Original Investigation

Prevalence of Diabetic Retinopathy in Adult Chinese American Individuals
The Chinese American Eye Study

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IMPORTANCE Chinese American individuals are a fast-growing segment of people in the United States, but the burden and effect of diabetic complications on this group of people is not fully understood.

OBJECTIVE To determine the age- and sex-specific prevalence of diabetic retinopathy (DR) overall and by severity, duration of diabetes, and treatment history in adult Chinese American individuals.

DESIGN, SETTING, AND PARTICIPANTS The Chinese American Eye Study (CHES), a population-based, cross-sectional study, was conducted from February 2010 to October 2013 for 10 census tracts in Monterey Park, California. This analysis, conducted between February 16, 2010, and October 9, 2013, included 4582 Chinese residents 50 years and older.

MAIN OUTCOMES AND MEASURES Prevalence of nonproliferative DR, proliferative DR, and macular edema, as well as stereoscopic fundus photography of 7 standard Early Treatment Diabetic Retinopathy Study fields.

RESULTS Of the 4582 survey participants, most were first-generation immigrants from China (68.7%) and female (63%). In total, 736 participants (16.1%) were identified as having type 2 diabetes. Fundus photographs were gradable for 665 (90.4%) of these participants. The reproducibility of DR grading was evaluated throughout study and showed moderate to excellent agreement (weighted κ = 0.78-0.97). Diabetic retinopathy was present in 35.8% of people with diabetes (95% CI, 32.1%-39.6%). The estimated prevalence of severe nonproliferative DR and proliferative DR was 1.7% (95% CI, 0.8%-2.9%) and 2.4% (95% CI, 1.4%-3.9%), respectively. Macular edema was observed among 4.5% of people with diabetes (95% CI, 3.0%-6.4%), and clinically significant macular edema was observed among 2.0% (95% CI, 1.1%-3.3%). The prevalence of DR was higher (56%) among participants with a longer duration of diabetes (≥15 years; $P < .001$). The prevalence of visual impairment (best-corrected visual acuity worse than 20/40 in the better-seeing eye) among participants with diabetes was higher than those without diabetes (6.7% vs 2.2% = difference of 4.5%; 95% CI, 3.9%-5.1%). The primary causes of visual impairment in participants with diabetes were cataracts (38% of participants; 95% CI, 36.6%-39.4%) followed by macular edema (7% of participants; 95% CI, 6.3%-7.7%).

CONCLUSIONS AND RELEVANCE Data from CHES and this study indicate that the prevalence of DR in the Chinese American Eye Study Group is relatively lower than studies of Chinese individuals residing in rural northern China or Latino individuals from Los Angeles County, California.

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Diabetic retinopathy (DR) is one of the most common complications of diabetes[1] and is a leading cause of visual impairment and blindness among adults in the United States.[2,3] The growing number of older adults affected by diabetes and complications of diabetes worldwide underscores the importance of accurate assessment of the burden of DR.[4] Population-based data on the prevalence of DR suggest that DR varies across racial/ethnic groups.[5-11] In the United States, studies have been completed on non-Hispanic white and Hispanic populations[5-11]; however, population-based data on the prevalence of DR in Chinese American individuals are limited, despite the fact that they constitute one of the fastest-growing populations in the United States.[12,13] Between 2000 and 2010, the number of Chinese American individuals in the United States increased by nearly 40%.[14] Existing data from Asian individuals living in Asia cannot be directly extrapolated to Chinese American individuals owing to differences in environmental and behavioral factors, including dietary differences, reduced physical activity, and different access to care. Knowledge of the prevalence and characteristics of DR in Chinese American individuals is needed to improve effective disease prevention and treatment programs and to inform health care policies. To our knowledge, the Chinese American Eye Study (CHES) is the largest, most comprehensive population-based study of eye disease among persons of Chinese ancestry 50 years and older, and specifically Chinese American individuals, designed to provide precise estimates of the overall and age- and sex-specific prevalence of DR.

Key Points

Question What is the prevalence of diabetic retinopathy in the Chinese American Eye Study?

Findings In this population-based cross-sectional study of Chinese-American individuals, diabetic retinopathy was present in 35.8% of participants with diabetes and in 56% of those with diabetes for more than 15 years.

