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Alcohol Consumption and the 15-year Cumulative Incidence of Age-Related Macular Degeneration (AMD)

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Abstract

Purpose—To investigate alcohol consumption as a risk factor for the 15-year cumulative incidence and progression of age-related macular degeneration (AMD).

Design—Prospective population-based study in Beaver Dam, WI with four examinations at 5-year intervals initiated in 1988 (n=3,509 contributed data for this analysis).

Methods—History of alcohol consumption was obtained via questionnaire. Cumulative incidence of early AMD, exudative AMD, pure geographic atrophy and progression of AMD were assessed from fundus photographs taken at each examination.

Results—Heavy drinking (4 or more drinks daily) at baseline was related to the 15-year cumulative incidence of pure geographic atrophy in men (odds ratio: 9.2, 95% confidence interval: 1.7-51.2). There were no consistent associations with the amount of beer, wine or liquor consumption and the incidence or progression of AMD.

Conclusions—Alcohol consumption is unlikely to strongly increase (or decrease) the risk of AMD.

At the 10-year follow-up of the Beaver Dam Eye Study, history of heavy drinking increased the risk of developing exudative macular degeneration.¹ Our previous observation involved a small number of heavy drinkers and incident exudative AMD cases. We extend our previous work with five additional years of follow-up.

Descriptions of the population, the examinations and AMD grading from retinal photographs have been presented in detail elsewhere.²⁻⁵ There were 3,842 persons between ages 43-86 years examined at baseline and contributed follow-up information. At each examination, photographs of the retina were taken and AMD was graded³. Fifteen year incidence of early AMD (soft indistinct drusen or pigment abnormalities in the presence of drusen), exudative AMD, and pure geographic atrophy were based on the event happening in the worse eye. Progression of AMD was based on progressing two or more steps along a 6-step scale or progressing from early to late AMD in either eye.⁵ History of alcohol intake and other medical and lifestyle characteristics was obtained.² Heavy drinking was defined as 4 or more drinks daily. A drink was defined as any of the following: 12 ounce beer, 4 ounce glass of wine, or 1.5 ounces of liquor. SAS version 9 (Cary, NC) was used to compute multivariate adjusted

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odds ratios from discrete logistic hazard regression models. All data were collected with Institutional Review Board approval in conformity with all federal and state laws.

The distribution of baseline drinking characteristics is shown in Table 1. Men reported higher alcohol consumption than women in all categories, except for wine drinking. Baseline heavy drinking status and the incidence and progressed AMD is shown in Table 2. In men, after controlling for age, systolic blood pressure, vitamin use, and history of smoking, there were significantly higher odds of incident pure geographic atrophy among current compared to never heavy drinkers. There were no other significant relationships among women or for incidence and progression of other AMD outcomes.

Multivariate adjusted increasing trends among categories of baseline history of beer, wine, liquor, and total drinking are shown in Figure 1. History of beer and liquor drinking were not related to any of the incident AMD outcomes. History of increased wine drinking was inversely related to the incidence of early AMD among women and directly related to the incidence of pure geographic atrophy among men. History of increased alcohol drinking among women was inversely related to exudative AMD. We also tested for non-linear effects in drinking amounts and found no significant relationships (data not shown). In an analysis combining incident AMD with progression of AMD, there was no relationship with any of the alcohol variables (data not shown).

We had previously reported a relationship of a history of heavy drinking with the 10-year incidence of exudative AMD.¹ This was attenuated and no longer statistically significant at the time of the 15-year follow-up. However, we did detect an increased risk in developing pure geographic atrophy among heavy drinkers at the baseline examination compared to never heavy drinkers. The confidence interval was wide because of small numbers suggesting the possibility of a chance finding. Biologically, heavy drinking may cause oxidative damage to the retina leading to the development of AMD.⁶

There were few relationships investigating beer, wine, and liquor drinking separately. Increased wine drinking among women showed a reduction in the risk of incident early AMD. The antioxidant and anti-platelet aggregation properties in wines have been hypothesized to explain this relationship.⁷ However, this relationship was not consistent among men or for other AMD outcomes.

