OR 2.47), being divorced/separated (OR 3.27), smoking (OR 2.09) and disability in activities of daily living (OR 2.35). Protective factors were undergoing eye screening at least once a year (*P*=0.029) and obesity (*P*=0.005). VI was significantly associated with low social engagement (adjusted OR 4.13) but not with poor mental health (*P*>0.05).

• CONCLUSION: Although VI older adults reported less participation in social activities, there is no significant association between VI and poor mental health. Annual eye examinations may prevent VI in older adults. Information about employment and anti-smoking should be targeted to older adults with VI.

• **KEYWORDS:** visual impairment; mental health; social engagement; community based study

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INTRODUCTION

Visual impairment (VI) is a leading cause of disabilities among older adults. World Health Organization (WHO) data indicate major causes of VI are uncorrected refractive errors (43%), cataract (33%), and glaucoma (2%)[1]. VI is defined as presenting visual acuity (VA) in the better-seeing eye of less than 20/70[2]. Previous studies highlighted a significant association between VI and poor mental health, including depression, anxiety, and suicide risk[3-4]. However, few studies have been conducted among older Asian populations[5-7].

VI has detrimental effects on most aspects of life, and is related to an increased risk of falling and injury, decline in functional status, and deterioration in quality of life[8]. VI also causes economic burden because of loss of productivity of affected people and their caregivers, and costs of healthcare services and rehabilitation[9]. A number of national programs have been launched to prevent blindness and VI[10]. Therefore, population-based studies of the prevalence of VI are important for health policy planning and implementation.

Most previous studies regarding the association between VI and psychosocial status were hospital-based studies that used checklists or questionnaires to evaluate visual status, and ophthalmic diseases (rather than detailed eye evaluation) to measure objective VA and identify causes of VI[8,11]. To our knowledge, this is the first study to integrate a comprehensive eye examination in an investigation of the impact of VI on mental health and social engagement among Thai older adults.

The main objective of this study was to evaluate the association of VI with mental health and social engagement. Secondary objectives were to identify the prevalence and causes of VI and determine sociodemographic characteristics associated with VI in older adults (aged ≥50y) living in a rural area of Thailand.

SUBJECTS AND METHODS

This cross-sectional community-based study was jointly conducted by the Chulalongkorn University Department of Ophthalmology, Faculty of Medicine, and the College of Public Health Sciences. The study was approved by the University's Institutional Review Board, adhered to the tenets

of the Declaration of Helsinki, and was registered in a Thai clinical trial registration database (TCTR 20160916002).

The database used in this study was extracted from the cross-sectional community survey conducted in Saraburi province, Thailand, whereby Chulalongkorn University intended to promote social engagement in the community (Chulalongkorn university database, 2016 www.osm.chula.ac.th/index.php/m-sp-ofoc/208-sp-ofoc4s-reason-3). That survey aimed to identify health indicators and the prevalence of VI in older adults in a rural setting in Thailand. The survey included participants aged ≥50y who resided in Kaeng Khoi, Saraburi. Three sub-districts of Kaeng Khoi (Cham Phak Phaeo, Tan Diao, and Huai Haeng) were selected using convenience sampling. The survey had two parts: an ophthalmic examination and a health interview conducted by trained interviewers.

Ophthalmic Examination Ophthalmologists conducted comprehensive eye examinations for all participants. The examination included uncorrected and corrected presenting distance VA with the participant's own eyeglasses or contact lenses, intraocular pressure measurement with an Icare rebound tonometer (Tiolat Oy, Helsinki, Finland), and an anterior eye segment exam with a portable slit-lamp (Keeler PSL, Windsor, UK). Fundus photography with a digital non-mydriatic fundus camera (Kowa Nonmyd a-D 5Mega, Torrance, CA, USA) was used for fundus evaluation. Fundus photographs were interpreted by a retina specialist. The purpose of the eye examination was to assess visual status and detect eye abnormalities among people with VI.

