

Prevalence of age related macular degeneration and associated factors at a tertiary eye care center in Addis Ababa, Ethiopia

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Abstract

Background: Age-related macular degeneration accounts for 8.7% of all blindness worldwide and there is an expected change in the presence of Age related macular degenerative disorders following a marked rise in life expectancy worldwide. With a paucity of data on age related macular degenerative disease from peoples of African descent prevalence information on Africans are largely from studies undertaken in African populations living outside of the African continent. This study aimed to determine the prevalence and associated risk factors of age related macular degeneration among patients attending a tertiary Eye care center in Addis Ababa.

Methods: A hospital based cross-sectional study was conducted on patients aged 50 years old and above attending a tertiary eye care center, with defined inclusion and exclusion criteria. Data was collected using a structured questionnaire and analyzed using statistical package for social studies version 21.

Result:-In the study 414 patients were participated. Two hundred twenty-three (53.9%) of the respondents were male with male to female ratio of 1.2:1. The mean age was 61.4 ± 9 years. The main presenting complaint of patients was distortion of vision in 288 (69.6%) followed by metamorphosis in 13 (3.1%). The prevalence of the age related macular degenerative disease was 100 (24.2%); among which 51(51%), 18(18%) and 31(31%) had early, intermediate and late AMD. Significant association were found between each decade of age increasing above 60 (p value 0.01), history of smoking (p value 0.021).

Conclusion: Age related macular degenerative disease is a common problem affecting old age people visiting tertiary eye center in Ethiopia. There is an increased risk of having the disease with each decade of age increment above the age of 60 years. We recommend a meticulous clinical examination and use of optical coherence tomography to detect the disease early and treat it properly in all age group greater than 50 years.

Key words: Blindness, macular degeneration, age related, risk factors, optical coherence tomography

Introduction

In recent decades, there has been a marked rise in life expectancy that has contributed to a major epidemiological shift in populations worldwide. These changes have increasingly lead to a shift in major public health issues in low- and middle-income countries (Pascolini 2012; Lopez 2006; Mathers 2006). In 2010, the WHO identified nine leading causes of visual impairment and blindness in its report. Of these nine leading causes; three were non communicable disease (NCDs), which are posterior segment in location that primarily includes: glaucoma, age-related macular degeneration (AMD) and diabetic retinopathy (DR) (Pascolini 2012). Among the later, age-related macular degeneration accounts for 8.7% of all blindness worldwide and is the most common cause of blindness in developed countries particularly in people older than 60 years (Boutayeb 2006; Friedman 2004).

The overall prevalence of any age-related macular degeneration is 8.69% (Wan 2014). With a paucity of data from peoples of African descent prevalence information on Africans are largely from studies undertaken in African populations living outside of the African continent (Pascolini 2012). AMD is generally

considered to be uncommon in Africans. However, Studies of AMD in low- and middle-income countries have shown a contrary result to what was originally thought. Accordingly, AMD is not rare in Asian and African populations but is a significant contributor to blindness as several reports document its existence. For instance a study conducted in Nigeria has reported AMD in 15% of cases with retinal disease (Mathenge 2013; Andrew 2014; Uhumwangho 2015).

In Ethiopia, as far as the authors' knowledge is concerned there are limited knowledge about retinal disease in general and AMD in particular. The only study done by Teshome et al. indicated a 2.7% prevalence of AMD among all retinal disease (Teshome 2004). This study will be helpful to provide data on the magnitude of AMD and its associated risk factors which will help to implement early detection strategies and management plan that prevent people from blindness.

Materials and Methods

A Hospital based cross-sectional study conducted on prospectively collected data St. Paul's Hospital Millennium Medical college, Ophthalmology department between March 1st/2018 and April 30/2018. The study area was St. Paul's Hospital

Millennium Medical College department of Ophthalmology. The department provides comprehensive eye examination, conducts major and minor surgeries and provides optometry service.

The sample size was determined by using single population proportion sample size calculation formula. The total number of study subjects calculated 384 with addition of 10 % non-response the final number of study subjects became 423. New patients in the age of 50 and above visiting outpatient department were included in the study and with exclusion of participants with bilateral media opacity that obscures fundusoscopic examination.

The study conducted after getting ethical clearance from Saint Paul Hospital Millennium Medical College IRB, and adequate explanation made for each patient about the risk and benefit of the study. Finally each study participants signed informed consent prior to data collection. All data collected prospectively from the patients with structured questionnaires through interview, physical examination and retinal imaging.

