



The Longitudinal Association between Cognitive Impairment and Incident Visual Impairment in a Multiethnic Asian Population

*Tai Anh Vu¹, *Preeti Gupta^{1,2}, Felicia ZY. Leow², Eva K. Fenwick^{1,2}, Ryan EK. Man^{1,2}, Yih-Chung Tham², Xin Xu^{3,4}, Debra QY. Quek², Chaoxu Qian², Charumathi Sabanayagam^{1,2}, Christopher LH. Chen³, Tien Yin Wong^{1,2}, Ching-Yu Cheng^{1,2}, Ecosse L. Lamoureux^{1,2,5}

1. Duke-NUS Medical School; 2. Singapore Eye Research Institute; 3. Memory Aging and Cognition Centre, National University of Singapore; 4. the 2nd Affiliated Hospital of Zhejiang University School of Medicine; 5. The University of Melbourne; * co first-authors

BACKGROUND

- While visual impairment (VI) is a well-established risk factor of cognitive impairment (CIM), the reverse association between baseline cognitive status with incident VI is still unclear due to a scarcity of long-term data.
- In this study, we investigated the longitudinal association between baseline CIM and incident VI across the spectrum of VI severity over 6-year follow-up in elderly Singaporeans.

METHODS

- Participants included 2,324 adults aged ≥ 60 years from the Singapore Epidemiology of Eye Diseases (SEED) study.
- CIM** was defined using the validated Abbreviated Mental Test as scores of ≤ 6 and ≤ 8 for those with 0-6 and >6 years of formal education, respectively.
- Visual acuity was objectively measured using a logMAR number chart.
- Any incident VI:** defined as having no VI (≤ 0.3) at baseline but present (>0.3) at 6-year follow-up in the better eye.
- Incident mild VI:** development of mild VI ($0.3 < PVA/BCVA \leq 0.48$) in the better eye at follow-up in individuals with no VI at baseline.
- Incident moderate-severe VI:** development of moderate-severe VI (>0.48) in the better eye at follow-up in individuals with no or mild VI at baseline.
- Multiple logistic regression models were used to examine the associations between baseline CIM with incident VI adjusted for demographics and clinical comorbidities.
- Sensitivity analysis** was conducted by excluding the visual cognitive item. This reliance on vision may overestimate the prevalence of CIM in visually impaired participants.

RESULTS

- Of the 2,324 included participants, 248 (10.7%) had CIM at baseline, of which the 6-year incidence of any, mild and moderate-severe VI was 20.1%, 11.6%, and 9.8%, respectively.
- The presence of baseline CIM was associated with more than twice the odds of any incident VI, incident mild and moderate-severe VI (Table 1).**

Table 1: Association Between Baseline CIM and Incidence of Any VI, Mild VI or Moderate-Severe VI over 6 Years

Variable	Best-corrected VA		Presenting VA	
	β^* (95% CI)	P value	β^* (95% CI)	P value
Any Incident VI				
CIM				
• None	1 [Reference]	NA	1 [Reference]	NA
• Any	2.48 (1.55, 3.90)	<0.001	1.78 (1.10, 2.82)	0.017
Incident Mild VI				
CIM				
• None	1 [Reference]	NA	1 [Reference]	NA
• Any	2.07 (1.17, 3.55)	0.010	1.63 (0.92, 2.78)	0.084

RESULTS

Table 1: Continued

Variable	Best-corrected VA		Presenting VA	
	β^* (95% CI)	P value	β^* (95% CI)	P value
Incident Moderate-severe VI				
CIM				
• None	1 [Reference]	NA	1 [Reference]	NA
• Any	2.61 (1.36, 4.93)	0.003	1.73 (1.01, 2.87)	0.040

Sensitivity Analysis for Incident Moderate-severe VI

Variable	Best-corrected VA		Presenting VA	
	β^* (95% CI)	P value	β^* (95% CI)	P value
CIM				
• None	1 [Reference]	NA	1 [Reference]	NA
• Any	2.05 (1.03, 3.94)	0.035	1.45 (0.80, 2.51)	0.203

* Adjusted for baseline age, sex, ethnicity; presence of diabetes, hyperlipidemia, hypertension, cardiovascular disease, and chronic kidney disease; current smoking status; alcohol intake; and body mass index

- Among those with baseline CIM and incident VI, the leading causes of VI were cataract and under-corrected refractive error (UCRE) (**Fig 1**).

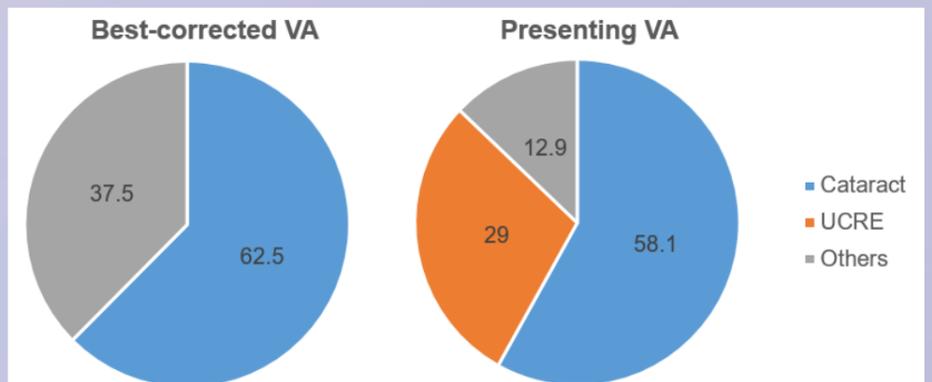


Fig 1: Main Causes of VI among Individuals with Baseline CIM and Any Incident VI

Others: diabetic retinopathy, age-related macular degeneration, glaucoma and other eye diagnoses

DISCUSSION & CONCLUSION

- Older adults with CIM had more than double the risk of VI development** over 6 years than their cognitively intact counterparts. Furthermore, **majority of causes of incident VI is correctable**.
- These findings support the need of **targeted vision screening, early referral of cognitively impaired older adults to eye-care services, and provision of glasses and cataract surgeries as potential strategies for early detection and management of VI in these patients.**