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ORIGINAL RESEARCH

Unequal Referral Patterns to Ophthalmology Subspecialists Based on Race and Ethnicity in Diabetes Mellitus: A Retrospective Analysis

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Purpose: Previous research has shown that racial disparities exist regarding the prevalence of and associated vision loss from diabetic retinopathy. Unfortunately, little is known about potential racial and ethnic disparities of diabetic eye exam referral patterns by primary care providers. Understanding referral patterns to ophthalmic specialists is key to understanding the steps needed to prevent progression of this vision-threatening condition, particularly in minority populations.

Patients and Methods: Patients who were diagnosed with type II diabetes mellitus (DM) at a tertiary medical center between 2015 and 2023 were retrospectively identified from the electronic medical record (n = 10,995). Patient demographics, comorbidities, presence or absence of ophthalmology referral, HbA1c and insulin dependence at time of referral, time from referral to first ophthalmic appointment, as well as diabetic retinopathy presence/stage at first ophthalmic exam after referral were collected.

Results: Of the white patients who were diagnosed with DM, 79.3% were referred for ophthalmology screening, compared to 78.55% of Hispanic patients (RR: 1.03 [95% CI: 0.92, 1.15]) and 75.75% of black patients (RR: 0.83 [95% CI: 0.74, 0.93]) (p = 0.0009). 56.38% of White patients had a HbA1c ≥ 7% at referral compared to 61.33% of Hispanic patients (RR: 1.16 [95% CI: 1.00, 1.34]) and 53.48% of Black patients (RR 0.86 [95% CI: 0.73, 1.01]) (p = 0.0004). 5.69% of referred white patients were diagnosed with diabetic retinopathy compared to 10.22% of Black patients (RR: 1.88 [95% CI 1.58, 2.23) and 10.91% of Hispanic patients (RR: 1.58 [95% CI 1.32, 1.89]) (p < 0.0001).

Conclusion: Black patients were less likely to receive an ophthalmology referral at the time of DM diagnosis, and Hispanic patients were more likely to be referred at a more severe HbA1c compared to white patients. Both black and Hispanic patients were more likely to be diagnosed with diabetic retinopathy at first ophthalmic appointment than white patients.

Keywords: diabetes mellitus, race, ethnicity, referrals, diabetic retinopathy

Introduction

Diabetic retinopathy is a common ocular consequence presenting in patients with long-standing diabetes mellitus (DM). More than 38 million Americans have diabetes mellitus, equating to 11.6% of the overall population.[1] Diabetic Retinopathy (DR) is a result of inadequately controlled diabetes causing retinal microvascular damage and is the most frequent complication of the disease, with an estimated prevalence of 25–30% among those with diabetes.[2,3] Diabetic retinopathy has been found to be the leading cause of vision loss in working aged adults, making diabetic retinopathy care a matter of public health.[4] The problem is even more dire for minority populations, with black and Hispanic populations suffering at higher prevalences and being more likely to have vision loss due to diabetic retinopathy than their white counterparts.[5] Compared to white individuals standardized for age and sex, Hispanic individuals have a 111% higher prevalence of vision-threatening diabetic retinopathy, while Black individuals have a 155% higher prevalence of

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vision-threating diabetic retinopathy.[6] Importantly, early screening, continuous monitoring, and prompt treatment when warranted can help to prevent or delay vision loss.[2,5]

Racial and ethnic minority groups bear an overwhelming degree of morbidity and mortality from some of the prevalent diseases including coronary vascular disease, stroke, obesity, hypertension, and diabetes.[7] Indeed, minority populations are twice as likely to be diagnosed with type 2 DM and 2–3 times more likely to develop visual complications from the disease. Additionally, racial minorities have a significantly higher prevalence of DR compared to their white counterparts and are less likely to be screened for DR,[6,7] with black individuals having the highest proportion of DR overall and the proliferative subtype.[8] Even after patients with DM receive appropriate care, minority populations are at greater odds of having a lapse in diabetic retinopathy care.[9] The racial disparities in screening, referral and treatment of DR have important consequences such as permanent vision loss, which is associated with difficulty completing daily tasks of life, decreased independence, and deleterious effects on social interactions and mental well-being.[10]

