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Limited English Proficiency Is Associated With Diabetic Retinopathy in Patients Presenting for Cataract Surgery

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Purpose: To investigate the relationship between limited English proficiency (LEP) and diabetic retinopathy (DR) in patients presenting for cataract surgery.

Methods: This is a retrospective observational study of patients who underwent cataract surgery between January 2014 and February 2020. Patients who self-identified as needing or preferring an interpreter were defined as having LEP. Differences in demographics, characteristics, and outcomes including history of type 2 diabetes (T2DM), DR, preoperative best corrected visual acuity (BCVA), macular edema, and anti-vascular endothelial growth factor injections were analyzed. Statistical comparisons were assessed using logistic regression with generalized estimating equations.

Results: We included 13,590 eyes. Of these, 868 (6.4%) were from LEP patients. Patients with LEP were more likely to be Hispanic ($P < 0.001$), female sex ($P = 0.008$), or older age ($P = 0.003$) and have worse mean BCVA at presentation ($P < 0.001$). Patients with LEP had a significantly higher rate of T2DM ($P < 0.001$), macular edema ($P = 0.033$), and DR (18.1% vs. 5.8%, $P < 0.001$). Findings remained significant when controlling for age, sex, race/ethnicity, and type of health insurance. Patients with LEP and DR were more likely to have had later stages of DR ($P = 0.023$).

Conclusions: Patients with LEP presenting for cataract surgery had a higher rate of DR and associated complications compared to patients with English proficiency. Further studies are needed to understand how language disparities influence health and what measures could be taken to improve healthcare in this vulnerable population

Translational Relevance: Our study highlights healthcare disparities within ophthalmology and emphasizes the importance of advocating for improved healthcare delivery for patients with LEP.

Introduction

According to a 2018 United States (U.S.) Census estimate, 67.3 million people in the U.S. speak a language other than English at home. This number has tripled since 1980 and more than doubled since 1990. Individuals with limited English proficiency (LEP) now represent 9% of the U.S. population, with the vast majority of LEP patients being Spanish speakers.[1] These numbers are projected to continue to increase over the next 10 years.[2] The literature has repeatedly demonstrated that this growing population is vulnerable to a variety of health disparities, largely stemming from unequal access to quality healthcare.[3] Patients with LEP have been found to have less access to medical appointments, less satisfaction with the healthcare system, and poorer comprehension of their health encounters.[4] Furthermore, studies have shown that Spanish-speaking patients with LEP are less likely to attend primary care visits, receive routine vaccines, schedule healthcare screenings such as mammograms, or use prescription medicines when compared to English-proficient (EP) patients.[5–7] Spanish-speaking patients with LEP are also more likely to have chronic health conditions such as type 2 diabetes

mellitus (T2DM).[8] Finally, language barriers also impact healthcare costs, overuse of the emergency department, and underuse of outpatient appointments.[9,10] These findings exemplify some of the challenges that patients with LEP and their providers face when trying to establish a therapeutic relationship.

Health disparities experienced by the LEP population place a significant impact on the management of chronic health conditions that require frequent monitoring and multidisciplinary care. In patients with T2DM, for example, LEP has been associated with longer hospital stays,[11] poorer glycemic control,[12] and suboptimal patient-provider interactions.[13] The management of conditions such as T2DM is critical in ophthalmology, because recent estimates project that the number of adults with diabetic retinopathy (DR) and vision-threatening DR will increase from 103.12 million and 28.54 million in 2020 to 160.50 million and 44.82 million by 2045, respectively.[14]

Although the effects of language barriers in other medical fields are well described, few studies have investigated the relationship of LEP and healthcare outcomes in ophthalmology. We aim to investigate the relationship between LEP and the growing epidemic of diabetes and DR in the U.S, among patients presenting for cataract surgery. We opted to examine this population because it captures a broad range of patients, including those who have not established care specifically for DR and have previously undiagnosed disease, an important consideration in examining the effects of socioeconomic barriers to care. Given that DR is the leading cause of new-onset blindness in American adults aged 24 to 70 years old,[15] it is important to better understand factors associated with DR among the vulnerable LEP patient population.

