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Choroidal Nevus in the United States Adult Population

Racial Disparities and Associated Factors in the National Health and Nutrition Examination Survey

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Purpose: To describe the prevalence of choroidal nevus in the US population and identify possible associated factors.

Design: Cross-sectional study.

Participants: A total of 5575 participants aged ≥40 years from the 2005–2008 National Health and Nutrition Examination Survey (NHANES) who underwent retinal imaging examination.

Methods: Predictor variables included a spectrum of demographic, ophthalmic, dermatologic, systemic, socioeconomic, or occupational factor variables available in NHANES.

Main Outcome Measures: Choroidal nevus on retinal imaging.

Results: The prevalence of choroidal nevus was 4.7% overall and increased with age (4.7%, 3.1%, 5.4%, 6.6%, and 7.5% in subjects aged 40–49, 50–59, 60–69, 70–79, and ≥80 years, respectively). The prevalence was 5.0% in men, 4.4% in women, 5.6% in whites, 2.7% in Hispanics, 0.6% in blacks, and 2.1% in others. After adjusting for age and race, the odds of choroidal nevus were 10-fold higher in whites than in blacks, 5-fold higher in Hispanics than in blacks, 4-fold higher in others than in blacks, and 2-fold higher in whites than in Hispanics. Choroidal nevus was associated with hypertension (odds ratio [OR], 1.40; 95% confidence interval [CI], 0.99–1.98); psoriasis (OR, 3.90; 95% CI, 1.57–9.66); lower high-density lipoprotein (OR, 0.99; 95% CI, 0.98–0.99); higher uric acid (OR, 1.13; 95% CI, 1.04–1.22); working in installation, maintenance, or repairs (OR, 1.42; 95% CI, 1.03–1.96); and having never worked (OR, 1.56; 95% CI, 1.03–2.37; $P = 0.04$). There was no association with visual symptoms, visual functioning, visual acuity, refractive error, visual field, diabetic retinopathy, age-related macular degeneration, or elevated cup-to-disc ratio on retinal imaging. There was no association with skin melanoma, other cancers, lung/liver/kidney/thyroid disease, alcohol/drug use, income/education, hemoglobin A1C, C-reactive protein, lactate dehydrogenase, electrolytes, or urine albumin.

Conclusions: Among US adults, the prevalence of choroidal nevus located within two 45° areas centered on the macula and optic disc is 4.7%. The prevalence increases with age, is highest among whites (5.6%), is lowest among blacks (0.6%), and has been previously under-recognized among Hispanics (2.7%). Extrapolating to the entire fundus, the true prevalence of choroidal nevus is even higher but difficult to accurately estimate. Possible associations with cardiovascular, renal, autoimmune, and occupational risk factors warrant further investigation. *Ophthalmology 2015;■:1–13 © 2015 by the American Academy of Ophthalmology.*

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Choroidal nevus is the most common intraocular tumor and often is found incidentally on ophthalmoscopy.[1,2] Although this lesion is usually asymptomatic, choroidal nevus can cause visual impairment if located at the foveola.[2,3] In addition, choroidal nevus carries an estimated risk of 1/8845[4] for transformation into malignant melanoma, a rare but serious consequence that threatens the patient's vision, globe, and life. Factors for detecting high-risk nevi have been identified and published.[5–7]

In the United States and around the world, it has been observed clinically that choroidal nevus is more common among white patients than among African Americans, Hispanics, East Asians, and Asian Indians.[1,2,8–11] Except for white race, there are no widely accepted risk factors that predict the development of choroidal nevus. Although there have been autopsy-based histopathologic studies,[12,13] clinical case series from a specialized ocular oncology practice,[1,3,5–7] and population-based studies of specific groups such as soldiers, pilots, and college students[14–16] describing the prevalence and features of choroidal nevus, there are relatively few population-based studies[9–11,17] reporting the prevalence of choroidal nevus among the general adult population.