Visual Acuity Assessment and Ophthalmic Evaluation Uncorrected and corrected presenting distance VA was measured with standard Snellen and tumbling E charts at a distance of 20 feet. Severity of VI was classified into three categories based on VA of the better seeing eye according to the Resolution of the International Council of Ophthalmology 2002[12] and recommendations from the WHO Consultation on "Development of Standards for Characterization of Vision Loss and Visual Functioning" 2003[13]: moderate VI (VA<20/70-20/200), severe VI (VA<20/200-20/400), and blindness (VA<20/400). Participants with VA of the better-seeing eye equal to 20/70 or better were defined as normally-sighted persons, and were categorized as the control group (no VI). Pinhole VA was measured if the presenting VA was <20/20 in either eye.

The principle cause of VI was assigned based on the WHO convention that attributes the principle cause to the primary disorder of the eye. In cases where two or more causes were found, the cause that was most easily treated was assigned as the principal cause[14]. Refractive error was recorded as the cause if the VA improved to 20/70 or better with pinhole VA measurement. Lens status was classified according to the degree of lens opacity: no cataract, visually significant cataract, aphakia, pseudophakia, and obscured lens due to corneal scar. Glaucoma was assigned as the cause if the optic disc showed glaucomatous optic neuropathy without other possible causes or history of diagnosis of glaucoma.

Health Interview Health interviews were conducted by trained interviewers drawn from local health volunteers and staff from the College of Public Health Sciences, Chulalongkorn University. The interviews covered sociodemographic data, mental health assessment, social engagement assessment, and evaluation of performance in activities of daily living (ADL).

Mental Health Assessment Mental health status was determined with the Thai General Health Questionnaire-12 (GHQ-12)[15]. This is a validated screening instrument for the Thai population, and comprises 12 items on three domains (as experienced in the past few weeks): depressive symptoms, anxiety, and social dysfunction. The Thai GHQ-12 has high reliability, validity, and internal consistency (Cronbach's alpha coefficient 0.84-0.91), with sensitivity of 78.1% and specificity of 84.4%[16]. The questionnaire has four response categories, with total scores ranging from 0-12. Scores of ≥2 suggest poor mental health.

Social Engagement Assessment Social participation was evaluated with the Index of Social Engagement (ISE)[17]. This includes six items with five response categories (total scores range from 0-25). The ISE focuses on interaction with others, engagement in individual and group activities, goal-setting, and involvement in everyday life. It has an internal consistency of 0.79 and average kappa for interrater item reliability of 0.58[18]. There is no standard cut-off point that demonstrates good or poor social engagement. However, higher scores indicate higher social engagement. In this study we used the 75th percentile value as the cut-off point. Participants with an ISE score <75th percentile value were categorized as the low level of social engagement group.

Definition of Variables Participants were divided into four age groups: 50-59y, 60-69y, 70-79y, and ≥80y. Education level was divided into two groups: uneducated and educated (at least 1y of education). Employment status was divided into two groups (unemployed and employed). Self-rated household income was classified as not enough and enough. Marital status was classified as single, married, widowed, and divorced/separated. Living arrangement was classified as living alone and living with others. History of diabetes and hypertension was categorized as with or without history of comorbidities. Smoking status was divided into three groups: current, past smoker, and never smoked. Body mass index (BMI; kg/m^2) was classified as normal (18.5-22.99), underweight (<18.5), overweight (23-24.99), and obese (≥25). History of eye exams was divided into three groups: never, within 1y, and over 1y. Sleep quality was classified as poor and good.

ADL performance was evaluated with the Barthel Index, which measures disability in 10 activities of daily living. Total scores range from 0 to 100[19]. Scores <100 suggest some limitations in ADL. Participants were categorized as independent or disability in ADL.

Statistical Analysis Descriptive analyses were conducted to demonstrate the characteristics of VI and normally sighted persons, and to analyze the prevalence of VI. Logistic regression analysis was performed to identify characteristics associated with VI. Variables with a *P*-value <0.1 in a univariate analysis were considered for inclusion in a multivariate model. Multivariate regression analysis was conducted to investigate the association of VI with mental health and social engagement. *P*-values <0.05 were considered statistically significant. All analyses were performed using IBM SPSS, version 22.0 (IBM Corp., Armonk, NY, USA) and Stata statistical software, version 14.0 (Stata Corp. LP College Station, TX, USA).

