

# ASSOCIATION BETWEEN VISUAL IMPAIRMENT AND DEPRESSION IN THE ELDERLY

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**Background and Purpose:** Visual disturbances greatly influence daily activities and social activities of the elderly. The purpose of this study was to investigate the association between impaired vision and depression among the elderly in a metropolitan community.

**Methods:** A population-based survey of eye diseases among subjects 65 years of age and older was conducted in Taipei between July 1, 1999, and December 31, 2000. A total of 2045 subjects were invited to participate, and 1361 (66.6%) participated in the survey. A structured questionnaire was used for door-to-door data collection. Interviewers also collected information on subjects' demographic characteristics, medical history, and from the Geriatric Depression Scale-Short Form (GDS-S). Those subjects who had been interviewed were invited to the hospital for detailed eye examinations, including best-corrected visual acuity measurement.

**Results:** Among the participants, the prevalence of impaired vision (visual acuity less than 6/12 in the better eye) was 7.2% and the percentage with depression (GDS-S scores of  $\geq 5$ ) was 8.8%. Impaired vision [ $p < 0.05$ , odds ratio (OR) = 2.11], female gender ( $p < 0.05$ , OR = 2.03), cardiovascular disease ( $p < 0.05$ , OR = 1.72), and stroke ( $p < 0.05$ , OR = 2.85) were significantly associated with depression in multivariate analyses. Multiple logistic regression models were used to evaluate the impact of impaired vision on each depressive item of the GDS-S. After controlling for all other covariates, impaired vision was a positive predictor for the following 4 items of the GDS-S: elderly with impaired vision feel unhappy most of the time [OR = 1.73; 95% confidence interval (CI) = 1.01 to 2.88]; they do not think it is wonderful to be alive now (OR = 2.13; 95% CI = 1.21 to 3.64); they feel worthless the way they are now (OR = 2.23; 95% CI = 1.24 to 3.90); and they feel that their situation is hopeless (OR = 1.95; 95% CI = 1.03 to 3.52).

**Conclusions:** Visual impairment was associated with feelings of worthlessness and hopelessness in this community population of older adults. However, elderly people often ignore disturbances or impact associated with worsening vision. There is an ongoing need for public education regarding the need for elderly people to pay active attention to visual care in their later life.

**Key words:** Visually impaired persons; Depression; Aged

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With the increased life span of people in many developing and developed countries, the functional status and quality of life among the 'graying population' have become important issues. Vision is an important contributor to living a pleasurable life and conducting activities effectively. Loss of vision restricts activity, fosters dependency, and diminishes the sense of well-being in older people.<sup>1,2</sup> Impaired vision is associated with reduced quality of life,<sup>3,4</sup> predisposition to falling and hip fracture,<sup>5</sup> decreased physical and social function,<sup>1,6-7</sup> limitation of activities of daily living, and increasing isolation of the elderly in their homes.<sup>8</sup> Depression was a co-morbid condition among elderly patients with impaired vision attending a

low-vision clinic.<sup>9</sup> Furthermore, impaired vision and depression are both strongly associated with functional impairment and disability in older people.<sup>10</sup> Previous studies of western populations<sup>9-11</sup> examined the association between depression and impaired vision in clinical samples of older people or the rural community elderly. There is no population-based or clinical data, however, regarding the association between depression and impaired vision among Asian elderly living in the community.

The purpose of this study was to identify factors associated with depression, with a focus on the association between impaired vision and depression among elderly in a Taiwanese metropolitan community.

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## Methods

### Selection of subjects

A population-based survey on eye diseases among subjects 65 years of age and older in Shihpai, Taipei, Taiwan, was conducted from July 1, 1999 through December 31, 2000. The Shihpai community is located in the Peitou district of Taipei, and has a population of approximately 247,100 and a land area of approximately 56.8 square kilometers, making it the second largest district in Taipei City. The Shihpai community is the Peitou district's prosperous commercial hub. The study was conducted at the Taipei Veterans General Hospital, one of the largest medical centers in Taiwan. The hospital has complete equipment and provides referral medical services. Shihpai was chosen as the study community after taking into consideration the population stability, metropolitan area, and local support.

Residents 65 years of age and older were identified by the household registration system, which is designed to collate and supply demographic information nationwide and to officially recognize the personal status and relations of all citizens in Taiwan. According to the official household registration in 1999, the total number of residents aged at least 65 years in Shihpai was 4750. After excluding vacant households (658 persons), residents who died before they were interviewed (48 persons), hospital in-patients, and those with severe paralysis and disability (298 persons), 3746 residents were eligible for participation in the study. Among these eligible residents, 2045 were randomly selected and invited to participate.

