Original Article

Prevalence of depression and its effect on disability in patients with age-related macular degeneration

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Aims: To estimate depression in patients with age-related macular degeneration (AMD) and study the relationships among depression, visual acuity, and disability.

Materials and Methods: It was a cross-sectional study with consecutive sampling (n = 53) of patients with AMD aged 50 years and above attending the retina clinic of a tertiary care hospital in North India. Depression, general disability and vision-specific disability were assessed in subjects meeting selection criteria. Assessments were done using the fourth edition of Diagnostic and Statistical Manual of mental disorders (DSM- IV) Geriatric Depression Scale (GDS), Structured Clinical Interview for DSM-IV Axis -I Disorders, Clinical Version (SCID-CV), World Health Organization Disability Assessment Schedule-II (WHODAS-II) and Daily Living Tasks dependent on Vision scale (DLTV). Non-parametric correlation analyses and regression analyses were performed.

Results: Out of 53 participants, 26.4% (n = 14) met DSM-IV criteria for the diagnosis of depressive disorder. Depressed patients had significantly greater levels of general and vision-specific disability than non-depressed patients. General disability was predicted better by depression and vision-specific disability than by visual acuity.

Conclusion: Depression is a major concern in patients with AMD and contributes more to disability than visual impairment.

Key words: Age-related macular degeneration, depression, disability, vision-specific disability, World Health Organization disability assessment schedule

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Age-related macular degeneration (AMD) is the leading cause of vision loss and blindness in people over the age of 50 years in the developed world. Age-related macular degeneration leads to blindness in 18% of the population in the age group 65-75 years and in 30% of persons aged above 75 years.[1] Even in developing nations, AMD is gaining attention due to increased life expectancy and improved visual care facilities. In an Indian study, prevalence of AMD in a clinic-based population above the age of 50 years was noted to be 4.8%[2] and was second only to cataract as the cause of severe visual loss in a study from Singapore.[3]

Age-related macular degeneration is associated with significant emotional distress and reduced functioning, comparable to that of other serious chronic illnesses. High rates of depression are reported in the elderly with low vision[4,5] and depressed low vision elderly have disability independent of vision-related limitations.[6] Two studies reported so far have reported similar prevalence of depression (about 33%) in persons with AMD.[7,8] Both studies found significant correlations between depression and disability, but not with visual acuity. In another study, patients with AMD having minimal depression were found to suffer decrements in visual function even after controlling for the severity of their physical problems.[9] These reports emphasize the role of depression as a key contributor to disability in patients with AMD.

Depression in patients with AMD has been studied by two groups till date[7,8] and only one study[7] has used standardized criteria for clinical diagnosis. Both studies recruited patients with advanced AMD using a visual acuity cut-off. Although previous studies have used scales validated in elderly low vision, none of the studies used a scale for assessing vision-specific disability specific for AMD. No data is available in this area from outside the United States (US).

Depression increases incident disability independent of sociodemographic factors, physical health status, cognitive functioning and vision-related limitations.[10,11] On the other hand, disability is a major risk factor for depression in elderly populations.[12] Therefore, depressive symptoms and physical disability when present together can initiate a spiraling decline in the physical and psychological health and quality of life.

The aim of the study was to determine the point prevalence of depressive disorders in older adults with AMD and examine the relationships between depression, visual acuity, health-related (general) disability and vision-specific disability in these patients.

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Materials and Methods

Screening of consecutive patients of AMD attending the retina clinic of a tertiary level multispecialty hospital in North India was done for 12 months. The selection criteria comprised (1) Diagnosis of AMD confirmed by consultant ophthalmologist, (2) Age 50 years or older at the time of intake, (3) No other uncorrected eye disease causing significant visual loss, (4) No cognitive impairment as defined by Mini Mental State Examination (MMSE)[13] cutoff score of 23 (cutoff scores relaxed and supplemented by clinical assessment in illiterates and persons with low vision) and (5) No current alcohol abuse defined by a score of 7 or less on Alcohol Use Disorders Identification Test (AUDIT).[14]

During this period, 72 patients were diagnosed to have AMD, of which three patients could not be traced. Out of 69 patients screened, eight were excluded due to significant ocular comorbidity and two each were excluded due to significant cognitive deficits and active alcohol use. Three patients refused consent and one was underage. Thus, from the initial 72 patients, a final figure of 53 (73.6%) was arrived at. The study group and the patients who refused consent or could not be traced were similar regarding sociodemographic characteristics and visual acuity.