Meaning This study identified a lower prevalence of diabetic retinopathy among Chinese American individuals than studies of Chinese individuals residing in rural northern China or Latino individuals from Los Angeles County, California.

Methods

Study Cohort

Participants for CHES were recruited from the city of Monterey Park in Los Angeles County, California, and examined from February 2010 to October 2013. The study protocol and informed consent forms were reviewed and approved by the institutional review board of the University of Southern California, and all study procedures adhered to the recommendations of the Declaration of Helsinki. Written informed consent was obtained from each participant. Data analysis was performed between February 16, 2010, and October 9, 2013. The study population consisted of 4582 noninstitutionalized Chinese American individuals 50 years and older from census tracts selected for their high proportion of Chinese American residents. Details of the study design and sampling plan have been described previously.[15]

In brief, a door-to-door census of all dwelling units was performed to identify eligible participants. Eligible adults were invited to participate, and written informed consent was obtained at the time of study enrollment. Interviews were conducted at participants' homes to collect detailed data on sociodemographic, behavioral, and health care access and use factors.

Clinic visits included comprehensive eye examinations performed by trained and certified ophthalmologists using standardized protocols. Measurements of glycosylated hemoglobin and random blood glucose levels were obtained from each participant. Participants with diabetes underwent stereoscopic photography of 7 standard Early Treatment Diabetic Retinopathy Study fields (field 1, the center of the optic disc; field 2, the center of the macula; field 3, temporal to the macula; field 4, temporal superior; field 5, temporal inferior; field 6, nasal superior; and field 7, nasal inferior) of the fundus for each eye with the Topcon TRC 50EX Retinal Camera (Topcon Corporation of America) after maximal dilation.

Definitions of Diabetes

We defined diabetes in the following ways: (1) the participant self-reported a history of diabetes and was undergoing treatment with oral hypoglycemic medications, insulin, or diet or with a combination of these treatments; or (2) the participant's hemoglobin A_{1c} level was measured at 6.5% or higher. Diabetes was considered to be type 1 if the participant was treated with insulin therapy and aged 30 years or younger at diabetes onset. Otherwise, diabetes was considered to be type 2. Diabetes was categorized as newly diagnosed if the participant did not report a history of diabetes and was not being treated but the participant's hemoglobin A_{1c} measurement was 6.5% or higher at clinic visit.

Definitions and Grading of DR

Diabetic retinopathy was defined as retinopathy in persons with diabetes. Fundus photographs were graded in a masked manner at the Ocular Epidemiology Grading Center at the University of Wisconsin in Madison. Grading protocols for DR were modifications of the Early Treatment Diabetic Retinopathy Study adaptation of the modified Airlie House classification of DR. For each eye, the maximum grade in any of the 7 standard photographic fields was determined for each of the lesions. Eyes were classified according to the following criteria: (1) no DR (levels 10-13) or (2) any DR (levels 14-85). Diabetic retinopathy was further classified into different severity levels: (1) mild nonproliferative DR (NPDR, levels 14-20), moderate NPDR (levels 31-43), or severe NPDR (levels 47-53); or (2) proliferative DR (PDR; levels 60-85). The reproducibility and reliability of DR grading were evaluated throughout study data collection. The assessment consisted of grading 60 participants every 6 months, measured by weighted κ statistics. The results showed moderate to excellent intergrader agreement (weighted $\kappa = 0.78$-0.97) and intragrader agreement (weighted $\kappa = 0.84$-0.99).

Table 1. Age- and Sex-Specific Prevalence of DR in Chinese American Individuals With Type 2 Diabetes