This study was approved by the Institutional Review Board of the Taipei Veterans General Hospital.

### Assessment instruments and definitions

Data were collected using a structured questionnaire during door-to-door home visits. Before data collection, interviewers were intensively trained in the techniques of conducting a household interview. Subjects that completed the interview were invited to Taipei Veterans General Hospital for an eye examination, including best-corrected visual acuity, tonometry, slit-lamp biomicroscopy, and ophthalmoscopy.

Visual acuity was assessed using a Snellen E chart at a distance of 6 meters, and recorded separately for each eye, and defined as the lowest line in which the majority of E letters were positioned correctly. Visual acuity was measured initially without refraction correction using the subject's glasses (if worn). If the visual acuity was less than 6/6, the examination was repeated with subjective refraction. If the refraction measurement could not be appropriately obtained, a pinhole-corrected acuity test was performed.

Best-corrected visual acuity was defined as the best of all measurements. Based on Sonksen-Silver acuity to classify the prevalence of visual impairment using the American criteria,<sup>11-15</sup> a more commonly used definition of legal blindness and a measure of visual impairment that screens and prevents a person from obtaining a driver's license in most states, visual impairment was defined as best-corrected visual acuity in the better-seeing eye of worse than 6/12 (or 20/40) and better than 6/60 (or 20/200), while blindness was defined as best-corrected visual acuity in the better-seeing eye of 6/60 (or 20/200) or worse. Because the number of subjects with visual acuity worse than 6/60 was too small to analyze, all subjects with best-corrected visual acuity worse than 6/12 were considered to have impaired vision in this study.

A Chinese language version of the Geriatric Depression Scale-Short Form (GDS-S)<sup>16</sup> was used to screen for depression. The Geriatric Depression Scale (GDS) has been successfully translated into many languages (Chinese, Dutch, French, German, Hebrew, Italian, Japanese, Portuguese, Rumanian, Russian, Spanish, and Yiddish), is being used in several countries around the world, and has been extensively validated in many elderly populations and settings.<sup>17,18</sup> The GDS is a commonly used instrument consisting of 30 items with yes/no answers.<sup>19</sup> Its short form, or GDS-S, consists of 15 of the items and was developed to reduce fatigue and deteriorating concentration of older individuals.<sup>20</sup> Scores on the GDS-S have a high correlation with those on the original form, and scores of 5 or more on the GDS-S are associated with a clinical diagnosis of depression.<sup>21-22</sup> A translated and adapted Chinese-language version of the GDS has been developed, and results showed that the GDS-S of this Chinese language version was able to correctly classify slightly over 90% of cases and non-cases in a community survey.<sup>16</sup> In view of these results, our study used the Chinese language version of the GDS-S instrument that is extensively documented as reliable and valid in past studies to explore the association between visual impairment and depression. In fact, the internal consistency of reliability of the Chinese language version of the GDS-S used in our study was high (Cronbach's  $\alpha$ , 0.80-0.83).

### Statistical analysis

Univariate and multivariate analysis was applied to explore the covariates of depression, and the results were expressed as an odds ratio and a 95% confidence interval (CI) [Table 1]. Analysis of covariance included gender, age, education, impaired vision, diabetes, hypertension, cardiovascular disease, and stroke. A *p* value of less than 0.05 was considered to be statistically significant. Logistic regression was used for multivariate analysis, with depression as a dependent

**Table 1.** Univariate and multivariate analyses of the relation between clinical characteristics and depression among residents 65 years of age and older in Shihpai, Taipei, Taiwan (n = 1352).

Variable	Depressive symptoms (GDS-S)					
	Univariate (Chi squared test)			Multivariate (logistic regression)		
	Odds ratio	95% confidence interval	<i>p</i>	Odds ratio	95% confidence interval	<i>p</i>
Gender (women vs men)	2.44	1.67–3.54	< 0.05	2.03	1.34–3.12	< 0.05
Age (≥ 75 vs 65 to 74 years)	1.59	1.08–2.35	< 0.05	1.28	0.84–1.92	0.24
Education (Junior high school and above vs primary school and illiterate)	0.48	0.33–0.71	< 0.05	0.66	0.43–1.02	0.06
Impaired vision (yes vs no)	2.78	1.62–4.78	< 0.05	2.11	1.32–3.31	< 0.05
Diabetes (yes vs no)	1.14	0.69–1.90	0.60	0.87	0.49–1.45	0.59
Hypertension (yes vs no)	1.37	0.94–1.99	0.10	1.20	0.80–1.81	0.37
Cardiovascular Disease (yes vs no)	1.78	1.20–2.64	< 0.05	1.72	1.13–2.59	< 0.05
Stroke (yes vs no)	2.79	1.47–5.30	< 0.05	2.85	1.38–5.56	< 0.05

