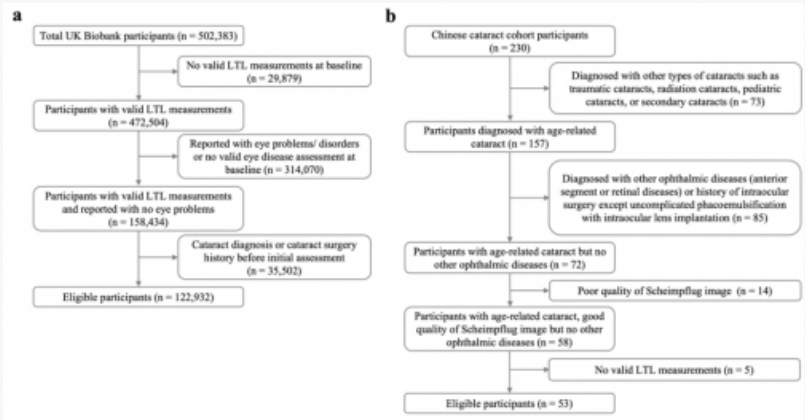
From blood to lens: Telomere length signals cataract development

FAYETTEVILLE, GA, UNITED STATES, February 15, 2026 /EINPresswire.com/ -- Age-related cataract is often viewed as an unavoidable consequence of growing older, yet people of the same age frequently show striking differences in when cataracts appear and how severe they become.



Flowchart of participants included in the two cohorts.

Cataracts remain the leading cause of blindness worldwide among adults over 50, despite major advances in surgical treatment. Traditionally, cataract formation has been considered an inevitable outcome of aging, yet clinical observations show wide variation in onset and progression among individuals of similar age. This disparity points to underlying biological mechanisms beyond simple time-dependent wear. Telomeres—protective DNA–protein structures at chromosome ends—shorten gradually with cellular division and oxidative stress, serving as markers of biological aging. Shortened leukocyte telomere length has been linked to cardiovascular disease, metabolic disorders, and mortality. Based on these challenges and unanswered questions, deeper investigation is needed to clarify whether telomere dynamics contribute directly to cataract development.

In a study published (DOI: 10.1186/s40662-025-00465-x) in Eye and Vision in 2025, researchers led by the Guangdong Eye Institute at Guangdong Provincial People's Hospital, Southern Medical University, in collaboration with the UK Biobank, The Hong Kong Polytechnic University, the University of Melbourne, and the Singapore Eye Research Institute, examined the relationship between leukocyte telomere length and age-related cataract. By analyzing long-term population data from the United Kingdom alongside detailed clinical imaging from a Chinese hospital-based cohort, the team assessed both cataract incidence and lens opacity severity, uncovering a consistent link between biological aging markers and visual decline.

The researchers combined epidemiological and clinical approaches to explore the telomere–cataract connection across two independent cohorts. In the UK Biobank, participants were followed for more than a decade, during which over 4,000 new cataract cases were

identified. Statistical modeling revealed a clear inverse relationship between leukocyte telomere length and cataract incidence: individuals with longer telomeres faced a significantly reduced risk of developing cataracts. Notably, the association followed an L-shaped pattern—risk dropped sharply as telomere length increased, then plateaued—suggesting a threshold beyond which additional telomere length confers limited extra protection.

To validate these findings across diseases, the team conducted a phenome-wide association study spanning more than 1,000 clinical conditions. Cataract emerged as one of the strongest outcomes linked to telomere length, reinforcing the robustness of the association. Complementing these population-level results, the Chinese hospital-based cohort provided insight into disease severity. Using Scheimpflug imaging to quantify lens opacity, researchers found that shorter telomeres were associated with denser, more opaque lenses, particularly in central regions most vulnerable to age-related damage. Together, these findings bridge systemic biomarkers of aging with objective measures of ocular degeneration.

“Our results suggest that the lens reflects biological aging occurring throughout the body,” said the study’s senior authors. “Leukocyte telomere length captures the cumulative burden of oxidative stress and inflammation across a lifetime, and the lens—because it does not regenerate—may amplify these signals. Rather than being a purely local eye condition, age-related cataract appears to share common pathways with systemic aging. This perspective helps explain why individuals of similar age can experience very different visual outcomes and highlights the lens as a window into overall biological health.”

Although telomere length is not intended as a clinical screening tool for individual cataract prediction, the findings have broader implications for aging research and preventive health. They suggest that lifestyle factors known to influence oxidative stress—such as smoking, physical activity, and metabolic health—may simultaneously affect telomere integrity and cataract development. More broadly, the study positions the eye as a sentinel organ for systemic aging, linking visual decline to whole-body biological processes. Understanding these shared mechanisms could inform strategies aimed at delaying age-related diseases, shifting the focus from treating cataracts solely as an ocular disorder to addressing aging as an integrated, modifiable process.

References
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