Type	Total		Prevalence, % (95% CI)					
			Age Group, y				Sex	
	No.	% (95% CI)	50-59 (n = 225)	60-69 (n = 272)	70-79 (n = 106)	≥80 (n = 62)	Female (n = 359)	Male (n = 306)
DR								
Any DR	238	35.8 (32.1-39.6)	39.1 (32.7-45.8)	34.2 (28.6-40.2)	39.6 (30.3-49.6)	24.2 (14.2-36.7)	32.6 (27.8-37.7)	39.5 (34.0-45.3)
Mild NPDR	132	19.9 (16.9-23.1)	21.8 (16.6-27.8)	18.8 (14.3-23.9)	20.8 (13.5-29.7)	16.1 (8.0-27.7)	20.3 (16.3-24.9)	19.3 (15.0-24.2)
Moderate NPDR	79	11.9 (9.5-14.6)	13.3 (9.2-18.5)	10.7 (7.3-15.0)	16.0 (9.6-24.4)	4.8 (1.0-13.5)	9.2 (6.4-12.7)	15.0 (11.2-19.5)
Severe NPDR	11	1.7 (0.8-2.9)	2.2 (0.7-5.1)	1.8 (0.6-4.2)	0.9 (0.02-5.1)	0 (0-0)	1.7 (0.6-3.6)	1.6 (0.5-3.8)
Prolif-erative DR	16	2.4 (1.4-3.9)	1.8 (0.5-4.5)	2.9 (1.3-5.7)	1.9 (0.2-6.7)	3.2 (0.4-11.2)	1.4 (0.5-3.2)	3.6 (1.8-6.3)
Macular edema								
Any ME	30	4.5 (3.0-6.4)	5.8 (3.1-9.7)	4.8 (2.6-8.1)	3.8 (1.0-9.4)	0 (0-0)	4.5 (2.6-7.2)	4.6 (2.5-7.6)
CSME	13	2.0 (1.1-3.3)	2.2 (0.7-5.1)	2.6 (1.0-5.2)	0.9 (0.02-5.1)	0 (0-0)	1.7 (0.6-3.6)	2.3 (0.9-4.7)

Abbreviations: CSME, clinically significant macular edema; DR, diabetic retinopathy; ME, macular edema; NPDR, nonproliferative diabetic retinopathy.

Definition of Macular Edema

Macular edema (ME) was defined as a thickening of the retina with or without partial loss of transparency within 1 disc diameter of the center of the macula. Clinically significant ME was defined as the presence of any one of the following criteria: (1) retinal thickening at or within 500 µm of the center of the macula, hard exudates at or within 500 µm of the center of the macula associated with thickening of the adjacent retina, or both; or (2) a zone or zones of retinal thickening 1 disc area in size, at least part of which was within 1 disc diameter of the center. Optical coherence tomography of the macula was not used to determine the presence of macular edema.

Statistical Analysis

The prevalence of DR was calculated as the proportion of participants with DR in 1 or both eyes to the total number of participants with diabetes and with a gradable fundus photograph. The prevalence by severity of DR, age, and sex were calculated, and their 95% CIs were also reported. We used χ^2 tests to evaluate the age- and sex-specific differences in DR prevalence and to evaluate the association of DR with duration of diabetes. All analyses were completed using SAS version 9.3 software (SAS Institute Inc). All reported *P* values were 2-sided with a .05 significance level.

Results

Study Cohort

Of the 5782 residents identified as eligible, 4582 (79%) completed a home interview and clinical examination (eFigure in the Supplement). Most of the participants (3149 [68.7%]) were first-generation immigrants from China. Compared with Chinese American individuals throughout the Unites States, CHES participants were similar in age to those in the United States as a whole (47% [n = 2180] were aged 50-59 years in CHES vs 44% [n = 1 070 000] in the United States), more likely to be female (63% [n = 2901] in CHES vs 52% [n = 1 260 000] in the United States), and were less likely to have 12 or more years of education (67% [n = 3090] in CHES vs 77% [n = 1 870 000] in the United States).[14]

