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Prevalence and associations of epiretinal membranes in the Australian National Eye Health Survey

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Editor,

Epiretinal membranes (ERMs) are a common retinal condition that is often associated with the symptoms of decreased visual acuity and metamorphopsia (Gupta et al. 2008). Clinically, two types of ERM can be identified (Klein et al. 1994), with the first, earlier stage, consisting of an irregular glinting reflection from the inner surface of the retina known as the cellophane macular reflex (CMR). The more advanced and vision threatening form, known as preretinal macular fibrosis (PMF), occurs as the membrane thickens and contracts giving the appearance of superficial traction lines or retinal folds.

We set out to determine the prevalence of ERMs in the Australian National Eye Health Survey (NEHS), a population-based cross-sectional study conducted on non-Indigenous Australians aged 50 years and older and Indigenous Australians aged 40 years and older, living in 30 sites stratified by remoteness. Ethics approval was obtained from the Royal Victorian Eye and Ear Hospital and from state level Indigenous organisations. ERMs were graded from retinal photographs using standardised protocols (Klein et al. 1994). Associations between ERMs and demographic and clinical variables, including; age, gender, educational attainment, English spoken at home, ethnicity, geographic remoteness, early age-related macular degeneration, self-reported diabetes and stroke, refractive error, best-corrected visual acuity (BCVA) and intra-ocular pressure (IOP) were explored using multivariable logistic regression.

A total of 3098 non-Indigenous (aged 50-98 years) and 1738 (aged 40-92 years) Indigenous Australians were examined in the NEHS. Of these, 3010 (97%) non-Indigenous and 1682 (97%) Indigenous participants had retinal photographs that were gradable for ERMs. In the non-Indigenous population, ERMs were observed in 367 participants (12.19%, 95% CI: 11.04%, 13.42%) with the earlier form, CMR, found in 9.60% (95% CI: 8.59%, 10.71%) and the later stage, PMF, observed in 2.59% (95% CI: 2.08%, 3.22%) (Table 1). This prevalence is higher than that found in previous Australian population-based studies, including the Blue Mountains Eye Study (7%) (Mitchell et al. 1997) and the Melbourne Visual Impairment Project (6%) (McCarty et al. 2005), but substantially lower than the Multi-Ethnic Study of Atherosclerosis (28.9%) (Ng et al. 2011) and the Latino Eye Study (18.5%) (Fraser-Bell et al. 2004) conducted in the United States. While a lower prevalence of CMR (5.83%, 95% CI: 4.80%, 7.05%) and PMF (1.49%, 95% CI: 1.06%, 2.19%) were observed in Indigenous Australians compared to non-Indigenous Australians, this difference did not reach statistical significance ($p = 0.156$).

Similar to previous studies (Mitchell et al. 1997; Fraser-Bell et al. 2004; McCarty et al. 2005), increasing age (non-Indigenous; OR 1.06, 95% CI: 1.04-1.08, $p<0.001$ & Indigenous; OR 1.07, 95% CI: 1.03-1.11, $p=0.001$) was significantly associated with ERM after multivariable adjustments. An ethnic variation was identified, with ERMs being over 1.5 times more prevalent in non-Indigenous Australians of European ethnicity compared to those of Oceanian ethnicity (OR 1.53, 95% CI: 1.03-2.27, $p=0.034$). Furthermore, we report a novel significant association between lower IOP and the presence of ERM in non-Indigenous participants (OR 0.93, 95% CI:

0.89-0.98, p=0.003). There is no obvious explanation for the potential protective effect of a higher IOP. Lower BCVA was associated with ERM in both Indigenous (OR 1.72, 95% CI: 1.32-2.26, p<0.001) and non-Indigenous (OR 2.58, 95% CI: 1.62-4.11, p<0.001) participants, with VA becoming worse with increasing severity of ERM (PMF) (mean [SD], PMF=0.47 [1.07] vs. no ERM=0.17 [0.54], p<0.001).

In conclusion, the prevalence of ERMs in the NEHS was higher in non-Indigenous Australians than Indigenous Australians. ERMs were significantly associated with lower BCVA, older age, European ethnicity and lower IOP in this Australian cohort.

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Table 1. Prevalence (% [95% CI]) of ERM by Indigenous status, age and gender

Variable	Total (n)	CMR (n = 289)	PMF (n = 78)	Any ERM
Non-Indigenous				
Gender				
Male	1395	10.18 (8.70, 11.88)	2.51 (1.81, 3.48)	12.69 (10.99, 14.55)
Female	1615	9.10 (7.79, 10.61)	2.66 (1.98, 3.57)	11.76 (10.23, 13.44)
Age (years)				
50-59	803	3.11 (2.11, 4.57)	0.62 (0.26, 1.49)	3.74 (2.53, 5.29)
60-69	1143	11.46 (9.74, 13.44)	2.54 (1.77, 3.63)	14.00 (12.04, 16.15)
70-79	734	14.03 (11.70, 16.75)	4.50 (3.21, 6.26)	18.52 (15.78, 21.53)
80+	330	9.09 (6.42, 12.73)	3.33 (1.85, 5.94)	12.42 (9.07, 16.48)
Total		9.60 (8.59, 10.71)	2.59 (2.08, 3.22)	12.19 (11.04, 13.41)
Indigenous				
Gender				
Male	692	6.50 (4.89, 8.61)	1.30 (0.68, 2.48)	7.80 (5.91, 10.06)
Female	990	5.35 (4.80, 7.05)	1.62 (0.99, 2.62)	6.97 (5.46, 8.74)
Age (years)				
40-49	575	3.48 (2.25, 5.34)	0.52 (0.17, 1.61)	4.00 (2.55, 5.94)
50-59	613	1.79 (0.99, 3.22)	1.31 (0.65, 2.59)	3.10 (1.88, 4.80)
60-69	344	11.04 (8.13, 14.84)	2.91 (1.57, 5.33)	13.95 (10.47, 18.07)
70+	150	19.33 (13.72, 26.53)	2.67 (0.99, 6.96)	22.00 (15.65, 29.49)
Total		5.83 (4.80, 7.05)	1.49 (1.06, 2.19)	7.32 (6.11, 8.66)

CI = confidence interval; CMR = cellophane macular reflex; ERM = epiretinal membrane; PMF = preretinal macular fibrosis