

## Original Research Article

# Study of association between the serum lipid profile and age-related macular degeneration in a tertiary care centre of Central UP

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### ABSTRACT

**Background:** Age-related macular degeneration (ARMD) is the major challenge in the new millennium in the developing countries as the size of elderly population continues to rise due to betterment of medical facilities and increased life expectancy. Lipids are implicated in the pathogenesis of ARMD. The relationship between systemic lipids and ARMD has not been well characterized, especially in rural population. The objective was to investigate the relationship between serum lipids and ARMD in older adults.

**Methods:** In this case-control study, 300 adults, aged  $\geq 50$  years, 150 each among cases and controls were included in the study. Mean lipids values between cases and controls were compared.

**Results:** Mean age of cases was  $62.45 \pm 8.472$  years and mean age of controls was  $61.89 \pm 8.51$  years. Among 150 cases, 124 (82.66%) cases were of dry ARMD while 26 (17.33%) cases were Wet ARMD. Author found that 38 cases among total cases (25.33%) and 15 individuals (10%) among controls had altered lipid profile. All mean lipid values were higher among cases compare to controls ( $p > 0.05$ ), while the mean of VLDL, TG and TG/HDL were significantly raised showing positive association ( $p < 0.05$ ).

**Conclusions:** Present study showed that high levels of serum lipid values especially VLDL, TG and TG/HDL positive association with an increased risk for development of ARMD, implying that strategies reducing serum lipid levels may be useful to prevent the development of the disease.

**Keywords:** Blindness, Dyslipidaemia, Mean lipid profile values, Rural population

### INTRODUCTION

Age related macular degeneration (ARMD) is one of the leading causes of visual impairment in individuals more than 50 years of age in developed countries second only to cataract.<sup>1,2</sup> It is the major challenge in the new millennium in the developing countries also, as the size of elderly population continues to rise due to betterment

of medical facilities and increased life expectancy.<sup>3</sup> ARMD accounts for 8.7% of total blindness worldwide. It is expected to reach 196 million by 2020. In India, 2-3.7% of the population affected. Over a 5-year time span, it is estimated that 1 in 3 people over the age of 70 years will develop its signs.<sup>4</sup> ARMD has been associated with numerous risk factors, several of which are modifiable. Severe visual loss can be prevented in some cases by

public education and modification of the risk factors like dietary habits, environmental factors and cigarette smoking.<sup>5</sup>

It has been shown that drusen found in ARMD share a number of molecular constituents with atherosclerotic plaques. These include lipids and some proteins like vitronectin, apolipoprotein E, calcium and complement components demonstrating ultimate relevance between advanced ARMD and serum lipid level.<sup>6</sup>

Up till now, studies evaluating the association between serum lipids and ARMD have been inconsistent, especially with quite lacking data about this issue among rural patients. The present study was developed to evaluate the relationship between serum lipid concentrations and ARMD among rural population as the pattern of lipid profile could be a hypothesized factor contributing to the development of ARMD and also to their progression.

**METHODS**

This was a case control study conducted at department of Ophthalmology Uttar Pradesh University of Medical Sciences, Saifai, Etawah, UP from January 2017 to June 2018.

**Inclusion criteria**

Total 150 diagnosed ARMD patients of age more than 50 years, normotensive, non-diabetic with no family history of any such diseases, no posterior segment disease other than ARMD, willing to give informed consent. 150 healthy individuals of more than 50 years of age with no systemic and posterior segment diseases including age related macular degeneration, willing to give informed consent as controls.

**Exclusion criteria**

Patients with less than 50 years of age, hypertensive, diabetic, other diseases of posterior segment other than ARMD, patient already on lipid lowering agents, not willing to give informed consent were excluded from study.