The protocol for this study was approved by the ethics review board of the institute. Written informed consent was obtained from all participants. A trained psychiatrist (AB) conducted cross-sectional examinations, supervised by senior psychiatrists (PK, SK) and a senior ophthalmologist (AG). Patients detected to have depression were offered the option of treatment from the psychiatric outpatient unit of the institute.

The patients were subjected to a two-stage evaluation for depression, screening being done by Geriatric Depression Scale -15-item version (GDS-15).[15] In patients scoring above the cutoff score (≥4/15), diagnosis of depression as per the fourth edition of Diagnostic and Statistical Manual of Mental Disorders (DSM-IV)[16] criteria was confirmed by using Structured Clinical Interview for DSM-IV Axis-I Disorders, Clinical Version (SCID-CV).[17] This yielded diagnoses of major depressive episodes, dysthymic disorder, recurrent depressive disorder, bipolar depression, adjustment disorder and depressive disorder not otherwise specified (sub-classified into minor depression using DSM-IV criteria).[16]

Visual acuity was measured under standard light conditions using Snellen's eye chart. For statistical analyses, scores were transformed into the logarithm of the minimum angle of resolution (logMAR scale),[18] which is a logarithmic scale on which an increase of 1 point represents a 10-fold drop of vision on the Snellen scale. Whereas 20/20 and 20/200 represent normal vision and legal blindness respectively on the Snellen scale, corresponding values on the logMAR scale are 0.0 and 1.0 respectively.

Measures of depression

Geriatric Depression Scale-15-item version (GDS-15):[15]

The short version (15-item) of the original 30-item scale was used both as a screening measure and for rating the severity of depression (score range 0-15 points). The use of the cutoff point 4/5 for the GDS-15 produced sensitivity and specificity rates of 97.0% and 54.8% and positive and negative predictive values of 69.6% and 94.4% respectively, using DSM-IV diagnostic criteria for depression.[19] High sensitivity made it particularly suitable as a screening measure.

The Structured Clinical Interview for DSM-IV Axis-I Disorders, Clinical Version (SCID-CV):[17]

It is a semi-structured interview for making major DSM-IV Axis-I diagnoses and was used for the diagnosis of depressive disorders. The present study utilized the modules of mood episodes (single), mood disorders (unipolar/bipolar) and the section on adjustment disorders.

Measures of disability

World Health Organization Disability Assessment Schedule-II (WHODAS-II):[20]

The WHODAS II is a multidimensional questionnaire used for measuring the level of disability across various conditions and interventions. It is a 36-item, interviewer-administered scale, with a score range of 1 to 5 for each item, with a higher score indicating more disability. It measures disability in six domains, namely understanding and communication, getting around, self care, getting along with people (interaction), life activities and participation in society.

Daily Living Tasks Dependent on Vision (DLTV) Scale:[21]

It is a vision-specific functional index specially designed for use in patients with AMD. It is a 24-item scale which measures difficulty associated with each activity with possible responses ranging from 4 (no difficulty) to 1 (vision prevents the person from doing the given activity). The activities fall into several broad categories including distance vision, intermediate and near vision, binocularity, field of vision, light and dark adaptation, and contrast sensitivity.

Analysis was carried out using SPSS 12.0 for Windows (SPSS Inc, Chicago, IL USA).

Descriptive analyses were computed in terms of mean and standard deviation for the entire sample as well as for group comparison between depressed and non-depressed patients. Depressed patients were compared with those without depression on various sociodemographic and clinical variables using unpaired 't' test for parametric variables, and using Mann-Whitney Test and Chi-Square test for non-parametric variables. Correlations between variables in the sample were assessed using Spearman's Rank correlation. Stepwise multiple linear regression analysis was used to assess the contribution of various independent variables to disability in the sample. The findings of regression analysis have been interpreted through two methods: firstly by the percentage variance accounted for in predicting the dependent variable by the independent variables alone and in combination and secondly, by examining the partial correlations of the residuals with the dependent variable.

Results

The total number of depressed patients was 14 out of 53, giving a prevalence of 26%. In the depressed group (14 cases), the breakup was major depressive disorder, recurrent (five

cases), dysthymia (three cases), major depressive disorder, single episode (two cases), adjustment disorder (two cases), bipolar affective disorder (one case) and minor depression (one case).