Methods

The Cataract Surgery Outcomes Database developed by the Department of Ophthalmology at the University of Colorado School of Medicine was used to perform a retrospective analysis. This database includes patients who underwent cataract surgery at the University of Colorado Sue Anschutz-Rodgers Eye Center starting in 2014. Professional research assistants trained in cataract data abstraction performed data collection, and an ophthalmologist performed secondary review of 5% of the records for quality control. This study was approved by the Colorado Multiple Institutional Review Board and was conducted in compliance with the Declaration of Helsinki. A waiver of consent was obtained given the retrospective nature of this study. LEP patients were identified using the EPIC electronic medical record software application by the Epic Systems Corporations. We defined LEP as patients who self-identified as needing or preferring an interpreter in medical encounters. Two authors (A.S.C. and Z.G.) reviewed LEP patients to confirm correct language and proficiency classification. Reviewers were masked to surgical outcomes. Patients who had cataract surgery between January 1, 2014, and February 24, 2020, based on scheduling surgical records were included in this study. Demographic characteristics analyzed included age, health insurance, and patients' self-reported sex, race, and ethnicity. Race and ethnicity were obtained from the medical records. At the time of enrollment, patients choose from the following options: Caucasian, African American, Hispanic, Latino(a), Asian, American Indian/Alaska Native, Native Hawaiian/Pacific Islander, multiple races, other, and unknown. Aggregate data were collected according to the combined format of the Standards, for Maintaining, Collecting, and Presenting Federal Data on Race and Ethnicity by the Office of Diversity, Inclusion and Civil Rights.[16] Outcome variables obtained through chart review were preoperative best-corrected visual acuity (BCVA), history of type 2 diabetes, macular edema, and presentation with DR.

Demographic and clinical characteristics and outcomes were analyzed by LEP status. Summary data were described by means and standard deviations for continuous variables, with median also included for variables that were not normally distributed. Basic frequencies and percentages were used to summarize categorical variables. Comparisons by LEP status were analyzed using logistic regression with generalized estimating equations and an unstructured correlation to account for correlation between eyes from the same subject. For demographic variables of age, sex, race/ethnicity, and health insurance, LEP was the dependent variable with the demographics at the independent variables. For outcome variables of type 2 diabetes, preoperative LogMAR, macular edema, diabetic retinopathy, injection, and proliferative DR (PDR), LEP was the independent variable (along with adjustment for demographics), and the clinical variables were the dependent variables. Measures of association for LEP and outcome variables are presented as odds ratios and 95% confidence intervals (CI) for categorical outcomes and as parameter estimates for preoperative LogMAR. Subanalyses were also performed for Hispanic and Asian populations separately because sample sizes for these two groups were sufficient. Adjusted analyses included age, sex, race/ethnicity (for the entire cohort), and health

insurance were also conducted for the main outcomes of interest, and injection and PDR were adjusted for age only. A P value <0.05 was considered statistically significant. All analyses were performed with SAS software (version 9.4, SAS Institute Inc., Cary, NC, USA).

Results

Our database included 868 (6.4%) LEP patient eyes, and 12,722 (93.6%) EP patient eyes. Demographic and preoperative characteristics of the patient population including health insurance are shown in Table 1. Compared to patients with EP, patients with LEP were less likely to be Caucasian (14.6% vs. 77.2%, $P < 0.001$) and more likely to be Hispanic (39.3% vs. 6.7%, $P < 0.001$). Furthermore, patients with LEP were more likely to be female (63.6% vs. 57.8%, $P = 0.008$), older (70.0 vs. 68.9 years, $P = 0.003$), and have worse visual acuity (mean logMAR 0.566 vs. 0.366, $P < 0.001$) at presentation. At the time of their cataract surgery, patients with LEP were more likely to suffer from type 2 diabetes (44.9% vs. 21.5%, $P < 0.001$), macular edema (9.8% vs. 2.9%, $P = 0.033$), and DR (18.1%