All patients underwent a complete ophthalmic examination and fundus photographs (Carl Zeiss Meditec AG FF 450 PLUSIR Jena, Germany) were taken. Blood investigation was sent that included serum lipid profile. Diagnosis of dyslipidemia includes LDL >140 mg/dl, HDL <40 mg/dl, total cholesterol >200 mg/dl, triglyceride >150 mg/dl.<sup>7</sup>

**RESULTS**

Author found that among 150 cases, 91 (60.66%) were males and rest females, similarly out of 150 controls 94 (62.66%) were males and remaining were females (Table

1). Mean age of cases was 62.45±8.472 years and mean age of controls was 61.89±8.51 years which was almost similar (Table 2) (p=0.56). Among 150 cases, 124 cases (82.66%) were of Dry ARMD (fundus had drusen and geographical atrophy) while 26 cases (17.33%) were Wet ARMD (fundus had CNVM in either eye).

**Table 1: Gender wise distribution of cases and controls.**

Gender	Case	Control	
Male	91	94	
Female	59	56	P=0.36
Total	150	150	

**Table 2: Mean age of cases and controls (N=300).**

Cases	Mean age (years)	Controls (N=150)	P value
Cases (N=150)	62.45±8.472	62.03±8.55	0.56
Dry ARMD (N=124)	62.194±8.86	62.03±8.55	0.87
Wet ARMD (N=26)	63.69±6.25	62.03±8.55	0.34

Author have found that 72 cases and 79 controls were of age less than 60 years, while 78 cases and 71 controls were more than 60 years. Author have noted that among controls, individuals of age less than 60 years, while among cases people of age above 60 were higher but the difference between them was statistically not significant (Table 3).

**Table 3: Comparison of cases and controls according to age groups (N=300).**

Age groups	Case	Control	P value
<=60 years	72	79	
>60 years	78	71	P=0.41
Total	150	150	

On comparing the serum lipids values, author found that 38 cases among total cases (25.33%) and 15 individuals (10%) among controls had altered lipid profile (Table 4).

All mean lipid values were higher among cases compared to controls (p>0.05), while the mean of VLDL, TG and TG/HDL were significantly raised showing positive association (p<0.05).

Out of 124 cases of Dry ARMD, 17 patients (14.51%) had altered lipid profile. Out of these the higher mean value of VLDL (p=0.006), TG (p<0.001) and LDL /cholesterol (p=0.049) compare to control showed positive association.

Among the 26 wet ARMD cases, 21 (80.76%) had altered lipid profile. Among these most of the mean lipid values were higher among cases but the mean lipid value of

LDL (p=0.010), VLDL (p value <0.001), TG (p value <0.001), cholesterol (p value <0.001), TG/HDL (p value <0.001) and cholesterol/HDL (p=0.032) showed association (Table 5).

**Table 4: Comparison of mean lipid values between cases and controls.**

Lipid component	Cases (Mean±SD)	Controls (Mean±SD)	P value
HDL	53.08±8.83	51.84±8.95	0.228
LDL	101.78±25.35	100.68±23.71	0.70
VLDL	24.41±5.08	21.947±4.56	<0.0001
Triglycerides	125.21±24.68	111±21.96	<0.0001
Total cholesterol	179.67±30.03	173.59±24.02	0.054
LDL/cholesterol	0.56±0.06	0.57±0.06	0.084
LDL/HDL	1.96±0.59	2.01±0.65	0.528
TG/HDL	2.42±0.69	2.20±0.56	0.003
Cholesterol/HDL	3.44±0.68	3.42±0.71	0.87
HDL/LDL	0.54±0.12	0.53±0.14	0.79

**Table 5: Comparison of mean lipid values between dry and wet ARMD cases and controls.**

Lipid component	Control Mean±SD	Dry ARMD (124) Mean±SD	P value (between dry ARMD and control)	Wet ARMD Mean±SD	P value (between wet ARMD and control)
HDL	51.84±8.95	52.83±8.67	0.35	54.26±7.31	0.210
LDL	100.68±23.71	99.04±22.49	0.561	114.80±33.58	0.010
VLDL	21.94±4.56	23.42±4.17	0.006	29.11±6.34	<0.001
Triglycerides	111.23±21.96	120.63±20.66	<0.001	147.03±30.57	<0.001
Total cholesterol	173.59±24.02	175.21±25.55	0.58	200.92±39.91	<0.001
LDL/cholesterol	0.57±0.06	0.56±0.05	0.049	0.56±0.10	0.678
LDL/HDL	2.01±0.65	1.92±0.54	0.225	2.17±0.74	0.244
TG/HDL	2.20±0.56	2.34±0.66	0.053	2.80±0.77	<0.001
Cholesterol/HDL	3.42±0.71	3.37±0.62	0.496	3.76±0.83	0.032
HDL/LDL	0.53±0.14	0.55±0.11	0.480	0.50±0.15	0.311