RESULTS

Prevalence and Causes of Visual Impairment Participants' baseline characteristics were shown in Table 1. Among 327 participants aged ≥50y, 60 (18.3%) had presenting distance VA of the better-seeing eye worse than 20/70. The prevalence rates of blindness, severe VI, and moderate VI were 3.06%, 0.92%, and 14.37%, respectively. The prevalence of VI increased with age (8.7% in adults aged 50-59y; 11.5% in adults aged 60-69y; 27.7% in adults aged 70-79y, and 43.5% in adults aged ≥80y). Refractive error was the most common cause of VI (58.3%), with cataract being the second most common (35%). Glaucoma was responsible for 3.3% of VI. Other causes, including age-related macular degeneration (AMD) and optic atrophy, were responsible for 3.3% of VI.

Association Between Sociodemographic Characteristics and Visual Impairment In the crude analysis, characteristics associated with VI (compared with the control group) were: older age [odds ratio (OR) 8.08, 95% confidence interval (CI) 2.17-30.11], unemployment (OR 2.72, 95%CI 1.53-4.82), being widowed (OR 2.47, 95%CI 1.32-4.62), being divorced/separated (OR 3.27, 95%CI 1.21-8.79), current smoking (OR 2.09, 95%CI 1.03-4.26), and disability in ADL (OR 2.35, 95%CI 1.30-4.25) (Table 2). After adjusting for covariates, older age was the only sociodemographic factor associated with VI (OR 5.31, *P*=0.025), whereas having an eye exam within 1y (OR 0.38, *P*=0.029) and obesity (OR 0.32, *P*=0.005) were protective factors for VI.

Association Between Visual Impairment and Mental Health In the crude analysis, VI increased the OR for poor mental health (OR 2.41, 95% CI 1.23-4.73; *P*=0.01). However, no association was found between the two conditions after adjusting for covariates (*P*=0.23; Table 3).

Association Between Visual Impairment and Social Engagement The multivariate regression analysis showed VI was significantly associated with a low level of social engagement (OR 4.13, 95% CI 1.47-11.59; *P*=0.007) (Table 4).

DISCUSSION

Our study found the prevalence of VI among older adults (defined as those aged ≥50y) in a rural area of Thailand was 18.3%. This is slightly higher than rates reported in the 5th National Survey of Blindness and Visual Impairment in

Table 1 Participants' characteristics *n* (%)

Characteristics	Total	Visually impaired	Normally sighted	*P*
Total	327	60 (18.3)	267 (81.7)	-
Gender				
M	112	20 (33.3)	92 (34.5)	
F	215	40 (66.7)	175 (65.5)	0.87
Age group, mean±SD	67.6±8.0	72.3±8.7	66.5±7.4	<0.001
≤60y	64	5 (8.3)	59 (22.1)	
61 to 70y	152	21 (35)	131 (49.1)	
>70y	111	34 (56.7)	77 (28.8)	
Educational level				0.23
Uneducated	17	5 (8.3)	12 (4.5)	
Educated	310	55 (91.7)	255 (95.5)	
Employment status				<0.001
Unemployed	131	36 (60.0)	95 (35.6)	
Employed	196	24 (40.0)	172 (64.4)	
Household income				0.49
Not enough	145	29 (48.3)	116 (43.4)	
Enough	182	31 (51.7)	151 (56.6)	
Marital status				0.004
Single	13	4 (6.7)	9 (3.4)	
Married	200	25 (41.7)	175 (65.5)	
Widow	92	24 (40.0)	68 (25.5)	
Divorced/separated	22	7 (11.7)	15 (5.6)	
Living arrangement				0.52
Living alone	31	7 (11.7)	24 (9.0)	
Living with others	296	53 (88.3)	243 (91.0)	
Diabetes				0.18
No	282	55 (91.7)	227 (85.0)	
Yes	45	5 (8.3)	40 (15.0)	
Hypertension				0.59
No	163	28 (46.7)	135 (50.6)	
Yes	164	32 (53.3)	132 (49.4)	
Smoking				0.08
Current	47	14 (23.3)	33 (12.4)	
Past	43	6 (10.0)	37 (13.9)	
Never	237	40 (66.7)	197 (73.8)	
Body mass index (BMI)				0.003
Underweight	25	4 (6.7)	21 (7.9)	
Normal	97	29 (48.3)	68 (25.5)	
Overweight/obese	205	27 (45.0)	178 (66.7)	
History of eye exams				0.05
Never	150	35 (58.3)	115 (43.1)	
Within a year	85	9 (15.0)	76 (28.5)	
Over a year	92	16 (26.7)	76 (28.5)	
Sleep quality				0.07
Poor	56	15 (25.0)	41 (15.4)	
Good	271	45 (75.0)	226 (84.6)	
Disability in ADL				<0.001
No	244	36 (60.0)	208 (77.9)	
Yes	83	24 (40.0)	59 (22.1)	

ADL: Activities of daily living.