Racial disparities in referral patterns from primary care providers to medical specialists have been well established in previous studies.[11,12] While much of the current literature within ophthalmology explores racial disparities in diabetic retinopathy, most studies have focused on differences in disease progression, management and intervention, and visual outcomes.[13–15] Studies assessing racial disparities in DR outside these factors including referral patterns to an ophthalmologist for DR and the factors associated with time to referral are limited.[6,15] Our previous study describes racial disparities in referral and timeline for cataract surgery;[16] however, little is known about racial disparities in ophthalmology referral amongst patients with diabetes mellitus. This is a crucial gap that needs to be addressed in order to accurately understand and improve minority eye care. To the best of our knowledge, this is the first study to assess the racial and ethnic disparities in referral patterns and comprehensive timeline between referral to ophthalmic evaluation in diabetic patients. In this study, we examined the racial differences of referral patterns between diabetic patients' primary physicians and ophthalmic specialists for ocular assessment. We assessed patient factors such as comorbid disease and stage of diabetic retinopathy on presentation to an ophthalmic specialist, as well as diabetic management at time of referral (insulin use, A1C level). This is critical to evaluating how ophthalmology DM care can be changed in the future to ensure racial minorities are receiving appropriate preventative care and minimizing adverse patient outcomes.

Materials and Methods

General Procedures

This study was conducted in accordance with the approval and supervision of the Institutional Review Board at University of Texas Medical Branch, John Sealy School of Medicine. The study was conducted following the guidelines put forth in the Declaration of Helsinki. A waiver of informed consent was obtained through the Institutional Review Board due to the retrospective nature of the study in accordance with 45 CFR 46.116(d). Patient data was collected and kept under HIPAA approved regulations. Every attempt was made to protect subject Protected Health Information including but not limited to: maintenance of electronic data in encrypted, password protected files, use of a firewall, and use of a limited access server.

Patient Identification

This retrospective chart review identified white (non-Hispanic), black, and Hispanic patients who were diagnosed with type II diabetes mellitus (ICD-10 code E.11) at the University of Texas Medical Branch over an eight-year period (1/1/2015-1/1/2023). Using the electronic medical record database EPIC, 10,995 patients were identified as having type II diabetes mellitus, of which 5076 were white, 2749 were black, and 3170 were Hispanic (Figure 1). For the purposes of this study, white patients with non-Hispanic ethnicity were classified as white, while white patients of Hispanic ethnicity were classified as Hispanic. Black patients with either Hispanic or non-Hispanic ethnicity were classified as black.