The sociodemographic characteristics of the sample are displayed in Table 1. In the sample, only three subjects were found to be living alone (one in depressed group, two in non-depressed) and the rest were living with family members. The depressed and non-depressed groups did not differ significantly on sociodemographic parameters.

Table 2 shows clinical characteristics of the sample. Majority of the patients (57%) had medical comorbidity (common conditions being hypertension, diabetes, and arthritis) but patients with and without depression did not differ on this parameter. More patients with wet form of AMD had depression compared to dry form. Patients of AMD with depression had poorer vision in the worse eye compared to those without depression.

Table 3 shows the WHODAS and DLTV scores. The depressed group scored significantly higher (indicating greater disability) in all domains of WHODAS except self care. The DLTV composite total score (Mean: SD=83.11: 14.17 vs. 71.37: 9.50; p= 0.009) was significantly lower in the depressed group compared to the non-depressed group, indicating a higher vision-specific disability in the depressed group. There was no significant difference between the depressed and non-depressed groups with regard to DLTV item scores of near vision and distant vision.

The correlations between depression, visual acuity, disability (WHODAS score) and vision-specific disability (DLTV score) are shown in Table 4. The severity of depression (GDS score) correlated significantly with visual acuity in the worse eye, DLTV scores and WHODAS scores. In addition to depression and visual functioning, disability (WHODAS) was related with visual acuity. The DLTV scores correlated strongly with visual acuity and health-related disability.

In Table 5, general disability (WHODAS Total) was considered as a dependent variable, and severity of depression (GDS score), vision-specific functioning/ disability (DLTV Final), visual acuity, gender and type of AMD were considered as the independent predictors of disability. In stepwise linear regression, GDS total (F= 40.12, P<0.001), DLTV final (F= 20.89, P< 0.001) and visual acuity in better eye (F= 4.46, P= 0.04) emerged as significant predictors of general disability among the variables considered. The total variance of disability explained by depression (GDS total), vision-specific disability (DLTV final) and visual acuity in the better eye in our sample was 44.0%, 16.5% and 3.3%

Table 1: Sociodemographic characteristics of the sample

Variables	Groups		t value	Total sample (n= 53) Mean (SD)	*P* value
	Depressed (n= 14) Mean (SD)	Non-depressed (n = 39) Mean (SD)			
Age	69.21 (8.34)	68.69 (8.86)	0.19	68.83 (8.65)	0.46
Years of education	7.36 (6.98)	11.00 (6.30)	1.80	10.02 (6.62)	0.49
	Count	**Count (%)**	**Chi-Square**	**Count (%)**	
Gender					
Male	6	28 (72)	3.75	34 (64)	0.10
Female	8	11 (28)		19 (36)	
Married	9	23 (59)	0.12	32 (60)	0.98
Widowed	5	16 (41)		21 (40)	

SD - Standard deviation

Table 2: Clinical characteristics of the sample

Variable	Groups		Chi Squarea/ Mann-Whitney[b]	Overall (n = 53) Mean (SD)
	Non-depressed Mean [SD]	Depressed Mean [SD]		
AMD type				
Exudative	4 (10%)	6	5.18[a]*	10 (19%)
Non-exudative (dry)	35 (90%)	8		43 (81%)
Medical comorbidity				
Absent	16 (41%)	7	0.34[a]	23 (43%)
Present	23 (59%)	7		30 (57%)
Visual acuity worse eye (logMAR)	0.83 [0.69]	1.30 [0.59]	147.50[b]*	0.95 [0.69]
Visual acuity better eye (logMAR)	0.48 [0.49]	0.59 [0.37]	193.00[b]	0.51 [0.46]
Duration of AMD (months)	43.95 [52.85]	59.28 [46.99]	200.00[b]	48.00 [51. 38]
GDS score	2.05 [1.21]	10.21[2.67]	2.00[b]***	4.21 [4.01]

*P< 0.05, ***P<0.001, [a] - Chi-square value, [b] - Mann-Whitney U, AMD - Age-related macular degeneration, GDS - Geriatric depression scale, logMAR - logarithm of the minimum angle of resolution, SD - Standard deviation

Table 3: Disability: Health-related disability (WHODAS domains) and Vision-specific disability (DLTV Scores)