## DISCUSSION

Author had excluded the patients having cardiovascular diseases, hypertension or diabetes as these can work as confounding factors in this study because according to a study of Hyman L et al, there was a positive association between wet ARMD and increased diastolic blood pressure and antihypertensive medication.<sup>8</sup> There were also other studies like Hyman L et al, Delcourt C et al, Chakravarthy U et al, Tomany SC et al, and Hogg RE et al, showing association between ARMD and cardiovascular diseases, hypertension and smoking.<sup>8-12</sup>

Author have found that there were more number of cases as age increases although statistically not significant. National Eye Institute 2007, Hyman L et al, Topouzis F et al, showed the similar result with statistically significant difference.<sup>13-15</sup>

Author have found that there was male preponderance among cases although statistically non-significant. The same result was found by Ambreen F et al, while many

studies showed female preponderance.<sup>13,14,16</sup> This variation could have been due to the fact that females in rural population report less incidentally in the hospital and in this study out of 150 cases there were 91 males and 59 females. This gender difference might bias the result.

The relationship between raised HDL and ARMD was shown by Wang Y et al, Cougars Gregoire A et al, Nowak M et al, Reynolds R et al, and Dawari MH et al, showed that there were reduced level of HDL in cases with ARMD as compared to controls, which was contradictory to this study. Wang Y et al, study although showed positive association between high HDL and ARMD but it had also negotiated any relationship between ARMD and cholesterol, triglycerides and LDL levels.<sup>17-21</sup>

The present study showed the positive association between increased cholesterol levels in the serum and ARMD. Same result in serum cholesterol and ARMD was shown by the eye disease case control study group and by Belda JS et al, Ambreen F et al, contrary to this

some studies found that there was no association or negative association as ARMD patients have low cholesterol in these studies as in Abalain JH et al.<sup>16,22,23</sup>

Controversies exist as regards the association of the ARMD with serum lipid profile. One possible reason might be the different forms and stages of ARMD in the considered subjects. Van Leeuwen R et al, found association of elevated concentration of high density lipoprotein (HDL) but not total cholesterol with an increased risk of non-vascular ARMD.<sup>24</sup> Similarly, no difference in total cholesterol, triglycerides, phospholipids, high and low density lipoprotein concentration was observed between ARMD patients and controls in a study done by Abalain JH et al.<sup>23,19</sup> Two major studies done by van Leeuwen R et al, and Delcourt C et al, demonstrated that ARMD was associated with elevated HDL levels.<sup>9,24</sup> Contrary to this, Reynolds R et al, found that high levels of HDL were inversely correlated with advanced ARMD indicating HDL to reduce the risk of wet type ARMD.<sup>20</sup>

When author studied the early ARMD patients, they found that in patients who have Drusen in their eyes (early ARMD) showed increased level of triglycerides and VLDL. The same results were found in Belda JS et al, and Nowak M et al, studies.<sup>19,22</sup> But in contrast, the Leeuwan EM et al, study had shown that the increased triglycerides levels were protective for early ARMD while a risk factor for late ARMD.<sup>25</sup> While Abalain JH et al, Davari MH et al, had shown no association of triglycerides and the disease.<sup>21,23</sup>

## CONCLUSION

Author found that there was increased mean level of cholesterol, triglycerides, LDL, VLDL and HDL in cases as compared to controls proving positive association between ARMD and increased level of mean lipid profile values.

Finally, author have reached to the conclusion that disturbance in serum lipid profile act as one of the contributing risk factors for the development of ARMD and by controlling the serum lipid values by modification in life style and eating habits, one can prevent disease development and progression.

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