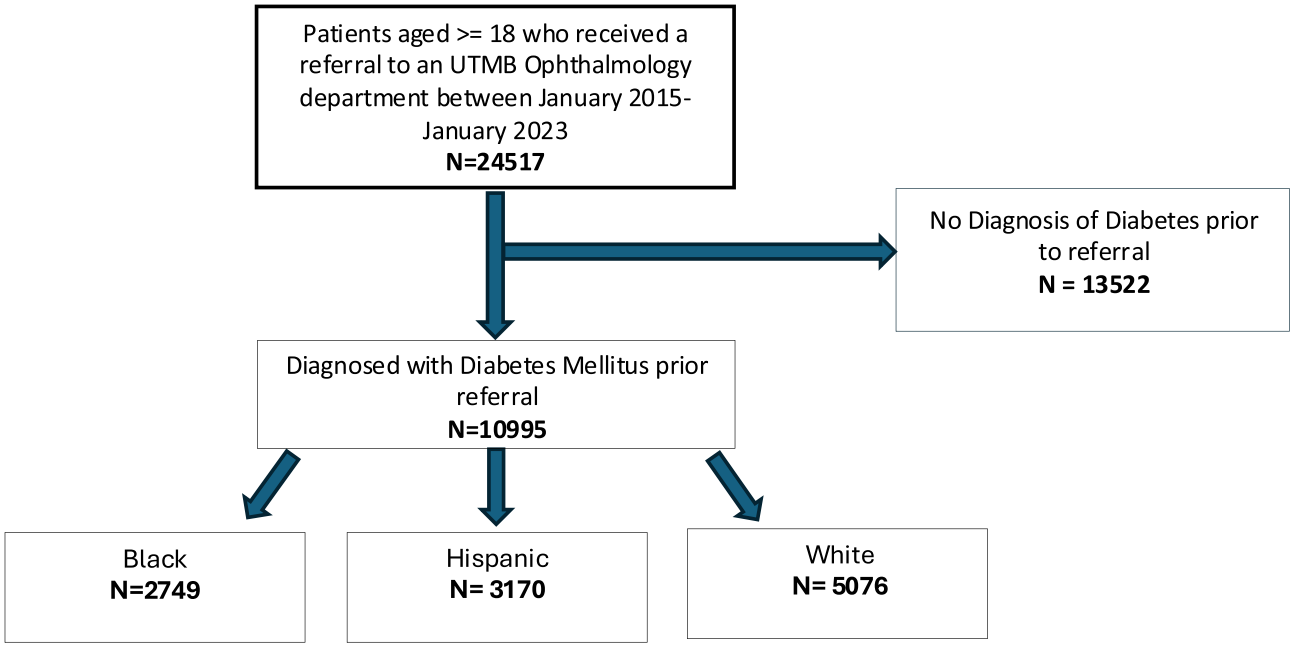

Figure 1 Inclusion criteria used to create retrospective cohort of patients subdivided based on race and ethnicity.

Inclusion/Exclusion Criteria

Criteria for the inclusion of subjects in this study included being a patient at University of Texas Medical Branch, being between the ages of 18–100 years, diagnosis of type II diabetes mellitus and referral to the UTMB Ophthalmology Department for eye evaluation (Figure 1). Patients that were incarcerated (Texas Department of Criminal Justice patients) were excluded from the study as they were considered a vulnerable population.

Comorbidities and Confounding Factors

Basic patient demographics, including age, sex, race, ethnicity, insurance status (Medicare/Medicaid vs others), and comorbid diseases (ocular and vascular), were collected for all patients. The following CPT codes were used to assess comorbidities among our cohort of patients: hypertension (included I10, I11, I12, I13, and I15), hyperlipidemia (E78.5), glaucoma (H40), retinal detachment (H33.0), Uveitis (H44.11 and H44.13), and keratopathy (H18.4). Basic demographic information and comorbid disease is presented in Table 1 and adjusted for in all subsequent analysis when calculating the relative risk (RR) and representative confidence intervals (CI).

Table 1 Patient Demographics, Insurance Status, and Comorbid Diseases

Patient Demographic/Classification	White (n=5076) Mean ± SD or N (%)	Hispanic (n= 3170) Mean ± SD or N (%)	Black (n= 2749)	P value
Age (years)	61.35 (13.41)	58.15 (14.19)	59.14 (14.06)	0.0001*
Sex				0.0001†
Male	2684 (52.88)	1499 (47.29)	1076 (39.14)	
Female	2392 (47.12)	1671 (52.71)	1673 (60.86)	
Insurance				0.0867†
Medicare/Medicaid	4758 (93.74)	2937 (92.65)	2548 (92.69)	
Others	318 (6.26)	233 (7.35)	201 (7.31)	

(*Continued*)

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Table 1 (Continued).