Two trained nurses did register the demographic data on structured questionnaire then they sent patients to trained ophthalmology residents for ocular history and comprehensive eye examination and recorded the result on the structured questionnaire. The fundus picture and SD Optical Coherence Tomography (OCT) were performed by trained optometrists. Interpretation of the fundus picture and SD OCT findings were done by Vitreo retina surgeon using standard definition. Age-related macular degeneration (AMD) is a disorder of the macula characterized by one or more of the following:-Presence of at least intermediate-size drusen ($>63 \mu\text{m}$ in diameter), Retinal pigment epithelium (RPE) abnormalities such as hypopigmentation or hyperpigmentation, Presence of any of the following features: geographic atrophy of the RPE, choroidal neovascularization ([CNV] exudative, wet), polypoidal choroidal vasculopathy (PCV), reticularpseudodrusen, or retinal angiomatous proliferation. We also used the classification Early, Intermediate and Advanced AMD according to Age-Related Eye Disease Study (AREDS) (Christina 2019). The collected data was entered into a computer and cleaned for any inconsistencies, missed values and incompleteness using EPI INFO 6 and then transferred to SPSS version 21 for the final analysis. During the analysis descriptive (proportion, mean and SD of age) and inferential statistics (chi-square, Confidence interval, crude and adjusted odds ratio and p-values) was determined.

Results

As indicated above the study intended to involve 423 new patients coming to the SPHMMC Ophthalmology department to seek medical care for their illnesses. However, only 414 patients were participated in the study that resulted in a response rate of 97.9%.

Socio-demographic characteristics of the participants: Two hundred twenty-three (53.9%) of the respondents were male with male to female ratio of 1.2:1. Their age ranges from 50 to 95 years (mean age 61.4 ± 9 years). More than half of the respondents were within the age of 50-60 years (Table 1). Majority of the study participants were from the urban residence 297 (71.7%) and housewife, 119 (28.7%), followed by employee 89 (21.5%) and farmers 83 (20%) (Table 1).

Table 1: Socio-demographic characteristics, reason for visit and risk factors of AMD among patients attending tertiary eye care in St. Paul's Hospital Millennium Medical College; March 1st/2018 to April 30/2018

Variable	Frequency
Sex	223(53.9)
Male	191(46.1)
Female	297(71.7)
Residence	117(28.3)
Urban	119(28.7)
Rural	89(21.5)
Occupation	83(20)
Housewife	63(15.2)
Government/ Private employee	22(5.3)
Farmer	6(1.4)
Retired	32(7.7)
Merchant	288(69.6)
Daily laborer	13(3.1)
Other	113(27.3)
Reason for visit	414(100)
Distortion of vision	177(42.7)
Metamorphosia	151(36.5)
Others	67(16.2)
Total	19(4.6)
Age group	6(1.4)
50-59	408(98.6)
60-69	119(28.7)
70-79	295(71.3)
>80	60(14.5)
History of smoking	354(85.5)
Yes	2(0.5)
No	412(99.5)
History of Hypertension	414(100)
Yes	
No	
History of D/Mellitus	
Yes	
No	
Family history of AMD	
Yes	
No	
Total	

Medical and family history of some relevant illnesses: The main presenting complaint of patients were distortion of vision 288 (69.6%) followed by metamorphosia 13 (3.1%). Family history of AMD mentioned by only 2(0.5%) and only 6(1.4%) patients reported having history of cigarette smoking. Of the 414 participants 119(28.7%) and 60 (14.5%) reported having hypertension and diabetes mellitus respectively prior to the current examination (table 1).

Clinical and SD OCT findings and diagnosis of AMD: Through the slit lamp examination cornea, lens, vitreous body, optic disc and retina were examined whether they had abnormalities. During the examination 110 (26.6%) and 103 (24.9%) of the right and left eyes of the participants respectively found having retinal lesions and/or abnormalities. The most common retinal lesion detected was drusen followed by retinal pigment epithelial abnormalities. The commonest type of drusen observed being small in size and multiple in distribution (Table 2).