This study was limited by the relatively infrequent amount of drinking reported in this cohort as well as the infrequency of late AMD. In addition, under-reporting of heavy or moderate drinking may have resulted in misclassification, affecting our findings. In summary, there was not consistent evidence for protective effects (e.g., moderate wine drinking) or detrimental effects (e.g., heavy drinking) with the incidence or progression of AMD.

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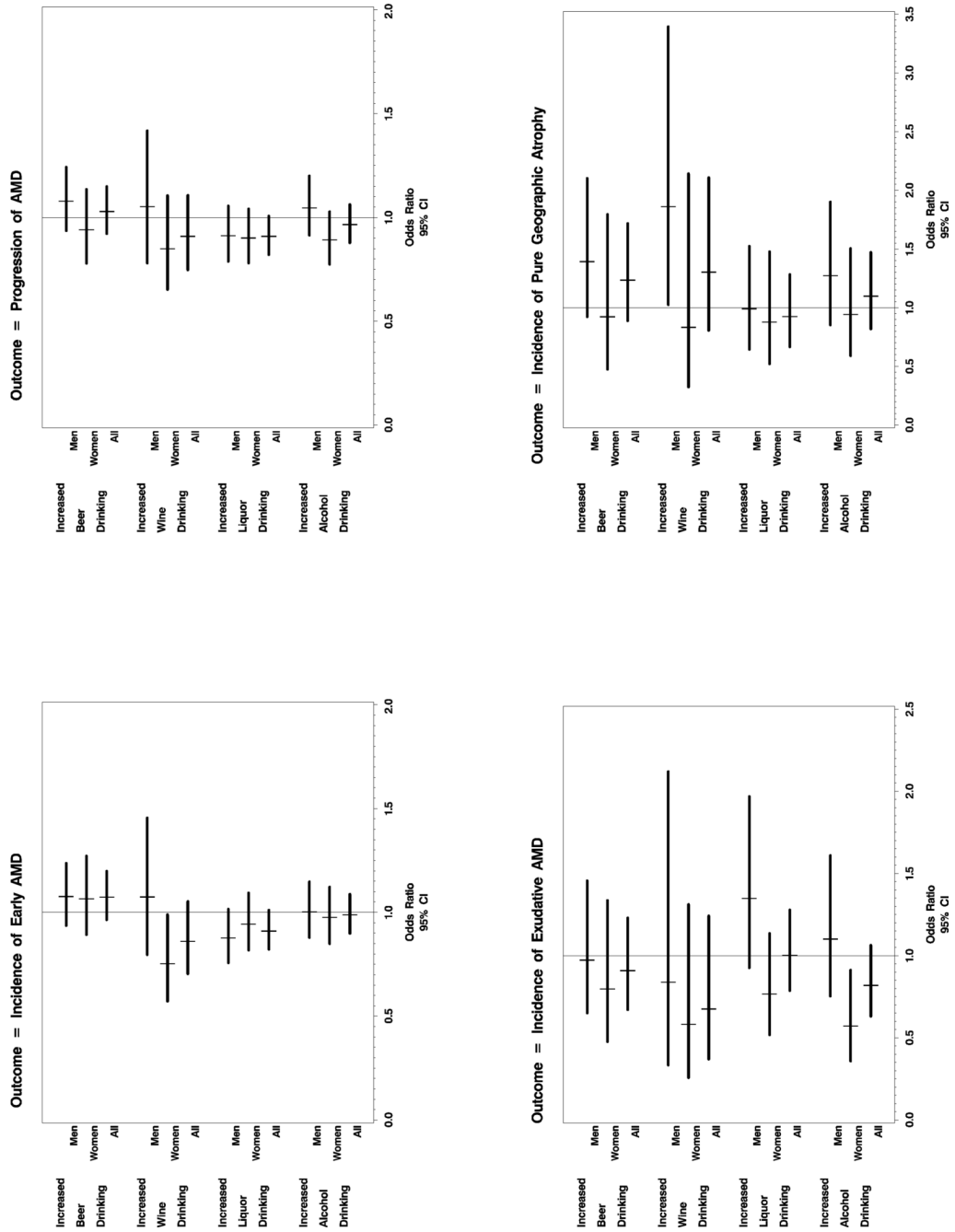


Figure 1. Multivariate adjusted 15-year cumulative incidence and progression of age-related macular degeneration (AMD) by baseline drinking status, Beaver Dam Eye Study 1988-2005. Odds ratios and 95% confidence intervals adjusted for baseline age categorically (43-54, 55-64, 65-74, 75-86 years), systolic blood pressure, vitamin use, smoking history and gender (where appropriate) are plotted for a 1-step increase in the drinking variable for men, women, and men and women combined (labeled all on the graph). The categories for beer, wine, liquor and all alcohol drinking combined can be found in Table 1.