Patient Demographic/Classification	White (n=5076) Mean ± SD or N (%)	Hispanic (n= 3170) Mean ± SD or N (%)	Black (n= 2749)	P value
Comorbid Ocular Disease				
Glaucoma	187 (3.68)	210 (6.62)	342 (12.44)	0.0001†
Retinal detachment	10 (0.20)	8 (0.25)	7 (0.25)	0.8254†
Uveitis	2 (0.04)	1 (0.03)	2 (0.07)	0.7252††
Keratopathy	11 (0.22)	8 (0.25)	12 (0.44)	0.2016†
Comorbid Vascular Disease				
Hypertension	3632 (71.55)	2168 (68.39)	2270 (82.58)	0.0001†
Hyperlipidemia	2694 (53.07)	1584 (49.97)	1611 (58.60)	0.0001†

Notes: Distribution of patient demographics, insurance status, and ocular comorbidity was controlled for in subsequent analysis. The P value was derived from comparing the means or distribution amongst the sample of white, Hispanic and black patients. *ANOVA test; †Chi-square test; ††Fisher's exact test.

Referral to Ophthalmology Outcome Measures

The main outcome measurements for this study included the percentage of patients who were referred at the time of their diabetes mellitus diagnosis and the duration until a patient's ophthalmology referral appointment was completed. Only patients who completed their referral visit were included in subsequent outcome measures.

To assess the duration until the referral appointment was completed, patients were categorized as either completing their referral appointment within one month or more than one month from the date of referral being given. The date of the referral was defined as the date that any of the patients' physicians (primary care providers, endocrinologists, etc.) placed a referral for them to have an appointment with the ophthalmology department. A referral appointment included any appointment within the ophthalmology department at UTMB, including UTMB's main and satellite ophthalmology campuses/clinics.

Disease Status Outcome Measures

Patients' HbA1C value at the time of referral was recorded and classified as either <7% or ≥7%. Whether or not a patient was insulin dependent at the time of referral was also collected using the CPT code Z79.4. Patients were considered "insulin dependent" if they were prescribed insulin (short, intermediate, or long- acting) as part of their antihyperglycemic regimen by one of their physicians. As the American Diabetes Association recommends an A1C goal of <7% for adults with Diabetes Mellitus, 7% or lower was considered a "controlled" A1C value for the purposes of this study.[17]

Statistical Analysis

Statistical analysis was performed with SAS version 9.4. Numerical variables were compared using an analysis of variance test (ANOVA). The distribution of categorical variables was compared using either a Chi square test or Fisher's exact test and a Poisson regression was subsequently performed to identify the relative risk (RR) after adjusting for age, sex, insurance status, and comorbid disease. The alpha value was set at 0.05 such that a P value <0.05 was considered statistically significant.

Results

Timeline to Referral and Diabetes Disease Status

To identify racial and ethnic disparities in referral patterns for ophthalmology examination, we assessed for the presence of ophthalmic referral at the date of diabetes mellitus diagnosis amongst white, black, and Hispanic patients. White and Hispanic patients were referred similarly at the time of diagnosis (79.3% and 78.55%, respectively), while black patients were referred at a significantly lower rate (75.75%) (p = 0.0009). After adjusting for age, sex, insurance, and comorbidities, black patients had a 1.21 (95% CI: 1.08, 1.36) higher risk of not receiving a referral to ophthalmology at the time that their diabetes was diagnosed compared to their white counterparts (Table 2). There were no significant differences in timeline of initial ophthalmology appointment (<1 month versus ≥1 month) between any of the patient groups when an ophthalmology

Table 2 Racial Disparities Amongst White, Hispanic and Black Patients Prior to Referral and Disparities in Follow-up After the Referral was Placed