Table 2 Sociodemographic characteristics associated with visual impairment using univariate logistic regression

Characteristics	Unadjusted OR (95%CI)	*P*
Gender		
F	1.05 (0.58-1.90)	0.87
M	Ref.	
Age		
50-59y	Ref.	
60-69y	1.36 (0.44-4.24)	0.60
70-79y	4.03 (1.32-12.27)	0.01
≥80y	8.08 (2.17-30.11)	<0.001
Educational level		
Uneducated	1.93 (0.65-5.71)	0.23
Educated	Ref.	
Employment status		
Unemployed	2.72 (1.53-4.82)	0.001
Employed	Ref.	
Household income		
Not enough	1.22 (0.70-2.13)	0.49
Enough	Ref.	
Marital status		
Single	3.11 (0.89-10.86)	0.08
Married	Ref.	
Widow	2.47 (1.32-4.62)	0.005
Divorced/separated	3.27 (1.21-8.79)	0.02
Living arrangement		
Living alone	1.34 (0.55-3.27)	0.52
Living with others	Ref.	
Diabetes		
No	Ref.	
Yes	0.52 (0.20-1.37)	0.18
Hypertension		
No	Ref.	
Yes	1.17 (0.67-2.05)	0.59
Smoking		
Current	2.09 (1.03-4.26)	0.04
Past	0.8 (0.32-2.02)	0.64
Never	Ref.	
Body mass index (BMI)		
Underweight	0.45 (0.14-1.41)	0.17
Normal	Ref.	
Overweight/obese	0.36 (0.2-0.64)	0.001
History of eye exams		
Never	Ref.	
Within a year	0.39 (0.18-0.86)	0.02
Over a year	0.69 (0.36-1.34)	0.27
Sleep quality		
Poor	1.84 (0.94-3.60)	0.08
Good	Ref.	
Disability in ADL		
No	Ref.	
Yes	2.35 (1.30-4.25)	0.005

OR: Odds ratio; ADL: Activities of daily living; Ref: Reference.

Thailand, 2012, where the prevalence of blindness was 0.6%, severe VI was 1.3%, and moderate VI was 12.6% among people aged 50 years and above[20]. Refractive error and cataract were the major causes of VI in both our analysis and the previous national survey. The prevalence of VI increases with age, as reported in the Rotterdam Study, in which the prevalence of VI ranged from 0.1% in persons aged 55-64y and increased to 3.9% in those aged 85y or older[21].

This study found that older age, unemployment, being divorced/separated or widowed, disability in ADL, and current smoking were associated with VI in older adults. This may indicate that unfavorable sociodemographic status is more common in people with VI than among normally sighted people. These findings are consistent with previous studies[5,22-23]. Advanced age is an important risk factor for various eye diseases, including refractive error, senile cataract, glaucoma, and AMD. The prevalence of these pathologic conditions increases with age. Smoking also contributes to the early development of AMD. In addition, being unemployed may limit access to primary eye services. Previous studies found that education level[5,23-25], household income[25], and living arrangements[24] were significantly associated with VI; however, these characteristics did not appear to be related to VI in our study.

Our finding that regular eye checkups (at least once a year) had a protective effect against VI in older adults is of particular importance. Jenchitr *et al*[26] investigated the attitude of Thai older adults toward their eye problems and found that only 12% of 595 participants had an eye checkup at least once a year, 65% sought an eye exam only when they experienced trouble seeing, and 10% wore glasses. To date, the benefits of routine VA screening in older adults remain inconclusive. According to the recommendations of the Thai Ministry of Public Health and the US Preventive Services Task Force, VA screening should be reserved for older adults who have vision problems[27-28]. However, our analysis highlighted the potential benefits of regular eye exams. This finding emphasizes the importance of eye screening services. Easily accessible primary eye care services are essential to achieve the goal of VISION 2020, the global initiative for the elimination of avoidable blindness by the year 2020. VISION 2020 is a joint program initiated by the WHO and the International Agency for the Prevention of Blindness[29].