Table 1. Demographics and Preoperative Characteristics for EP and LEP Patients

			Unadjusted		Adjusted*	
	LEP (n = 868)	EP (n = 12,722)	Measure of Association (95% CI)	*P* Value	Measure of Association (95% CI)	*P* Value
Mean age (SD)	70.0 (9.3)	68.9 (10.8)	—	0.003	—	—
Sex						
Male	316 (36.4%)	5367 (42.2%)	Reference		—	—
Female	552 (63.6%)	7355 (57.8%)	—	0.008		
Race/ethnicity						
Caucasian	127 (14.6%)	9815 (77.2%)	Reference	<0.001		
Hispanic	341 (39.3%)	858 (6.7%)	—	<0.001		
African-American	45 (5.2%)	1132 (8.9%)	—	<0.001	—	—
Asian	245 (28.2%)	343 (2.7%)	—	<0.001		
American Indian/Alaska Native†	0	40 (0.3%)	—	—		
Native Hawaiian/Pacific Islander†	3 (0.4%)	17 (0.1%)	—	—		
Multiple races†	17 (2.0%)	49 (0.4%)	—	—		
Other†	68 (7.8%)	208 (1.6%)	—	<0.001	—	—
Unknown	22 (2.5%)	260 (2.0%)	—	<0.001		
Health Insurance						
Medicare	618 (71.2%)	9669 (76.0%)	Reference	<0.001		
Medicaid	172 (19.8%)	571 (4.5%)	—	<0.001		
Private	44 (5.1%)	1798 (14.1%)	—	0.424		
Uninsured	30 (3.5%)	393 (3.1%)	—	0.014		
Other	4 (0.5%)	284 (2.2%)	—			
Prevalence of Type 2 Diabetes	390 (44.9%)	2740 (21.5%)	3.0 (2.5, 3.6)	<0.001	1.5 (1.2, 1.9)	<0.001
Preoperative LogMAR						
n	864	12,697				
Mean (SD)	0.566 (0.64)	0.366 (0.51)	0.2 (0.2, 0.3)	<0.001	0.1 (0.1, 0.2)	<0.001
Median	0.398	0.301				
History of Macular edema	85 (9.8%)	374 (2.9%)	4.5 (1.1, 17.8)	0.033	5.7 (1.2, 27.3)	0.030
History of Diabetic retinopathy	157 (18.1%)	736 (5.8%)	3.6 (2.8, 4.5)	<0.001	2.0 (1.5, 2.8)	<0.001

Measure of association is odds ratio for categorical variables and a parameter estimate for continuous variable of preoperative LogMAR.

*Adjusted for age, sex, race/ethnicity, and health insurance.

†Combined into one group of "other" race/ethnicity for statistical comparison.

Table 2. Demographics and Preoperative Characteristics for Hispanic EP Patients and Hispanic LEP Patients

			Unadjusted		Adjusted*	
	LEP (n = 341)	EP(n = 858)	Measure of Association (95% CI)	*P* Value	Measure of Association (95% CI)	*P* Value
Mean age (SD)	67.8 (9.7)	64.5 (12.7)	—	0.011	—	—
Sex						
Male	131 (38.4%)	370 (43.1%)	Reference	0.142	—	—
Female	210 (61.6%)	488 (56.9%)	—			
Health insurance						
Medicare	242 (71.0%)	579 (67.6%)	Reference			
Medicaid	65 (19.1%)	117 (13.7%)	—	0.355		
Private	18 (5.3%)	103 (12.0%)	—	0.030	—	—
Uninsured	14 (4.1%)	32 (3.7%)	—	0.645		
Other	2 (0.6%)	25 (2.9%)	—	0.069		
Prevalence of Type 2 diabetes	190 (55.7%)	389 (45.3%)	1.5 (1.1, 2.0)	0.020	1.4 (1.0, 2.0)	0.040
Preoperative LogMAR						
n	339	856				
Mean (SD)	0.647 (0.72)	0.527 (0.69)	0.1 (0.01, 0.2)	0.034	0.1 (0.03, 0.2)	0.010
Median	0.398	0.301				
History of macular edema	55 (16.2%)	83 (9.7%)	1.7 (1.1, 2.7)	0.023	2.2 (1.4, 3.6)	0.001
History of diabetic retinopathy	108 (31.8%)	186 (21.8%)	1.6 (1.1, 2.3)	0.009	1.5 (1.0, 2.3)	0.031

Measure of association is odds ratio for categorical variables and a parameter estimate for continuous variable of preoperative LogMAR.

*Adjusted for age, sex, and health insurance.

vs. 5.8%, $P < 0.001$). When controlling for age, sex, race/ethnicity, and health insurance patients with LEP were still more likely to have type 2 diabetes with an increased odds of 1.5 (95%CI, 1.2–1.9; $P < 0.001$), macular edema (odds ratio = 5.7 [95% CI, 1.2–27.3]; $P = 0.030$), and DR (odds ratio = 2.0 [95% CI, 1.5–2.8], $P < 0.001$)).

