e-ISSN: 0976-822X, p-ISSN:2961-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2025; 17(8); 1406-1410

Original Research Article

Prevalence and Determinants of ARMD in the 50 Years and Older Population

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Received: 27-06-2025 / Revised: 25-07-2025 / Accepted: 27-08-2025

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Conflict of interest: Nil

Abstract:

Background: One of the main causes of permanent vision loss in people over 50 worldwide is age-related macular degeneration (ARMD). Its prevalence is increasing in India due to demographic transition and lifestyle risk factors. Understanding regional prevalence patterns and determinants is crucial for planning preventive and therapeutic strategies.

Methods: A retrospective study was conducted in the Upgraded Department of Ophthalmology, Darbhanga, over two years (March 2023–February 2025). A total of 100 patients aged ≥50 years diagnosed with ARMD were included. Demographic details, systemic and lifestyle risk factors, and clinical profiles were analyzed. ARMD was classified into early and late forms, with late ARMD further divided into geographic atrophy and neovascular types. Statistical analysis was performed to identify significant determinants.

Results: The mean age of patients was 64.8 years, with the majority (42%) in the 60–69 years age group. ARMD prevalence increased with advancing age, with late ARMD most frequent in patients ≥70 years. Females accounted for 56% of cases. Early ARMD was observed in 62% of patients, while 38% had late ARMD, of which the neovascular form (24%) was more common than geographic atrophy (14%). Hypertension (46%) and smoking (30%) showed strong associations with late ARMD, whereas diabetes and prior cataract surgery were not significantly correlated.

Conclusion: ARMD is prevalent among the elderly population in this region, with age, hypertension, and smoking emerging as important determinants. Early ARMD was more common overall, but late neovascular ARMD posed a higher risk of visual loss. The findings underscore the importance of targeted screening, lifestyle modification, and systemic disease control to reduce the burden of ARMD-related blindness.

Keywords: Age-related macular degeneration, prevalence, determinants, elderly, hypertension, smoking, India.

Introduction

Age-related macular degeneration (ARMD), a progressive degenerative disease of the central retina, is one of the primary causes of persistent central vision loss in the elderly population. Approximately 8.7% of blindness is caused by ARMD, making it the third most frequent cause of visual impairment globally after cataract and glaucoma [1]. Due to rising life expectancy, the prevalence of ARMD is predicted to rise to 196 million individuals globally by 2020 and roughly 288 million by 2040 [2]. Population-based studies such as the Rotterdam Study and Beaver Dam Eye Study have shown that the incidence of ARMD rises significantly with age [3,4].

In India, ARMD is increasingly being recognized as an important cause of visual morbidity in the elderly. The reported prevalence varies between 1.2% and 4.7% in individuals above 40 years, depending on regional and study differences [5,6]. The Pune Eye Study documented an overall prevalence of 1.38%, while the Sankara Nethralaya Rural–Urban (SN-RU) study reported early ARMD in 16–21% and late ARMD in about 2.3% of participants aged 60 years and above [7,8]. The Central India Eye and Medical Study also reported comparable rates, underlining that ARMD is no longer uncommon in Indian populations [9].

Several determinants have been identified for ARMD, including increasing age, female gender, family history, hypertension, diabetes, and lifestyle factors such as smoking and tobacco use [3,7,10]. Indian studies have also highlighted the role of smokeless tobacco, obesity, and urban residence as significant contributors [8,9]. Cataract and previous cataract surgery have shown associations with ARMD in some cohorts [11]. Even with these revelations, there is still a dearth of information from Eastern India, especially Bihar. In order to evaluate the prevalence and related determinants of ARMD among patients 50 years of age and older, the current retrospective study was carried out at the Upgraded Department of Ophthalmology, Darbhanga.

Materials and Methods

Over the course of two years, from March 2023 to February 2025, this retrospective, hospital-based study was conducted in the Upgraded Department of Ophthalmology at Darbhanga Medical College and Hospital in Bihar. The medical records of patients who were 50 years of age or older and who used the inpatient and outpatient services during this time were examined. There were 100 patients in all who met the eligibility requirements.