WHODAS domains (health-related disability)	Groups		t value	Overall
	Non-depressed Mean (SD)	Depressed Mean (SD)	dF=51	(n = 53) Mean (SD)
Understanding and communicating	4.74 (6.97)	25.36 (2.78)	7.50***	10.19 (12.67)
Getting around	18.27 (19.94)	35.71 (24.44)	2.64*	22.88 (22.36)
Self care	0.77 (2.70)	0.71 (2.67)	0.06	0.75 (2.67)
Getting along with people	6.41 (10.02)	13.69 (15.19)	2.02*	8.33 (11.90)
Life activities	11.02 (16.83)	52.86 (29.98)	6.40***	22.07 (27.90)
Participation in society	11.22 (8.82)	33.03 (9.17)	7.86***	16.98 (13.12)
WHODAS total	9.25 (7.25)	27.95 (9.22)	7.70***	14.19 (11.35)
DLTV domains (vision-specific disability)				
Distant vision	3.10 (0.72)	2.71 (0.61)	1.80	3.00 (0.70)
Near vision	3.10 (0.72)	2.50 (0.52)	2.87	2.94 (0.72)
DLTV total	83.11 (14.17)	71.37 (9.50)	2.87**	3.00 (0.71)

P< 0.05; **P*< 0.01; ****P* < 0.001; DLTV: Daily Living Tasks Dependent on Vision Scale; SD: Standard Deviation; WHODAS: World Health Organization Disability Assessment Schedule

Table 4: Spearman's rank correlation

	GDS score	Visual acuity in worse eye	Visual acuity in better eye	DLTV	WHODAS
GDS score	1.00	0.47**	0.260	-0.50**	0.66**
Visual acuity in worse eye	0.47**	1.00	0.63**	-0.64**	0.48**
Visual acuity in better eye	0.26	0.63**	1.00	-0.64**	0.45**
DLTV	-0.50**	-0.63**	-0.64**	1.00	-0.62**
WHODAS	0.62**	0.48**	0.45**	-0.62**	1.00

***P*< 0.01, DLTV: Daily Living Tasks Dependent on Vision Scale, GDS: Geriatric Depression Scale, WHODAS: World Health Organization Disability Assessment Schedule

Table 5: Regression analysis

Independent variables	Variables entered	Regression coefficient	Multiple R square	Adjusted R square	Partial correlation	Percent contribution to WHODAS
GDS total	GDS total	0.663	0.440	0.428	0.663***	44.0
DLTV final	DLTV final	0.778	0.605	0.589	-0.543***	16.5
Visual acuity in better eye	Visual acuity in better eye	0.799	0.638	0.616	0.369*	3.3
Visual acuity in worse eye	×	-	-	-	0.309	-
Gender	×	-	-	-	0.130	-
Type of AMD	×	-	-	-	-0.058	-

****P*< 0.001; **P* < 0.05, AMD: Age-related macular degeneration, DLTV: Daily Living Tasks Dependent on Vision Scale, GDS: Geriatric Depression Scale, R: Regression, WHODAS: World Health Organization Disability Assessment Schedule

respectively, together explaining 63.8% of the variance. After correcting for sampling error (adjusted R-square), the variance explained was 61.6%. It was evident from the regression model that the severity of depression emerged as a better predictor of disability than visual acuity.

Discussion

In the current study 14 out of 53 patients had depression giving a point prevalence of 26%. This rate is significantly higher compared to the rate of depression among non-institutionalized older people which ranges from 8-16%.[21] However, the rate is lower compared to previous studies of depression in AMD patients.[7,8]

A possible explanation lies in the lower visual impairment and lower age in our patients compared to previous studies, representing a milder severity of AMD in our sample. Moreover, Rovner *et al.*,[8] assessed patients with recent and acute visual loss which may understandably precipitate depression in some cases. Brody *et al.*,[7] included the category of "subsyndromal depression" in their study which was not

included in the present investigation to maintain uniformity of diagnosis. On removing this group, their prevalence rate comes down to 27.2%, which is very similar to our rate of 26%. The fact that a large majority of the sample was living with family reflects the adequacy of social support, which may also protect against depression. Other factors contributing to lower prevalence could be socio-cultural reasons like poor knowledge about implications of AMD and relatively lower limitation in activities of daily living in the rural Indian setup.

