

# Abstract

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## Inverse Association of Vitamin C with Cataract in Older People in India.

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**OBJECTIVE:** To examine the association between vitamin C and cataract in the Indian setting.

**DESIGN:** Population-based cross-sectional analytic study.

**PARTICIPANTS:** A total of 5638 people aged  $\geq 60$  years.

**METHODS:** Enumeration of randomly sampled villages in 2 areas of north and south India to identify people aged  $\geq 60$  years. Participants were interviewed for socioeconomic and lifestyle factors (tobacco, alcohol, household cooking fuel, work, and diet); attended a clinical examination, including lens photography; and provided a blood sample for antioxidant analysis. Plasma vitamin C was measured using an enzyme-based assay in plasma stabilized with metaphosphoric acid, and other antioxidants were measured by reverse-phase high-pressure liquid chromatography.

**MAIN OUTCOME MEASURES:** Cataract and type of cataract were graded from digital lens images using the Lens Opacity Classification System III (LOCS III), and cataract was classified from the grade in the worse eye of  $\geq 4$  for nuclear cataract,  $\geq 3$  for cortical cataract, and  $\geq 2$  for posterior subcapsular cataract (PSC). Any cataract was defined as any unoperated or operated cataract.

**RESULTS:** Of 7518 enumerated people, 5638 (75%) provided data on vitamin C, antioxidants, and potential confounders. **Vitamin C was inversely associated with cataract** (adjusted odds ratio [OR] for highest to lowest quartile = 0.61; 95% confidence interval (CI), 0.51-0.74;  $P=1.1 \times 10^{-6}$ ). Inclusion of other antioxidants in the model (lutein, zeaxanthin, retinol,  $\beta$ -carotene, and  $\alpha$ -tocopherol) made only a small attenuation to the result (OR 0.68; 95% CI, 0.57-0.82;  $P < 0.0001$ ). Similar results were seen with vitamin C by type of cataract: nuclear cataract (adjusted OR 0.66; CI, 0.54-0.80;  $P < 0.0001$ ), cortical cataract (adjusted OR 0.70; CI, 0.54-0.90;  $P < 0.002$ ), and PSC (adjusted OR 0.58; CI, 0.45-0.74;  $P < 0.00003$ ). Lutein, zeaxanthin, and retinol were significantly inversely associated with cataract, but the associations were weaker and not consistently observed by type of cataract. Inverse associations were also observed for dietary vitamin C and cataract.

**CONCLUSIONS:** **We found a strong association with vitamin C and cataract in a vitamin C-depleted population.**

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