Inclusion criteria were patients aged ≥50 years with a documented diagnosis of age-related macular degeneration (ARMD) based on clinical fundus findings, fundus photography, and/or optical coherence tomography (OCT). Exclusion criteria included patients with incomplete records, those with other macular pathologies (such as diabetic macular edema, retinal vein occlusion, or high myopia), and those with significant ocular trauma or prior complicated ocular surgery.

ARMD was classified into early and late forms (geographic atrophy and neovascular ARMD) using the International Age-related Maculopathy Epidemiological Study Group classification [12]. Data regarding patient demographics (age, gender, residence), systemic risk factors (hypertension, diabetes mellitus, cardiovascular disease, smoking, smokeless tobacco use, and obesity), and ocular history (including prior cataract surgery) were extracted from records.

Microsoft Excel was used to enter the data, and SPSS version 26.0 (IBM Corp., Armonk, NY, USA) was used for analysis. Descriptive statistics were used to compile the prevalence and contributing variables of ARMD. For categorical variables, frequencies and percentages were employed, and the associations between ARMD and possible risk factors were assessed using the Chi-square or Fisher's exact test, as applicable. A p-value of less than 0.05 was considered statistically significant [7].

Results

A total of 100 patients aged 50 years and above, diagnosed with age-related macular degeneration (ARMD), were included in this retrospective study. The mean age of the study population was 64.8 ± 8.5 years (range: 50–85 years). The highest proportion of patients belonged to the 60–69 years age group (42%), followed by 70–79 years (28%), while 12% were above 80 years, indicating that ARMD was more common in the elderly age brackets. The 50–59 years group contributed to only 18% of cases, suggesting that clinically significant ARMD becomes more frequent with advancing age. A slight female preponderance was observed, with 56 females (56%) compared to 44 males (44%), giving a male-to-female ratio of 0.8:1. Table 1 describes the age and gender distribution of study participants (n = 100)

Table 1: Age and Gender Distribution of Study Participants (n = 100)

Variable	Frequency (n)	Percentage (%)
Age group (years)		
50–59	18	18%
60–69	42	42%
70–79	28	28%
≥80	12	12%
Gender		
Male	44	44%
Female	56	56%

Prevalence and Subtypes of ARMD: Among the 100 patients studied, early ARMD was more frequent (62%) compared to late ARMD (38%). Within the late ARMD group, the neovascular (wet) form was more common (24%) than geographic atrophy (14%). This finding suggests that while early ARMD predominates, a significant proportion of patients progress to advanced stages with vision-threatening complications. Late ARMD was more commonly observed in patients aged ≥70 years, consistent with the natural progression of the disease. Table 2 shows the distribution of ARMD types (n = 100).

Table 2: Distribution of ARMD Types (n = 100)

ARMD Type	Frequency (n)	Percentage (%)
Early ARMD	62	62%
Late ARMD – Neovascular	24	24%
Late ARMD – Geographic Atrophy	14	14%

Systemic and Lifestyle Risk Factors: Systemic comorbidities were common among the study population. Hypertension was the most frequently observed, present in 46% of patients, followed by diabetes mellitus (28%) and cardiovascular disease (12%). Lifestyle-related risk factors included smoking (30%) and smokeless tobacco use (22%), both of which are known to contribute to oxidative stress and vascular damage in the retina. A history of prior cataract surgery was noted in 18% of patients, though this was not significantly correlated with ARMD severity. Distribution of Risk Factors among ARMD Patients (n = 100) has been illustrtaed in Table 3

Table 3: Distribution of Risk Factors among ARMD Patients (n = 100)

Risk Factor	Frequency (n)	Percentage (%)
Hypertension	46	46%
Diabetes Mellitus	28	28%
Cardiovascular Disease	12	12%
Smoking	30	30%
Smokeless Tobacco Use	22	22%
Prior Cataract Surgery	18	18%

Association of Risk Factors with ARMD Severity: When associations between risk factors and ARMD type were analyzed, it was observed that older age (≥70 years), hypertension, and smoking were significantly associated with late ARMD ($p < 0.05$). In contrast, diabetes mellitus and prior cataract surgery did not show statistically significant associations. Specifically, among patients with late ARMD, 58% were aged ≥70 years, 63% had hypertension, and 42% were smokers. These findings reinforce the role of vascular risk factors and age in the progression from early to late ARMD. Table 4 shows Association of Risk Factors with ARMD Severity

Table 4: Association of Risk Factors with ARMD Severity

Risk Factor	Early ARMD (n=62)	Late ARMD (n=38)	p-value
Age ≥70 years	18 (29%)	22 (58%)	0.01*
Hypertension	22 (35%)	24 (63%)	0.02*
Diabetes Mellitus	16 (26%)	12 (32%)	0.48
Smoking	14 (23%)	16 (42%)	0.03*
Cataract Surgery	10 (16%)	8 (21%)	0.56

*Statistically significant ($p < 0.05$).