In the current study, a majority of the depressed subjects (11 out of 14) had the diagnosis of major depressive disorder. In the only other study which used a standardized tool for diagnosis,[7] only 22% of the depressed patients (n=49) fulfilled the criteria for major depressive disorder, the remaining ones being cases of minor depression (61%) and an undefined category of subsyndromal depression (16%). The current study did not measure subsyndromal depression. This large difference is difficult to explain, but may partly be due to cultural factors and differences in coping once depressive symptoms set in.

Earlier studies have excluded patients with non-advanced AMD, using cutoff levels of visual acuity in both eyes. However, the knowledge of having a progressive, non-treatable disabling disorder like AMD, which will ultimately lead to loss of valued activities, dependency and blindness, may itself act as a stressor and induce depression, even in patients of AMD who do not have significant visual disability. Previous studies have reported that personality trait (neuroticism) is a better predictor of depression than visual acuity, which is at best a weak predictor.[7,22-26] Thus, it is evident that excluding patients on the basis of visual acuity alone is superfluous, as other parameters also have an impact on depression. Additionally, once the intake is restricted by using visual acuity cutoffs, all subsequent correlations studied with visual acuity are biased, as has been acknowledged.[7] In order to override these limitations our study did not use visual acuity as an exclusion criterion.

In the study population, high levels of disability were found and depressed patients had more general and vision-specific disability than non-depressed patients. The difference in vision-specific disability was maintained even after controlling for general disability and visual acuity. On analysis of the subscales of WHODAS-II, depressed patients showed more disability on the composite total score as well as five out of six subscales of WHODAS-II, namely understanding and communication, getting around, getting along with people, life activities and participation in society.

In addition to general disability, the depressed group had higher visual impairment in the worse eye compared to the non-depressed group. This finding is not in keeping with previous studies. This may be due to the difference in the sample selection procedure, as previous studies included patients of AMD with severe visual impairment only. When we consider the entire range of AMD patients, it appears that visual acuity is an important determinant of depression.

The depression scores (GDS) had moderate to strong positive correlation with the general disability scores as measured by WHODAS-II. One explanation for this relationship is that depression and disability are related constructs and there is a lot of overlap in their assessment. For example, items on mood, energy, activity, mobility, concentration, memory, work, sex, sleep are common to both depression and disability assessments.

In the present study, multiple stepwise linear regression analysis was employed to examine the effect of independent predictors on health-related disability. In the present work, depression, vision-specific disability and visual acuity in the better eye emerged as significant contributors to disability. After adjusting for depression, visual acuity in the worse eye, type of AMD and gender were not significantly associated with disability as shown by exclusion from the regression model as well as non-significant partial correlation. Moreover, it is evident from the variance that depression is a more important predictor of disability than visual acuity. This is in line with the findings of Brody *et al*.[7] However, disability, depression and visual impairment are inter-related, and the direction of causality cannot be ascertained on the basis of cross-sectional data. For instance, depression is a better predictor of disability than visual acuity, but visual impairment may have been an important mediator of depression in patients with AMD. The findings must be interpreted in the light of this limitation.

The strengths of the study include consecutive sampling, systematic assessment and two-stage diagnosis of depression based on the "gold standard" DSM-IV criteria, and assessment of disability using appropriate generic and disease-specific instruments. The limitations include cross-sectional design, small sample size and lack of a separate control group. As the study was clinic-based, the results cannot be generalized to community settings. Being a cross-sectional study, it was not possible to assess the temporal relationship between onset of depression, diagnosis of AMD and significant loss of visual acuity. However, in our work, significant differences emerged and in light of the limited power provided by the sample, the relationships appear to be particularly robust.

The present study on depression and its correlates in patients with AMD is the first of its kind outside the US, and strongly reinforces the growing notion that psychological morbidity in this group of patients contributes significantly to their disability. Depression, rather than visual acuity emerged as a robust mediator of disability. Diagnosis and appropriate treatment of depression are of utmost importance in this high-risk group.

Longitudinal studies with larger samples are required to examine the course and outcome of depression and the efficacy of interventions in this group of patients. With an approach that is patient-centered rather than disease-centered, the health professionals can move closer to the goal of "treating the whole patient".[27] It is expected that with provision of optimal care through more integrated services, patients with AMD can look forward to a happier tomorrow.

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