GDS-S = Geriatric Depression Scale-Short Form.

variable and all of the covariates as independent variables. To study the impact of impaired vision on each depressive item of the GDS-S (Table 2), separate logistic regression models were used after controlling for gender, age, education, diabetes, hypertension, cardiovascular disease, and stroke. The analysis was performed using Statistical Analysis System (SAS 6.12; SAS Institute, Cary, NC) software.

## Results

Of the 2045 potential subjects, 1361 (66.6%) fulfilled the study criteria for completion of both the questionnaires and eye examination. Because there were 9 subjects with missing GDS-S data, the analysis of this study was based on the data gathered from 1352 subjects. Of the 684 non-examined subjects, 677 subjects (33.1%) consented to complete only the first-step of the household interview, and 7 (0.3%) could not be contacted during three visits for the household interview. Reasons for non-response were refusal to participate, lack of time, or inability to contact the subjects. A comparison of demographic and clinical characteristics in the subjects with and without the eye examinations revealed that the participating subjects were younger than those who were not examined (72.8 vs 74.3 years,  $p < 0.05$ ); they were also more likely to be male ( $p < 0.05$ ), with a higher level of education ( $p < 0.05$ ) and rate of cardiovascular disease ( $p < 0.05$ ) than those who were not examined. Other clinical variables (cigarette smoking, alcohol intake, and the self-reported chronic conditions of hypertension history, diabetes history, and stroke history) as well as the prevalence of depression were not significantly different between the 2 groups. The overall prevalence of impaired vision (best-corrected visual acuity worse than 6/12) was 7.2% with a 95% CI of 5.8 to 8.6%. The prevalence of depression was 8.8% with a 95% CI of 7.3 to 10.3%.

The covariates of depression expressed as odds ratios (ORs) and 95% CIs based on univariate and multivariate analyses are shown in Table 1. The significant covariates included gender ( $p < 0.05$ ), age ( $p < 0.05$ ), education ( $p < 0.05$ ), impaired vision ( $p < 0.05$ ), cardiovascular disease ( $p < 0.05$ ), and stroke ( $p < 0.05$ ). Women had a higher rate of depression than men. Age, impaired vision, cardiovascular disease, and stroke were positively correlated, while education level was negatively correlated with depression. Multivariate logistic regression analysis was used to study the factors associated with depression with a focus on the relation between impaired vision and depression. After controlling for all other variables, impaired vision remained a significant risk factor for depression. Subjects with impaired vision were 2.11 times more likely to have depression than those with non-impaired vision (95% CI, 1.32 to 3.31). Besides impaired vision, other significant risk factors for depression were gender, cardiovascular disease, and stroke.

To explore the impact of impaired vision on each depressive item of the GDS-S, a separate multivariate logistic regression was fitted for each item and the results are shown in Table 2. After adjusting for other covariates (gender, age, education, diabetes, hypertension, cardiovascular disease, and stroke), impaired vision remained a significant factor in causing depressive symptoms for the following 4 items: the elderly with impaired vision feel unhappy most of the time (item 7); they do not think it is wonderful to be alive now (item 11); and they feel worthless the way they are now (item 12); and they feel that their situation is hopeless (item 14).

## Discussion

In this population-based study, we explored the potential risk factors for depression among the elderly community, but our main interest was to determine

**Table 2.** Multiple logistic regression of the relation of impaired vision to each item of the Geriatric Depression Scale-Short Form (GDS-S) after controlling for gender, age, education, diabetes, hypertension, cardiovascular disease, and stroke.