Table 2 presents demographic and preoperative characteristics stratified by Hispanic patients separately. Among the 1199 Hispanic patient eyes, 341 (28.4%) were from patients with LEP. Hispanic patients with LEP were more likely to be older (67.8 vs. 64.5 years, $P = 0.011$) and have worse preoperative visual acuity (mean logMAR 0.647 vs. 0.527, $P = 0.034$) than their counterparts with EP. Hispanics with LEP were also more likely to present with type 2 diabetes (55.7% vs. 45.3%, $P = 0.020$), macular edema (16.2% vs. 9.7%, $P = 0.023$), and DR (31.8% vs. 21.8%, $P = 0.009$). All differences between Hispanic patients with LEP and EP remained significant when controlling for age, sex, and health insurance as shown in Table 2.

Table 3 presents demographic and preoperative characteristics for Asian patients separately. Of the 588 Asian patient eyes, 245 (41.7%) were from patients with LEP. Asian patients with LEP were also more likely to be older (71.4 vs. 69.0 years, $P = 0.034$) and, although not statistically significant, were found to have worse preoperative visual acuity (mean logMAR 0.466 vs. 0.381, $P = 0.108$) than their counterparts with EP. Although not statistically significant, Asians with LEP were also more likely to present with type 2 diabetes (35.9% vs. 30.9%, $P = 0.313$), macular edema (6.1% vs. 3.8%, $P = 0.277$), and DR (7.8% vs. 6.1%, $P = 0.453$).

Table 4 demonstrates disease characteristics of the 893 eyes in our dataset with DR. One hundred fifty-seven (17.6%) of these DR eyes belonged to patients with LEP. DR patients with LEP were more likely to have had anti-vascular endothelial growth factor injections of borderline significance in univariate analysis (34.4% vs. 23.5%, $P = 0.054$) with significantly increased odds of 1.7 (95% CI, 1.0–2.6; $P = 0.036$) when adjusted for age. LEP patients were also more likely to have later stages of DR with 3.0 (95% CI,

Table 3. Demographics and Preoperative Characteristics for Asian EP Patients and Asian LEP Patients

			Unadjusted		Adjusted*	
	LEP (n = 245)	EP (n = 343)	Measure of Association (95% CI)	*P* Value	Measure of Association (95% CI)	*P* Value
Mean age (SD)	71.4 (8.0)	69.0 (11.1)	—	0.034	—	—
Sex						
Male	85 (34.7%)	104 (30.3%)	Reference		—	—
Female	160 (65.3%)	239 (69.7%)	—	0.657		
Health Insurance						
Medicare	178 (72.6%)	274 (79.9%)	Reference			
Medicaid	41 (16.7%)	8 (2.3%)	—	<0.001		
Private	17 (6.9%)	50 (14.6%)	—	0.040	—	—
Uninsured	7 (2.9%)	8 (2.3%)	—	0.736		
Other	2 (0.8%)	3 (0.9%)	—	0.845		
Prevalence of Type 2 Diabetes	88 (35.9%)	106 (30.9%)	1.3 (0.8, 2.0)	0.313	1.3 (0.8, 2.0)	0.320
Preoperative LogMAR						
n	245	343				
Mean (SD)	0.466 (0.50)	0.381 (0.47)	0.1 (−0.01, 0.2)	0.108	0.1 (0.03, 0.2)	0.163
Median	0.301	0.301				
History of macular edema	15 (6.1%)	13 (3.8%)	1.7 (0.7, 4.3)	0.277	1.7 (0.6, 4.5)	0.298
History of diabetic retinopathy	19 (7.8%)	21 (6.1%)	1.4 (0.6, 3.1)	0.453	1.9 (0.7, 4.8)	0.183

Measure of association is odds ratio for categorical variables and a parameter estimate for continuous variable of preoperative LogMAR.

*Adjusted for age, sex, and health insurance.