Table 1

Baseline drinking characteristics among men and women in the Beaver Dam Eye Study*

Drinking Characteristic	Men (N=1538)	Women (N=1971)	P-value[†]
History of heavy drinking			<0.001
Never	70.1	94.4	
Past	25.4	5.2	
Current	4.5	0.5	
Beer drinking (avg. per week)			<0.001
None	48.2	82.8	
1 to <2	7.9	5.0	
2 to <6	21.5	7.6	
6 or more	22.5	4.6	
Wine drinking (avg. per week)			0.63
None	87.4	87.6	
1 to <2	6.2	5.1	
2 or more	6.5	7.3	
Liquor drinking (avg. per week)			<0.001
None	56.8	73.4	
1	10.9	8.8	
>1 to <4	12.6	9.1	
4 or more	19.6	8.7	
Any alcohol drinking (avg. per week)			<0.001
None to <1	32.1	60.3	
1 to <5	25.2	23.6	
5 to <7	9.7	4.6	
7 to <28	28.6	11.1	
28 or more	4.5	0.5	

* Only includes persons with AMD data available for incidence or progression analysis

[†] Cochran-Mantel-Haenszel test for gender difference adjusted for age

Table 2 15-Year Cumulative Incidence and Progression of AMD by Heavy Drinking Status at the Baseline Examination, Beaver Dam Eye Study 1988-2005.

	Heavy Drinking History			Men %	OR (95% CI)*	N	Ev	Women			Both Genders %	OR (95% CI)*	
	N	Ev	%					N	Ev	%			N
Incidence of Early AMD	Never	964	113	13.0	referent	1615	232	16.2	referent	2579	345	15.0	referent
	Past	345	26	8.4	0.70 (0.45, 1.09)	87	11	14.9	1.38 (0.72, 2.65)	432	37	9.7	0.85 (0.58, 1.23)
	Current	60	7	12.9	1.11 (0.49, 2.53)	7	2	33.3	1.94 (0.42, 9.02)	67	9	15.6	1.42 (0.69, 2.91)
Progression on 6-step scale	Never	1212	101	9.8	referent	2016	250	14.5	referent	3228	351	12.7	referent
	Past	450	30	7.8	0.92 (0.60, 1.41)	112	9	9.2	0.91 (0.45, 1.83)	562	39	8.1	0.91 (0.63, 1.31)
	Current	80	9	13.1	1.75 (0.82, 3.73)	9	0	0.0	referent	89	9	11.6	1.51 (0.74, 3.10)
Incidence of Exudative AMD	Never	1201	10	1.0	referent	1995	43	2.6	referent	3196	53	2.0	referent
	Past	448	5	1.3	1.42 (0.47, 4.29)	112	3	3.3	1.90 (0.56, 6.43)	560	8	1.7	1.63 (0.72, 3.71)
	Current	77	2	3.4	3.20 (0.61, 16.8)	9	0	0.0	referent	86	2	3.0	3.00 (0.67, 13.5)
Incidence of Pure Geographic Atrophy	Never	1197	9	0.9	referent	1983	22	1.4	referent	3180	31	1.2	referent
	Past	447	5	1.4	2.44 (0.79, 7.58)	110	1	1.3	1.36 (0.17, 11.1)	557	6	1.4	1.94 (0.73, 5.15)
	Current	78	2	2.6	9.23 (1.66, 51.2) [†]	9	0	0.0	referent	87	2	2.3	7.21 (1.50, 34.6) [†]

Abbreviations: AMD=age-related macular degeneration; N=number at risk; Ev=Number of cumulative events; %=15-year cumulative incidence (adjusted for competing risk of death); OR= odds ratio; CI = confidence interval

* adjusted for baseline age categorically (43-54, 55-64, 65-74, 75-86 years), systolic blood pressure, vitamin use, smoking history and gender (where appropriate)

[†] P-value = 0.01