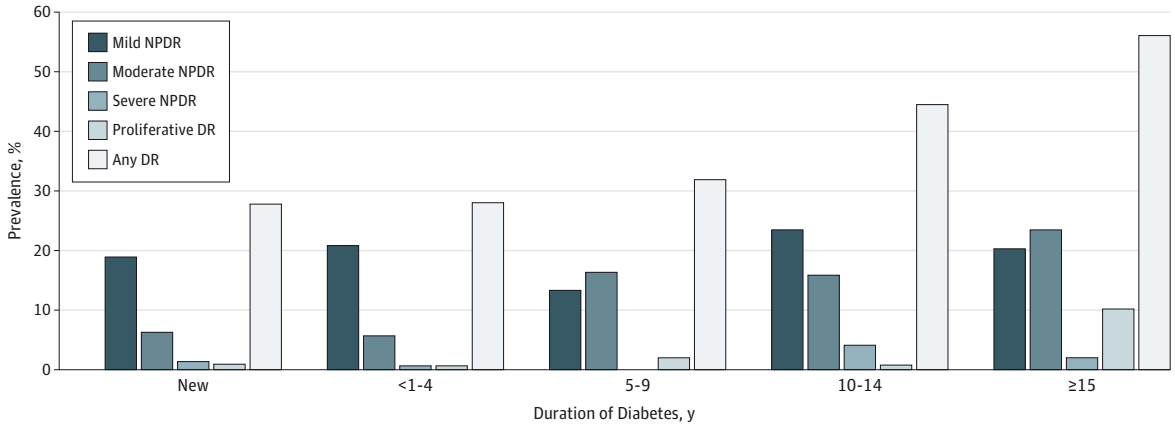
Compared with participants who completed the clinical examination, eligible participants who did not complete the clinical examination were similar in age (mean age, 63 vs 61 years), slightly more likely to be current smokers (12% [n = 103] vs 7% [n = 304]), less likely to have 12 or more years of education (58% [n = 491] vs 67% [n = 3090]), and just as likely to speak English (59% [n = 2695] vs 52% [n = 445]). Among the 4582 participants, 736 (16.1%) were identified as having diabetes, and all were characterized as having type 2 diabetes. Gradable fundus photographs were obtained from at least 1 eye for 665 participants (90.4%); 71 participants with diabetes were excluded from the analysis because of missing (n = 35) or ungradable fundus photographs owing to poor photograph quality (n = 36).

Prevalence of DR and Macular Edema

Among the 665 Chinese American participants with diabetes, 238 (35.8%) had DR (95% CI = 32.1%-39.6%). The prevalence of mild, moderate, and severe NPDR and PDR were 19.9% (n = 132), 11.9% (n = 79), 1.7% (n = 11), and 2.4% (n = 16), respectively. Thirty participants (4.5%; 95% CI = 3.0%-6.4%) had ME, and 13 (2.0%; 95% CI = 1.1%-3.3%) were considered to have clinically significant ME (**Table 1**). The prevalence of DR and ME were lowest in the oldest age group (≥80 years) and relatively higher in younger age groups. However, there were no trends in the prevalence of DR or ME with older age groups.

Males had a higher prevalence of moderate DR (15.0% [n = 46] vs 9.2% [n = 33]; *P* = .02) and proliferative DR (3.6% [n = 11] vs 1.4% [n = 5]; *P* = .049) than females, after adjusting for age. However, no sex-specific differences were noted for the prevalence of any DR or for ME.

Figure. Prevalence of Diabetic Retinopathy (DR) by Duration of Diabetes and Severity in Chinese American Individuals With Diabetes in the Chinese American Eye Study



Seven patients had no data on the duration of disease. NPDR indicates nonproliferative diabetic retinopathy.

Table 2. Prevalence of DR in 665 Chinese American Individuals With Type 2 Diabetes by Treatment[a]

Type	No. (%)				
		Patients With Previously Diagnosed Diabetes[a]			
	Patients With Newly Diagnosed Diabetes (n = 205)	Any Insulin (n = 45)	Oral Hypoglycemic/ Oral Hypoglycemic and Diet (n = 372)	Diet Only (n = 12)	No Treatment (n = 26)
Any DR	57 (27.8)	29 (64.4)	138 (37.1)	5 (41.7)	9 (34.6)
Mild NPDR	39 (19.0)	11 (24.4)	73 (19.6)	4 (33.3)	5 (19.2)
Moderate NPDR	13 (6.3)	9 (20.0)	55 (14.8)	1 (8.3)	1 (3.9)
Severe NPDR	3 (1.5)	3 (6.7)	4 (1.1)	0	1 (3.9)
Proliferative DR	2 (1.0)	6 (13.3)	6 (1.6)	0	2 (7.7)
Any ME	5 (2.4)	3 (6.7)	19 (5.1)	0	3 (11.5)
CSME	3 (1.5)	1 (2.2)	7 (1.9)	0	2 (7.7)

Abbreviations: CSME, clinically significant macular edema; DR, diabetic retinopathy; ME, macular edema; NPDR, nonproliferative diabetic retinopathy.

[a] Five participants had no data on treatments for diabetes.