Clinical Characteristic	White N (%)	Hispanic N (%)	Black N (%)	Unadjusted RR (95% CI)	Adjusted RR (95% CI)	P-value
Time to Referral						
Referral at time of diagnosis	4026 (79.31)	2490 (78.55)	2081 (75.70)	0.96 (0.86, 1.06)$^{\Phi}$ 0.81 (0.73, 0.91)$^{\Phi\ \Phi}$	1.03 (0.92, 1.15)$^{\Phi}$ 0.83 (0.74, 0.93)$^{\Phi\ \Phi}$	0.0009†
No referral at diagnosis	1050 (20.69)	680 (21.45)	668 (24.30)	1.05 (0.94, 1.17)$^{\Phi}$ 1.23 (1.10, 1.37)$^{\Phi\ \Phi}$	0.97 (0.87, 1.08)$^{\Phi}$ 1.21 (1.08, 1.36)$^{\Phi\ \Phi}$	
Time from Referral to Appointment						
< 1 month	2498 (62.05)	1573 (63.17)	1282 (61.60)	1.05 (0.95, 1.16)$^{\Phi}$ 0.98 (0.88, 1.09)$^{\Phi\ \Phi}$	1.06 (0.96, 1.18)$^{\Phi}$ 1.01 (0.90, 1.13)$^{\Phi\ \Phi}$	0.5115
≥ 1 month	1528 (37.95)	917 (36.83)	799 (38.40)	0.95 (0.86, 1.06)$^{\Phi}$ 1.02 (0.91, 1.14)$^{\Phi\ \Phi}$	0.94 (0.85, 1.05)$^{\Phi}$ 0.99 (0.88, 1.11)$^{\Phi\ \Phi}$	
HbA1C at Referral						
<7%	841 (43.62)	495 (38.67)	494 (46.52)	0.82 (0.71, 0.94)$^{\Phi}$ 1.12 (0.97, 1.31)$^{\Phi\ \Phi}$	0.86 (0.75, 1.00)$^{\Phi}$ 1.16 (0.99, 1.36)$^{\Phi\ \Phi}$	0.0004†
≥ 7%	1087 (56.38)	785 (61.33)	568 (53.48)	1.23 (1.06, 1.42)$^{\Phi}$ 0.89 (0.77, 1.03)$^{\Phi\ \Phi}$	1.16 (1.00, 1.34)$^{\Phi}$ 0.86 (0.73, 1.01)$^{\Phi\ \Phi}$	
Insulin Dependent at Referral						
Yes	937 (18.46)	649 (20.47)	573 (20.84)	1.14 (1.02, 1.27)$^{\Phi}$ 1.16 (1.04, 1.31)$^{\Phi\ \Phi}$	1.13 (1.01, 1.27)$^{\Phi}$ 0.98 (0.87, 1.11)$^{\Phi\ \Phi}$	0.0150†
No	4139 (81.54)	2521 (79.53)	2176 (79.16)	0.88 (0.79, 0.98)$^{\Phi}$ 0.86 (0.77, 0.97)$^{\Phi\ \Phi}$	0.88 (0.79, 0.99)$^{\Phi}$ 1.02 (0.90, 1.15)$^{\Phi\ \Phi}$	

Notes: The P value was derived from comparing the distribution amongst the sample of white, Hispanic and black patients. †Indicates a P value of < 0.05. $^{\Phi}$Relative Risk of Hispanic compared to white patients, $^{\Phi\ \Phi}$Relative Risk of black compared to white patients.

referral was placed (p = 0.5115). Hispanic patients had a higher risk of having a HbA1C value of ≥7% at the time of their referral than white patients. After adjusting for confounding variables, Hispanic patients were 1.16 times more likely to have an HbA1C of ≥7% (95% CI: 1.00, 1.34). Hispanic patients were also more likely (20.47%) to have become insulin dependent by the time they were referred for ophthalmology evaluation than white patients (18.46%) (p = 0.015).

Diabetic Retinopathy Progression

To identify disparities in the severity of disease at which the various groups were referred we examined the proportion of patients with the presence of diabetic retinopathy at the time of ophthalmology referral as well as their respective progression of diabetic retinopathy. Although a similar proportion of Hispanic and black patients were diagnosed with diabetic retinopathy (10.22% and 10.91%, respectively), just 5.69% of white patients were diagnosed with diabetic retinopathy at the time of their referral appointment. Indeed, Hispanic patients were 1.88 times more likely (CI 95%: 1.58, 2.23) and black patients were 1.58 times more likely (CI 95%: 1.32, 1.89) to already have diabetic retinopathy at the time of referral compared to white patients (p < 0.0001).