Table 2: Clinical findings and SD OCT findings of the participants attending tertiary eye care at St. Paul's Hospital Millennium Medical College, March 1-April 30, 2018

Retinal Lesion	OD	OS
Drusen	N (%)	N (%)
Small	41(9.9)	36(8.7)
Intermediate	20(4.8)	22(5.3)
Large	4(1)	2(0.5)
RPE abnormality		
hypopigmentation	11(2.7)	13(2.4)
hyper pigmentation	7(1.4)	4(1)
Geographic atrophy		
Outside the center of the fovea	8(1.9)	8(1.9)
Involving the center of fovea	9(2.2)	6(1.4)
Neovascular maculopathy		
Choroidal neovascularization	2(0.5)	1(0.2)
Disciform scar	3(0.7)	3(0.7)
Other retinal lesions	34(8.6)	36(8.7)
*SD OCT findings		
Drusen	44(10.6)	35(8.5)
RPE irregularity, thinning ,disrupted	18(4.3)	23(5.6)
RPE thinning ,loss of EZ and increase visibility of BM and choroid	14(3.4)	7(1.7)
Choroidal neo-vascular membrane	5(1.2)	6(1.4)
Retinal pigment detachment	1(0.2)	1(0.2)
Sub retinal /intera-retinal fluid	1(0.2)	1(0.2)
Other	60(14.5)	40(9.7)
Not done due to media opacity	33(9.2)	40(9.7)
Normal	253(61.1)	265(64)

*Spectral domain Optical coherence tomography

Table 3: Clinical diagnosis, SD OCT diagnosis and Final Diagnosis of the participants attending tertiary eye care at St. Paul's Hospital Millennium Medical College, March 1-April 30, 2018

Diagnosis	OD	OS
Clinical Diagnosis	N (%)	N (%)
Early AMD	46(11.1)	37(8.9)
Intermediate AMD	12(2.9)	17(4.1)
Advanced Dry AMD	9(2.2)	6(1.4)
Wet AMD-ACTIVE	2(0.5)	1(0.2)
Advanced Wet AMD	3(0.7)	3(0.7)
normal	7(1.7)	10(2.4)
Other diagnosis	335(80.9)	340(82.1)
Total	414(100)	414(100)
SD OCT diagnosis	N (%)	N (%)
Early AMD	39(9.4)	29(7)
Intermediate AMD	11(2.7)	12(2.9)
Advanced Dry AMD	9(2.2)	10(2.4)
Wet AMD –ACTIVE	2(0.5)	2(0.5)
Advanced Wet AMD	3(0.7)	4(1)
Sub clinical Early AMD	11(2.7)	7(1.7)
subclinical Intermediate AMD	3(0.7)	2(0.5)
subclinical Advanced Dry AMD	4(1)	3(0.7)
No AMD	332(80.2)	345(83.3)
Total	414(100)	414(100)

Final Diagnosis (combining clinical and SD OCT) and severity classification

	OD	OS	Number of Patient (%)
AMD	N (%)	N (%)	
82 (19.8)	69 (16.7)	100 (24.2)	
No AMD	332(80.2)	345(83.2)	314(75.8)
Total	414(100)	414(100)	414(100)
Severity of AMD	Number of eyes affected (%)		Number of patients (%)
Early AMD	86 (53)		51 (51)
Intermediate AMD	28(18.5)		18(18)
Advanced AMD	37(24.5)		31(31)
Total	151 (100)		100(100)

Table 4: Associated risk factors for the development of AMD among patients attending tertiary eye care in the study period

	P Values	COR	95%CI	P Values	AOR	95%CI
Age						
50-59		1				
60-69	.004	2.297	1.310-4.030	.010	2.211	1.213-4.028
70-79	.000	3.332	1.717-6.466	.001	3.502	1.670-7.344
80 +	.000	13.812	4.792-39.817	.000	12.416	4.140-37.239
Sex						
Male	.623	1.120	.712-1.762	.664	.861	.437-1.695
Female		1				
History of smoking						
Yes	.032	6.500	1.172-36.036	.021	8.329	1.371-59.587
No		1				
Family history of AMD						
Yes	.999			.999		
No		1				
History of Hypertension						
Yes	.343	0.780	0.467-1.303	.118	0.616	0.336-1.130
No		1				
History of DM						
Yes	.869	1.055	0.560-1.987	.169	1.681	0.802-3.527
No		1				

Based on the clinical findings both in right and left eyes, the researcher (Vitreoretinal surgeon) made the clinical diagnosis. In general, 72 (17.4%) and 64

(15.5%) of the participants had AMD of different stages in right and left eyes respectively (refer table 4). The OCT examination findings interpreted by the

Vitreous retinal Surgeon and final diagnosis of AMD made in 82 (19.8%) and 69 (16.7%) of the right and left eyes of the participants respectively in 100(24.2%) individuals (Table 3 and 4).