Clinical Characteristics of DR

Among the 238 participants with any DR, 92 had DR in both eyes and 132 had DR in only 1 eye (eTable 1 in the Supplement). Most of the bilateral DR cases were moderate NPDR (59.8% [n = 55]), while most of the unilateral DR cases were mild NPDR (87.1% [n = 127]) (data not shown).

The most common clinical characteristic of DR was microaneurysms or retinal hemorrhages (95.8% [n = 228] in all DR) (eTable 1 in the Supplement), which was in 93.2% (123) of unilateral DR cases and in 98.9% (91) of bilateral DR cases.

Prevalence of DR by Duration of Diabetes

Among the 665 Chinese American participants with diabetes, 205 participants (30.8%) were newly diagnosed as having diabetes at the clinical examination. This group of participants was similar to those whose diabetes was diagnosed previously with respect to sex ($P = .51$) and body mass index ($P = .05$), but they were relatively younger than people previously diagnosed as having diabetes (mean [SD] age, 61.0 [8.1] years vs 65.7 [9.7] years; $P < .001$) and had slightly higher hemoglobin A_{1c} levels (7.3% vs 7.0% of total hemoglobin [to convert to proportion of total hemoglobin, multiply by 0.01]; $P = .01$).

The prevalence of any DR and ME was higher in participants with a longer duration of diabetes (**Figure**). The prevalence of any DR in persons with diabetes for 15 years or longer (56.1% [n = 55]) was more than double in persons who were newly diagnosed as having diabetes (28.8% [n = 57]). The prevalence of PDR in persons with diabetes for 15 years or longer (10.2% [n = 10]) was 10-fold higher than those who were newly diagnosed as having diabetes (1.0% [n = 2]).

Prevalence of DR in Type 2 Diabetes by Treatment

Of the 460 participants with previously diagnosed diabetes, 45 were prescribed insulin or insulin-combined treatments, while 372 were prescribed oral hypoglycemic agents alone or together with diet modification (**Table 2**). The prevalence of DR, especially severe NPDR and PDR, was highest among participants who were treated with insulin (any DR, 64.4% [n = 29]; severe NPDR, 6.7% [n = 3]; and PDR, 13.3% [n = 6]).

Burden of Visual Impairment and Blindness Among Participants With Diabetes

The prevalence of visual impairment (best-corrected visual acuity worse than 20/40 in the better-seeing eye) among participants with diabetes was 3 times higher compared with those

without diabetes (6.7% [n = 47] vs 2.2% [n = 73]; $P < .001$). The prevalence of blindness (best-corrected visual acuity of 20/200 or less in the worse-seeing eye) was also 3 times higher among participants with diabetes compared with those without diabetes (3.9% [n = 27] vs 1.3% [n = 43]; $P < .001$). The primary diabetes-related causes for visual impairment were cataracts (49% [n = 23]; 95% CI = 34%-64%) and ME (7% [n = 3]; 95% = CI 6.3%-7.7%) (data not shown).

Comparison With Other Studies

Detailed comparisons of the age-specific and age-adjusted prevalence of DR between similar population-based studies from the CHES population suggest a different pattern of DR prevalence for those persons of Chinese ancestry in China and Singapore (eTable 2 in the Supplement).

Discussion

To our knowledge, CHES is the largest and most comprehensive population-based study of eye disease among people of Chinese ancestry 50 years and older, both within and outside the United States. In this study, we present data on the prevalence and characteristics of DR in Chinese American adults residing in Los Angeles County, California. Chinese American populations are highly concentrated in this region of California, which provides a unique opportunity to characterize the burden and severity of eye disease in the fastest-growing racial group of the US population.[13] In this cohort of adults 50 years or older, the prevalence of DR was 35.8% (95% CI = 32.1%-39.6%), and the prevalence of ME and clinically significant ME was 4.5% (95% CI = 3.0%-6.4%) and 2.0% (95% CI = 1.1%-3.3%), respectively.

Although there have been other studies of DR in Chinese American individuals (such as the Multi-Ethnic Study of Atherosclerosis),[16] the total number of Chinese American participants in those studies was too small to provide accurate estimates, and the sample was selected to exclude participants with evidence of cardiovascular disease. Population-based studies of DR in China have also been conducted[17,18]; however, important environmental and lifestyle differences exist for Chinese American individuals compared with rural and urban populations living in China. Ancestral, environmental, and lifestyle differences between countries may result in important variations in the prevalence of DR.