Table 4. Injections and Severity of DR Among DR Patients

			Unadjusted		Age-Adjusted*	
	LEP (n = 157)	EP (n = 736)	Odds Ratio (95% CI)	*P* Value	Odds Ratio (95% CI)	*P* Value
Anti-VEGF injection	54 (34.4%)	173 (23.5%)	1.6 (1.0, 2.5)	0.054	1.7 (1.0, 2.6)	0.036
Severity of DR†						
Mild NPDR	33 (21.0%)	253 (34.4%)	—		—	
Moderate NPDR	19 (12.1%)	116 (15.8%)	—		—	
Severe NPDR	13 (8.3%)	48 (6.5%)	—		—	
PDR	92 (58.6%)	316 (42.9%)	1.8 (1.2, 2.8)	0.010	3.0 (1.6, 5.8)	0.001

*Adjusted for age only; sex, race/ethnicity and insurance were not significantly associated with Anti-VEGF injection or PDR.

†All DR severity categories presented for numbers and frequencies; statistical comparisons are PDR versus no PDR.

VEGF, vascular endothelial growth factor; NPDR nonproliferative DR.

1.6–5.8; $P = 0.001$) higher odds of PDR among LEP patients when adjusted for age.

Discussion

There is limited research examining the disparities between patients with LEP and EP in the field of ophthalmology. In keeping with prior results investigating patients with LEP, the LEP patients presenting for cataract surgery in our study were significantly more likely to have type 2 diabetes with twice the prevalence and an adjusted odds ratio of 1.5 times more likely. Furthermore, our study is the first to demonstrate a higher prevalence of DR in the LEP population among a cohort of patients presenting for cataract surgery with three times the prevalence and an adjusted odds

ratio of two. Our patients with LEP were also more likely to present with macular edema, have later stages of DR, and were more likely to have had intravitreal injections.

There are likely many factors contributing to the higher rates and greater severity of DR in patients with LEP presenting for cataract surgery. A major risk factor implicated in the development and progression of DR is duration of T2DM.[17] Given that our LEP population was significantly older than our EP population, there was concern that they may also have a longer disease duration. However, when controlling for age, sex, race/ethnicity, and health insurance, the rates of T2DM, DR, and macular edema were all still significantly greater among patients with LEP.

Previous studies have identified other risk factors associated with the development and progression of DR, including poor glycemic control, systemic hypertension, and dyslipidemia.[17] Many studies have demonstrated worse glycemic control and higher rates of hypertension in patients with LEP, particularly in the setting of language-discordant encounters.[12,18–20] Given that many of the risk factors for progression of DR include "silent" diseases such as hypertension and dyslipidemia, the fact that studies show patients with LEP are less likely to be screened and treated for these conditions in a preventative healthcare setting likely contributes to higher rates of DR.[3,6,7,21,22]

In addition to a lack of access to primary care, we believe that our findings also suggest inadequate access to specialty ophthalmologic care. Our insurance data demonstrates higher rates of Medicaid insurance in patients with LEP compared with higher rates of private insurance in patients with EP. These differences remain consistent when stratified data were presented by Hispanic and Asian patients. Medicaid eligibility is based on household, income, age, citizenship, and other characteristics such as pregnancy or disability status.[23] Recently, an estimated 56.4% of Medicaid beneficiaries were from racial and ethnic minorities, pointing to income inequality in race and ethnicity.[23]

Although Medicaid has certainly improved access to healthcare among low-income populations,[23] studies have shown that social challenges such as poor access to transportation, time-off request, availability, and securing childcare, for example, may contribute to frequency of missed appointments, ultimately leading to worse health outcomes.[24] In addition, it has been demonstrated that some insured individuals are unaware of details of coverage and may elect to delay or avoid preventative care given assumed cost.[25] For example, some research suggests that call centers are less successful in trying to obtain eyecare appointments for patients with Medicaid compared with private insurances,[26] Within our field of ophthalmology, studies have found that patients with Medicaid have a low rate of diabetic eye examinations[27] and receive less glaucoma care compared to those with private insurance.[28] We argue that language barriers because of LEP status could also have an important role in our results suggesting higher rate of DR and associated complications in these populations.

In addition, patients included in this study with LEP were older, had more severe disease, and had worse visual acuity at presentation when compared to patients with EP. Keeffe et al.[29] showed that an inability to speak English was a risk factor for not receiving ophthalmologic care. It is possible that delayed presentation to ophthalmic providers may have contributed to increased rates of DR and macular edema among patients with LEP in our study.