Prevalence and Factors associated with the occurrence of AMD: Final diagnosis was done at individual level using both the clinical and/or imaging findings. Therefore, 100 (24.2%) of the study participants had AMD. Among the eyes affected by AMD 53% were having early AMD. At individual patient level 51 (51 %), 18(%) and 31(31%) were having early, intermediate and late AMD respectively (table 4). Significant association were found between age greater than 60 (p value 0.01, AOR=2.21 and 95%CI 1.21-4.03), history of smoking (p value 0.021, AOR =8.34, 95%CI 1.37-59.58), but there was no association found between family history of AMD ,sex, history of DM, History of HTN with occurrence of AMD in our study.

Discussion

A 24% prevalence of AMD in our study revealed that it is not a rare disease in low income country and proved the recent findings in related studies in developed and developing countries (Susan 2001; Mathenge 2013; Andrew 2014; Fafowara 1997). Our finding is in line with reports that predicted the prevalence increment of AMD by 97% in 2050 (David 2009). This can be explained by the recent rise in life expectancy in the world population including low and middle income countries. Thus, understanding the prevalence, burden, and population impact is essential for adequate health care planning and provision, which require both precise and contemporary estimates of disease prevalence.

The prevalence of AMD in Our study is by far greater than the previous study done in Ethiopia that showed 2.7% among all retinal disease (Teshome 2004). This may be explained by the fact that the difference in study population , the increased aging population, and the diagnostic capabilities like using SD OCT to diagnose the disease. The development of optical coherence tomography (OCT) makes it possible to have cross-sectional images of the macula or optic nerve head analogous to ultrasonography. OCT has revolutionized the diagnosis, classification, management and follow up of patients with Age related macular degenerative disease (Caio 2011; Shamika 2020). Sudhalkar et al. and Harika et al. reported 24 % and 28% prevalence of late AMD in a hospital based study, which are comparable with our report of late AMD. But Kulkarni et al reported a much lower rate of late AMD, 17.4%. This may be attributed to the difference in the study time, genetic variability and environmental factors that necessitate

further study (Sudhalkar 2015; Harika 2019; Kulkarni 2013).

There are different risk factors that are associated to the development of AMD, identifying and acting on them helps to prevent the development of the disease and early detection and treatment also helps in preventing visual impairment and loss in aged people (Jennifer 2001). Age is the commonest non modifiable risk factors for the development of AMD. In our study age greater than 60 years found to be significantly associated with occurrence of AMD which is similar with other studies in the world (Jennifer 2001; Ali 2016; Klein 2010; Clemons 2005; Usha 2010). The other risk factor strongly associated with AMD was cigarette smoking. The literature review done by Thornton et al. confirmed a strong association between current smoking and AMD, which fulfilled established causality criteria. Cigarette smoking is likely to have toxic effects on the retina. In spite of the strength of this evidence, there appears to be a lack of awareness about the risks of developing eye disease from smoking among both healthcare professionals and the general public (Emily 2012).

Our study doesn't show association of sex with occurrence of AMD unlike the Kenya study where after controlling for age, women had a higher prevalence of early AMD than men (Mathenge 2013). This increased prevalence of AMD in the female population is also witnessed in different large eye studies. A revision made by Jennifer showed a small increased risk for women, mainly to the older age-groups (Evans 2001). In this study there was no association detected between hypertension, family history of AMD and occurrence of AMD unlike most studies in other countries (Jennifer, 2001; Ali 2016; Klein 2010). Beside age ,gender , smoking , alcohol intake and genetic factors there were also other factors like use of hormonal replacements , drugs use and other factors that has been mentioned to be weakly associated with age related eye disease. The protective factors like vitamin and omega 3 fatty acid supplements were also mentioned in age related eye disease study which is a multicenter study going on since (Jennifer, 2001; Clemons 2005; Usha 2010; Thornton, 2005). But those factors not included in our study as the trend of dietary recording habit in the Ethiopian population is not a common trend and such supplements are not widely available

Conclusion

Age related Macular degenerative disease is a common problem affecting old age people visiting tertiary eye care in Ethiopia. The use of SD OCT helped in detecting subclinical AMD .There is an increased risk of having the disease with each decade of age increment above the age of 60years and

cigarette smoking remains the epidemiologically associated with the development of AMD. We recommend a meticulous clinical examination and use of optical coherence tomography to detect the disease, classify and treat it properly in all age group greater than 50 years.

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