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Table 1. Prevalence of Choroidal Nevus in Multi-Ethnic Study of Atherosclerosis-EYE, Blue Mountains Eye Study, Beijing Eye Study, Singaporean Malay Eye Study, and Central India Eye and Medical Study: Stratified by Age, Gender, and Race

	MESA* (n = 6176)	BMES (n = 3583)	BES (n = 2477)	SiMES (n = 3260)	CIEMS* (n = 4711)
Age, yrs					
40–50	1.7%	n/a	3.0%	1.5%	n/a
50–60	2.7%	7.3%	2.7%	2.0%	n/a
60–70	2.5%	7.0%	3.5%	1.3%	n/a
70–80	1.3%	5.5%	1.8%	0.6%	n/a
≥80	n/a	5.0%		n/a	n/a
Gender					
Male	2.2%	6.2%	3.9%	1.8%	0.3%
Female	2.1%	6.7%	2.2%	1.0%	0.2%
Race					
White	4.1%	6.5%	n/a	n/a	n/a
Black	0.7%	n/a	n/a	n/a	n/a
Hispanic	1.2%	n/a	n/a	n/a	n/a
Other†	0.4%	n/a	2.9%	1.4%	0.3%
Total	2.1%	6.5%	2.9%	1.4%	0.3%

BES = Beijing Eye Study; BMES = Blue Mountains Eye Study; CIEMS = Central India Eye and Medical Study; MESA = Multi-Ethnic Study of Atherosclerosis; n/a = not available; SiMES: Singaporean Malay Eye Study.
*In MESA, the age categories were 45–54, 55–64, 65–74, and 75–84 years. In CIEMS, data were not stratified by age.
†This "Other" racial group represents Chinese Americans in MESA, Chinese in BES, Malay Singaporeans in SiMES, and Indians in CIEMS.

To date, there have been 4 large, cross-sectional, population-based eye studies reporting the prevalence of choroidal nevus at 6.5% in white Australians,[17] 2.9% in Chinese,[10] 1.4% in Singaporean Malays,[9] and 0.15% in Asian Indians.[11] In the United States, a recent analysis of the Multi-Ethnic Study of Atherosclerosis (MESA) cohort directly compare the prevalence of choroidal nevus among different racial groups using a similar ascertainment method in a single study (MESA-EYE).[8] Among this sample of more than 6000 adults aged 44 to 84 years from 6 different US communities and with no baseline history, symptoms, or signs of cardiovascular disease, the prevalence of choroidal nevus was reported to be 4.1% in white Americans, 0.7% in African Americans, 1.2% in Hispanic Americans, and 0.4% in Chinese Americans[8] (Table 1).

To our knowledge, there has been no large, cross-sectional, epidemiologic study investigating the prevalence of choroidal nevus in a representative sample of the entire US adult population. The National Health and Nutrition Examination Survey (NHANES)[18] is a population-based survey conducted annually in the United States by the Centers for Disease Control and Prevention with the purpose of estimating disease prevalence among the US population. According to the methodology published on its website, NHANES uses a complex, stratified, multistage sampling design to select a nationally representative sample of approximately 5000 persons each year to participate in a series of comprehensive health-related interviews and examinations, including retinal imaging. These persons are located in counties across the country, 15 of which are visited each year. NHANES purposely oversamples persons aged ≥60 years, Hispanics, and African Americans to acquire more detailed health-related information about the aging population and these racial minority groups.[19] Many studies about a variety of health-related and ophthalmic topics have been published using data from NHANES.[20–29]

The purpose of this study is to characterize the prevalence of and associated factors for choroidal nevus in a representative sample of the US adult population using data from NHANES. This study aims to (1) estimate the prevalence of choroidal nevus in the United States and compare the prevalence among different racial, gender, and age groups; (2) compare these results with those of the MESA-EYE, Blue Mountains Eye Study (BMES), Beijing Eye Study (BES), Singapore-Malay Eye Study (SiMES), and Central India Eye and Medical Study (CIEMS); and (3) investigate whether there are any ophthalmic, dermatologic, systemic, socioeconomic, or occupational factors associated with choroidal nevus. If this analysis finds choroidal nevus to be previously under-recognized in any group, or if new associated factors are identified, then the results of this study could have implications on national screening and monitoring guidelines for choroidal nevus.

Methods

Study Population

Our analysis includes participants aged ≥40 years from the 2005–2008 NHANES database (n = 6797) who successfully completed the retinal imaging examination (n = 5575). The retinal imaging examination was administered by NHANES to this age group only during these 4 years. NHANES data are de-identified and publically available online, so institutional review board approval is not needed to access and analyze these data. The raw data from any NHANES questionnaire or examination component can be downloaded directly from the NHANES website as an .xpt file and subsequently merged, cleaned, and analyzed using any statistical software.