Our analysis showed obesity was a protective factor for VI. We hypothesized that as obesity leads to other systemic diseases such as diabetes mellitus, hypertension, and hypercholesterolemia[30-31], patients with these diseases might regularly seek healthcare providers for follow-up care and therefore have easier access to eye examinations. However, obesity is a well-established risk factor for many vision-threatening diseases such as diabetic retinopathy, retinal vein occlusion, and ischemic optic neuropathy[32-34].

We found no significant association between VI and poor mental health after adjusting for covariates. A similar result

Table 3 The association between visual impairment and mental health *n* (%)

Mental health	Visually impaired (*n*=60)	Normally sighted (*n*=267)	Unadjusted OR (95%CI)	*P*	[a]Adjusted OR (95%CI)	*P*
Poor	16 (26.7)	35 (13.1)	2.41 (1.23-4.73)	0.01	1.68 (0.72-3.91)	0.23
Good	44 (73.3)	232 (86.9)	Ref.		Ref.	

[a]Each OR is adjusted with age, sex, BMI, marital status, living arrangement, sleep quality, disability in ADL and level of social engagement. Ref.: Reference.

Table 4 The association between visual impairment and social engagement *n* (%)

Level of social engagement	Visually impaired (*n*=60)	Normally sighted (*n*=267)	Unadjusted OR (95%CI)	*P*	[a]Adjusted OR (95%CI)	*P*
Low	55 (91.7)	192 (71.9)	4.3 (1.66-11.15)	0.003	4.13 (1.47-11.59)	0.007
High	5 (8.3)	75 (28.1)	Ref.		Ref.	

[a]Each OR is adjusted with age, sex, BMI, sleep quality and mental health. Ref.: Reference.

was reported in a Korean population-based study, which found VI was not associated with depressive symptoms, suicidal ideation, and perceived stress[5]. In contrast, most studies, including previous studies from Thailand, showed VI had a significant negative impact on mental health[6-7,11]. A cohort study among Thai older adults conducted by Yiengprugsawan *et al*[11] found that refractive errors and uncorrectable VI were positively associated with poor psychological health. However, there were differences in methodology between those studies and our study. In our study, all participants received an eye examination to measure VA and detect causes of VI, rather than self-reporting vision and eye diseases. Variation in results might therefore be due to design, VI evaluation, and population selection technique.

We found that VI was not directly associated with poor mental health. However, disability in ADL resulting from VI has a negative impact on mental health. A national survey of US adults concluded that visual function loss that included limitations in ADL, rather than loss of VA, was significantly associated with depression[35]. This may suggest that VI-induced functional disability has significant impact on mental health, rather than objectively measured VA. Therefore, screening for psychological problems may be warranted in people with VI.

Our study demonstrated an association between VI and a low level of social engagement. Similarly, Wang and colleagues[36] reported difficulties in socializing among visually impaired older adults. Lack of understanding from others and/or lack of visual cues might be contributing factors. Special attention to psychosocial aspects is required for older adults with VI. Encouraging social participation among this group might be important to increase social engagement.

This study had some limitations. First, convenience sampling was used to recruit participants the survey took place in only one rural community, meaning the sample might not be representative of the Thai older adult population as a whole. Second, the duration and onset of VI, which might affect mental health and social engagement, were not recorded. Third, the cross-sectional design of the study did not allow us to differentiate cause from effect when determining risk and protective factors. Finally, the GHQ-12 is a short screening test that has reported limitations in screening for psychiatric morbidity[37].

Particular strengths of our study included the comprehensive eye examination and use of validated questionnaires. VA was objectively measured in all participants instead of being assessed *via* self-report. To identify the cause of VI, examination of both anterior and posterior segments of the eye was performed by ophthalmologists.

In conclusion, older adults with VI reported less participation in social activities than normally sighted people. There was no association between VI and poor mental health. Regular eye examinations (at least once a year) may prevent VI in older adults. Information regarding employment and anti-smoking should be targeted to older adults with VI. Refractive error and cataract causes VI can be reversible and should be supported by health care system. Improvement of quality of life in the aging population relies on integrating community health promotion into national health policies.

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