Discussion

The present retrospective study assessed the prevalence and determinants of age-related macular degeneration (ARMD) in individuals aged 50 years and above attending the Upgraded Department of Ophthalmology, Darbhanga, over a two-year period. Our findings revealed that ARMD was more common in the elderly, with the mean age being 64.8 years. The majority of patients (42%) belonged to the 60–69 years group, while late ARMD was predominantly seen in those aged ≥70 years. This age-related pattern aligns with several population-based studies, including the Beaver Dam Eye Study and Blue Mountains Eye Study, which consistently reported a steep rise in ARMD prevalence after the sixth decade of life [13,14]. The biological basis for this observation is likely related to cumulative oxidative stress, impaired retinal pigment epithelium (RPE) repair mechanisms, and increased drusen deposition with aging [4].

A slight female predominance (56%) was observed in our cohort. While some studies from India and other Asian populations report higher ARMD prevalence in females [15], others show either no gender difference or male predominance [16]. Possible explanations for female excess include increased longevity, hormonal influences, and differential health-seeking behavior. However, as gender association remains inconsistent across studies, it may not represent a strong independent determinant.

In terms of clinical types, early ARMD was more frequent (62%) compared to late ARMD (38%), and within late ARMD, the neovascular form (24%) was more common than geographic atrophy (14%). Similar distributions have been documented in

Indian population studies, where early ARMD constitutes the bulk of cases, but late ARMD accounts for the majority of vision-threatening disease [17,18]. The predominance of neovascular ARMD among late cases is clinically relevant, as it carries a higher risk of irreversible visual loss, and underscores the importance of early detection and treatment with anti-VEGF therapy [19].

Systemic and lifestyle risk factors were frequent among our patients. Hypertension (46%) and smoking (30%) were strongly associated with late ARMD, while diabetes and prior cataract surgery did not show significant correlations. These findings resonate with previous reports highlighting hypertension and smoking as major modifiable determinants of ARMD progression [20,21]. Smoking, in particular, has been shown to double the risk of neovascular ARMD due to its role in oxidative damage and vascular compromise [22]. The lack of significant association with diabetes in our study contrasts with some earlier reports [23], though others have also failed to demonstrate a consistent link [24]. This suggests that the relationship between diabetes and ARMD may be complex and influenced by confounding variables.

The study has certain limitations. Being retrospective and hospital-based, the findings may not directly reflect the true community prevalence of ARMD, as selection bias could be present. Additionally, genetic determinants, nutritional factors, and serum biomarkers could not be evaluated. Nevertheless, the study provides valuable regional data on ARMD patterns and determinants, highlighting age, hypertension, and smoking as key risk factors. These insights emphasize the need for targeted screening and preventive strategies, particularly in older hypertensive and smoking populations. Future larger, community-based prospective studies are warranted to validate these findings and explore additional determinants in the Indian context.

Conclusion

This retrospective study highlights that age-related macular degeneration (ARMD) is a significant cause of visual morbidity among individuals aged 50 years and above in the Darbhanga region. The prevalence was highest in those aged over 60 years, with late ARMD particularly affecting patients ≥70 years. Female predominance was noted, although not strongly conclusive as an independent determinant. Among systemic and lifestyle factors, hypertension and smoking emerged as the most important risk contributors, whereas diabetes and history of cataract surgery showed no significant association. The findings emphasize the need for early detection strategies, especially targeting high-risk groups such as elderly hypertensive and smoking individuals. Strengthening community-based screening, promoting smoking cessation, and optimizing systemic disease control may help in reducing the burden of ARMD-related visual impairment. Larger, population-based prospective studies are recommended to validate these observations and to explore additional genetic and environmental determinants in the Indian population.

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