Differences in protocol used to collect and analyze data from CHES and other population-based studies could result in different estimates of DR prevalence. In CHES, each participant underwent stereoscopic retinal photography of 7 standard Early Treatment Diabetic Retinopathy Study fundus fields to ascertain the presence of DR. Previous population-based studies of Chinese participants did not perform the same standardized examinations used in CHES. Some studies (eg, the Shihpai Eye Study in Taiwan,[19] the Liwan Eye Study in urban China,[20] the Tajong Pagar Study in urban Singapore,[21] and the China Nine-Province Survey[22]) did not take fundus photographs for the diagnosis of DR, while other studies used nonstereoscopic photography (Beijing Eye Study[18]) or stereo photography of fewer fields (the Handan Eye Study in rural China,[17] which used 2 fundus fields). The use of nonstereoscopic photography in select studies may have resulted in fewer cases of DR being detected than could have been identified with stereoscopic retinal photography of 7 standard Early Treatment Diabetic Retinopathy Study fields. Another challenge is that available data from studies of DR based their diagnoses on different definitions of diabetes (eTable 2 in the Supplement). For example, diabetes was defined using hemoglobin A_{1c} level, history of diabetes, and treatment based on recent guidelines in CHES,[23] whereas in the Handan Eye Study, diabetes was diagnosed by fasting glucose level.[17] The higher prevalence of DR in the Handan Eye Study compared with CHES could be influenced by the use of fasting glucose alone to define diabetes, which may result in overestimation of diabetes.

The age-standardized prevalence of DR in CHES participants in the United States (41.0%) was lower compared with that in Chinese residents in rural northern China (Handan Eye Study, 45.7%[17]) and that of Latino individuals from Los Angeles (Los Angeles Latino Eye Study [LALES], 48.1%[11]). The differences were more pronounced among individuals who had diabetes for 10 or more years (50.3% in CHES vs 88% in Handan Eye Study,[17] and 57.3% in CHES [using hemoglobin A_{1c} cut point of 7%] vs 77.9% in LALES[11]). The same pattern was observed for the prevalence of ME. The age-standardized prevalence of ME in CHES was 4.7%, lower than the 5.7% observed in the Handan Eye Study[17] and the 10.5% in LALES[11] (data not shown). Differences between the prevalence of DR and ME in CHES and the Handan Eye Study[17] may be explained in part by the fact that participants in CHES are from an urban population and Handan is a rural population. While the reasons for these differences need additional study, some contributing factors could be differences in dietary habits and potentially earlier screening and intervention for diabetes in urban environments owing to better access to health care. We also observed the prevalence of DR and ME to be higher in Latino individuals in LALES[11] than in Chinese American individuals in CHES, although the 2 studies shared identical study protocols and similar urban environments. Future analyses will explore the biologic, ophthalmic, and lifestyle factors that may be associated with the presence of DR in CHES participants.

The age-standardized DR prevalence was higher in CHES than in African Caribbean individuals in the Barbados Eye Study[24] and in non-Hispanic white individuals in the Beaver Dam Eye Study[25] (41.0% vs 28.1% and 36.7%, respectively). This difference was mainly observed among patients with diabetes who were diagnosed recently (within the past 5 years; 31.8% vs 11.9% and 22.9%, respectively), suggesting that cultural or environmental differences in use of care may have contributed to these observed differences. In addition, recent improvements in the diagnosis and better management of diabetes and its complications[23] may provide earlier detection of retinopathy.

The decrease in the prevalence observed in older CHES participants may be explained by either the competing risks or high mortality associated with longer duration of diabetes or a later age at diagnosis. This pattern has been observed in most popu-

lation-based studies, including the Handan Eye Study[17] and in LALES.[11] Within the CHES population, there was also a higher prevalence of DR in people with diabetes treated with insulin compared with those treated with oral hypoglycemic agents or diet modification. The higher prevalence of DR in participants treated with insulin was also present in Latino individuals (LALES).[11] One explanation for this is that insulin use may be a marker for people with poor glycemic control compared with those who only take oral hypoglycemic medications. The lower prevalence of DR observed among people with diabetes using both oral medications and modified diet compared with those who were taking oral medications only (42.4% vs 29.7%; $P = .01$; data not shown) suggests an interesting association that needs further exploration.