Dependent variable: 15 items of GDS-S		Depressive symptoms if answer is:	Impaired vision		
			Odds ratio	95% confidence interval	p
1	Are you basically satisfied with your life?	(No)	1.79	0.82–3.65	0.12
2	Have you dropped many of your activities and interests?	(Yes)	1.19	0.79–1.77	0.38
3	Do you feel that your life is empty?	(Yes)	1.50	0.90–2.43	0.10
4	Do you often get bored?	(Yes)	1.15	0.71–1.80	0.54
5	Are you in good spirits most of the time?	(No)	1.40	0.75–2.46	0.26
6	Are you afraid that something bad is going to happen to you?	(Yes)	1.16	0.75–1.74	0.47
7	Do you feel happy most of the time?	(No)	1.72	1.01–2.88	< 0.05
8	Do you often feel helpless?	(Yes)	1.21	0.70–2.02	0.46
9	Do you prefer to stay at home, rather than going out and doing new things?	(Yes)	1.28	0.93–1.75	0.11
10	Do you feel you have more problems with memory than most?	(Yes)	1.03	0.75–1.41	0.83
11	Do you think it is wonderful to be alive now?	(No)	2.13	1.21–3.64	< 0.05
12	Do you feel pretty worthless the way you are now?	(Yes)	2.23	1.23–3.89	< 0.05
13	Do you feel full of energy?	(No)	1.38	0.85–2.17	0.17
14	Do you feel that your situation is hopeless?	(Yes)	1.94	1.03–3.52	< 0.05
15	Do you think that most people are better off than you are?	(Yes)	1.04	0.52–1.94	0.89

the relation between visual impairment and depression. Depression is one of the most common psychiatric disorders in later life.<sup>23,24</sup> Past studies<sup>24–32</sup> indicated that depression in later life is commonly associated with a variety of physical illnesses or disorders such as heart disease, cancer, diabetes, stroke, and other chronic illnesses. Visual impairment, which is common among the elderly, however, is considered to be inevitable in later life.<sup>33</sup> Hence, visual conditions are often ignored by the elderly; only a few participants in the present study (30.9%; 421/1361) had contact with vision services before this survey. Although visual impairment is not a fatal disease, daily or social activities and the quality of life of the elderly are influenced by it.<sup>4,34</sup> A community-based study of people 70 to 75 years of age from Italy revealed that visual impairment was significantly and independently associated with an increased risk for depression, and visual dysfunction was independently associated with fewer social relationships.<sup>2</sup> In this study, subjects with impaired vision were 2.11 times more likely to have depression than those with non-impaired vision after adjusting for the other covariates.

This study used a validated Chinese language version of the GDS-S to evaluate the association of depression with impaired vision. Impaired vision had some impact on specific depressive items, as follows: subjects with impaired vision feel unhappy most of the time; those with impaired vision do not think it is wonderful to be alive now; they feel worthless the way they are now; and they feel hopeless. Based on the criteria in the fourth edition of the Diagnostic and Statistical Manual of the American Psychological Association (DSM-IV) — the content of many of the depression measurement scales is judged in terms of coverage of the DSM criteria, feelings of worthlessness

and hopelessness of most depressive symptoms were considered to qualify for major depression.<sup>35</sup> Although impaired vision was not significantly associated with other mild or moderate depressive items of GDS-S in this study, the results revealed an association between major depressive symptoms and impaired vision and demonstrated a meaningful public health concern.

Visual impairment causes difficulties with basic activities of daily living and self-care, and hampers activities previously taken for granted, such as dressing, eating, writing, mobility, and simple communications or interactions with others.<sup>34</sup> The Blue Mountains Eye Study<sup>36</sup> also reported that visual impairment in the elderly can have a significant negative impact on social functioning and greatly decrease independence. Multi-dimensional impacts on daily living are affected by visual factors. This could be an explanation for feelings of unhappiness, hopelessness and worthlessness among the elderly with impaired vision in our study.

This study had several limitations. As noted earlier, the applicability of the GDS-S has been demonstrated by testing in community and patient samples. Its reliability, sensitivity and specificity were generally high among cognitively intact elderly people. However, as with most self-rating depression scales, it should be followed by a psychiatric interview or a clinical diagnosis of depression to confirm the classification. Second, we were unable to assess in detail other medical factors that could have potentially affected depressive symptoms: for instance, somatic complaints due to physical illness or to medication use may falsely elevate scores on depression scales that have a somatic component.

In summary, our results revealed a significant association between impaired vision and depressive symptoms in the elderly community, and emphasize the impact of impaired vision on depressive symptoms.

Vision is important for living a pleasurable life and conducting daily activities effectively, and visual impairment deeply affects the mood of the elderly. Elderly people tend to believe that visual loss is expected in later life and often ignore disturbances or impact with worsening vision; hence, there is an ongoing need for public education regarding the importance of visual care in the elderly.

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