It should be noted that the majority of our patients with LEP were Hispanic, a population that has high rates of T2DM and DR. The Centers for Disease Control and Prevention has found that prevalence of T2DM in Hispanics is as high as 12.1% compared to 7.4% in Caucasians.[30] In addition, multiple studies have shown that DR affects Hispanics at a higher rate than Caucasians.[31–33] The Multi-Ethnic Study of Atherosclerosis showed that Hispanics had an overall DR prevalence of 37.4% compared to 24.8% for Caucasians.[33] Higher rates of macular edema and severe DR as defined by the Early Treatment Diabetic Retinopathy Study have also been reported among Hispanic patients.[34] Despite these higher rates of disease, Canedo et al.[35] showed that Hispanic diabetic patients were less likely to have yearly eye, foot, and HbA1c screenings.

Given the sufficiently large number of Hispanic and Asian LEP patients in our study, we conducted subanalyses for these populations stratified by races and ethnicities to determine whether LEP status would remain an independent risk factor for DR when stratifying for race and ethnicity. There were insufficient numbers of LEP patients from other races/ethnicities to permit subanalyses for those populations. Our results demonstrate that LEP patients had higher rates of DR in both the Hispanic and Asian subgroups; however, the differences between LEP and EP were only statistically significant among the Hispanic population, likely because of the larger sample size. Our subgroup analysis of Hispanic patients showed a significant association between LEP and higher rates of T2DM, later stages of DR, higher rates of macular edema, and worse preoperative BCVA. Our data show that rates of these chronic conditions were 20% to 50% higher among the eyes of Hispanic patients with LEP compared to the eyes of Hispanic patients with EP.

These findings indicate that even among the Hispanic population, having LEP acts as a compounding risk factor associated with DR. Although many ophthalmologists may be aware of the increased risk of DR among the Hispanic population, our data suggest that additional attention getting patients into appropriate care could benefit patients with LEP.

Asian patients with LEP also had higher rates of T2DM, DR, macular edema, and worse visual acuity at presentation when compared to Asian patients with EP; however, these differences were not statistically significant. The lack of significance between Asian patients with LEP and EP is likely multifactorial. First, the sample size was smaller and may not have been large enough to detect significant differences between the two groups. Second, the magnitude of differences between Asian patients with LEP and EP were not as large as those seen in Hispanic patients. Furthermore, possible differences between our Asian and Hispanic populations in terms of social risk factors, health literacy, transportation, and family support could contribute to the smaller magnitude of differences. Although our study does not collect information on these potential confounders, it does highlight the importance of investigating these sociodemographic factors in future studies.

Our study investigates a novel question and provides important observations into the relationship between language barriers and diabetic retinopathy; however, it does have several limitations. Fist, our identification of patients as having LEP is dependent on the patient having an accurate designation in the electronic medical record as "needing or preferring an interpreter." Although we believe these designations to be largely accurate, it is certainly possible that this method did not fully capture all patients with LEP in our dataset. It must also be mentioned that the specific group of patients with LEP at our academic institution may not be generalizable to patients with LEP in other practice settings because our status as a tertiary referral center might explain our high rates of severe DR. Another limitation of our study is that we do not capture what modality of interpretation was used or whether a language-concordant family member or physician was present during the medical encounter. Next, we understand that this study included patients who underwent cataract surgery, and we inherently did not capture patients who did not present for surgery. This potentially raises a selection bias toward patients with better access to care. We also acknowledge the inherited limitations of the use of chart review for data collection, particularly regarding the demographic characteristics data. Historically, there has been a lack of consistency and accuracy regarding race and ethnicity data in the U.S. healthcare system.[36] Addressing health disparities requires detail and accurate demographic data. We believe that priority should be given to improve self-reported data by implementing intentional policies, procedures, and training in place to ensure accurate collection standards. Finally, we did not capture other social risk factors including income, transportation, and level of education. All these factors are critical to analyze in future studies as we seek to identify and address healthcare disparities in ophthalmology.

In conclusion, our data support the hypothesis that LEP is associated with higher rates of T2DM, DR, macular edema, intravitreal injections, and worse preoperative BCVA at time of presentation for cataract surgery. These findings remained significant when stratified by race and ethnicity among the Hispanic population. This may be related to multiple factors including suboptimal access to preventative healthcare, poorer glycemic control, and poorer access to ophthalmologic screening and treatment; however, future studies are needed to better outline the root causes of these disparities. This article adds to the current literature describing patient social risk factors in ophthalmology and emphasizes the importance of advocating for improved healthcare delivery for vulnerable patient populations such as patients with LEP.

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