One limitation of our study was the inability to obtain the exact age at which participants developed diabetes, which may misclassify the exact time of diagnosis. In addition, while we may have slightly underestimated the prevalence of DR because those who did not participate were slightly older, there were no differences in vision coverage and self-reported history of diabetes between participants and nonparticipants, thus making the difference most likely small. Not including optical coherence tomographic data for evaluating diabetic ME may have been a limitation, and future studies are needed to compare clinically diagnosed diabetic ME and optical coherence tomographic evaluation.

The CHES cohort is composed mostly of Mandarin-speaking immigrants, 68.7% of whom were from mainland China. While there are small differences between the Chinese American individuals included in this study and those in the United States, we believe these data are representative of Chinese American individuals. However, caution is warranted when extrapolating these estimates to Chinese populations of different geographic or genetic heritage, as differences in these characteristics may contribute to differences in the burden of DR. Therefore, age-specific or age-standardized estimates should be used to compare prevalence differences across Chinese populations.

Conclusions

To our knowledge, CHES is the largest and most comprehensive study of eye disease in persons of Chinese ancestry 50 years and older and provides precise estimates of the overall and age- and sex-specific prevalence of DR. Further studies are needed to explore why Chinese American individuals in CHES have a lower prevalence of DR compared with studies of Chinese people living in rural China or Latino individuals in the United States. While these potential explanations include population differences in genetic susceptibility, environment, and lifestyle factors, a detailed, careful assessment seems warranted.

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Study concept and design: Varma, McKean-Cowdin.
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Invited Commentary

Observations From a Population-Based Study of Diabetic Retinopathy in Chinese Americans

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Population-based epidemiologic studies address 3 principal questions: how many people are affected by the disease (prevalence); who will develop this disease over time (incidence), and who is at risk for the disease and why they are at risk (analyses of risk factors). Over the past few decades, findings from population-based studies of ocular diseases have provided such information that guides clinical care and allow policy makers to design disease-screening programs and related public health strategies to minimize the impact of eye diseases in different communities.

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Diabetic retinopathy (DR) is a leading cause of vision loss in working-aged people globally. In the 1980s, classic epidemiological studies, such as the Wisconsin Epidemiologic Study of Diabetic Retinopathy, provided comprehensive data on the prevalence, incidence, and risk factors of DR.[1] Since then, several population-based studies on DR have been conducted in the United States in both populations of European ancestry (white individuals) and other racial/ethnic groups, such as African American and Hispanic individuals.[2,3] Likewise, estimates on DR prevalence have been reported from other continents, including Europe, Australia, and Asia. A pooled analysis of 23 000 patients with diabetes from 35 population-based studies worldwide showed that the overall prevalence of DR was 35%, with 7% having vision-threatening DR[4] (severe nonproliferative DR, proliferative DR, or diabetic macular edema).

Findings from such population-based studies across different racial/ethnic groups, geographic regions, and periods provide important insight into how the risk for DR has been influenced by increasing urbanization and globalization, changes in demographics and lifestyle (such as changes in diet that increase the risk for obesity), and population immigration and acculturation.

A major gap in the literature is the relative lack of population-based data on DR in Chinese people, the largest ethnic group in the world, constituting approximately 20% of the global population. Data on epidemiology of DR in ethnic Chinese populations living in China and among those who have migrated to other countries are limited. Some of the questions that are unanswered include: is the prevalence of DR in Chinese people who have immigrated overseas higher than that of Chinese people living in China? Are the risk factors similar or different? Are there unique characteristics (eg, language, culture, access to health care, or behavioral habits) that allow novel approaches to prevent vision loss?

Some of these questions are addressed in this issue of *JAMA Ophthalmology*. The Chinese American Eye Study (CHES) examined the prevalence and characteristics of DR among Chinese American individuals residing in California.[5] This large population-based study on Chinese American individuals provides the first robust data on the epidemiology of DR in one of the fastest-growing immigrant groups in the United States. In addition to a high response rate of nearly 80%, one of the strengths of CHES is the use of 7-Standard Early Treatment Dia-