When assessing whether patients had mild, moderate, or severe disease at their ophthalmology appointment, the rates at which Hispanic and black patients met the criteria for diabetic retinopathy was higher than their white counterparts in every subtype assessed (Table 3). While only 2.96% (n = 150) of white patients had mild diabetic retinopathy at the time of their ophthalmology appointment, 4.79% (n = 152) of Hispanic patients and 5.46% (n = 150) of black patients presented with mild diabetic retinopathy at this time point. When examining the proportion of patients who met criteria for severe diabetic retinopathy, Hispanic patients were 2.31 times more likely than white patients to have severe diabetic retinopathy (CI 95%: 1.71, 3.12) (p < 0.0001) when they were referred. Hispanic patients were 1.45 times more likely to require the initiation of anti- VEGF therapy at their ophthalmology evaluation, characterizing more advanced disease in this population at the time they were referred (CI 95%, 1.20, 1.74) (p = 0.0004).

Table 3 Racial Disparities Amongst White, Hispanic and Black Patients After the Referral was Placed and the Patient Followed up with Ophthalmology

Clinical Characteristic	White N (%)	Hispanic N (%)	Black N (%)	Unadjusted RR (95% CI)	Adjusted RR (95% CI)	P-value
DR at Referral	289 (5.69)	324 (10.22)	300 (10.91)	1.89 (1.60, 2.22)[Φ] 2.03 (1.71, 2.40)[Φ Φ]	1.88 (1.58, 2.23)[Φ] 1.58 (1.32, 1.89)[Φ Φ]	<0.0001[†]
Stage of DR at Referral Mild	150 (2.96)	152 (4.79)	150 (5.46)	1.65 (1.31, 2.08)[Φ] 1.90 (1.50, 2.39)[Φ Φ]	1.67 (1.32, 2.11)[Φ] 1.48 (1.16, 1.89)[Φ Φ]	<0.0001[†]
Moderate	30 (0.59)	35 (1.10)	32 (1.16)	1.88 (1.15, 3.06)[Φ] 1.98 (1.20, 3.27)[Φ Φ]	1.87 (1.14, 3.09)[Φ] 1.55 (0.92, 2.61)[Φ Φ]	0.0100[†]
Severe	74 (1.46)	117 (3.69)	77 (2.80)	2.59 (1.93, 3.48)[Φ] 1.95 (1.41, 2.69)[Φ Φ]	2.31 (1.71, 3.12)[Φ] 1.31 (0.94, 1.84)[Φ Φ]	<0.0001[†]
Initiation of anti-VEGF	261 (5.14)	230 (7.26)	167 (6.07)	1.44 (1.20, 1.73)[Φ] 1.19 (0.98, 1.46)[Φ Φ]	1.45 (1.20, 1.74)[Φ] 1.05 (0.85, 1.30)[Φ Φ]	0.0004[†]

Notes: The P value was derived from comparing the distribution amongst the sample of white, Hispanic and black patients. [†]Indicates a P value of < 0.05. [Φ]Relative Risk of Hispanic compared to white patients (white used as reference) [Φ Φ]Relative Risk of black compared to white patients (white used as reference).
Abbreviations: DR, diabetic retinopathy; VEGF, vascular endothelial growth factor.

Discussion

This large, retrospective study examines the differences between racial and ethnic subgroups when it comes to their referral for specialty evaluation by an ophthalmic specialist following their diagnosis of diabetes mellitus. This study is the first to look at the racial disparities seen between patients when it comes to the timeframe and rate at which they are referred for a diabetic retinopathy examination. Our study demonstrated that black patients were less likely to be referred for an ophthalmic specialist appointment at the time of their diabetes mellitus diagnosis than their white counterparts. While the absolute difference between these groups was modest (79.3% vs 75.75%), it is a statistically significant difference. Black and Hispanic patients were more likely than white patients to already have diabetic retinopathy by the time they attended this referral appointment. Additionally, our study showed that Hispanic patients were more likely to have an A1c >7% at the time of their first referral as well as have a higher incidence of initiating intravitreal anti-VEGF therapy. Interestingly, this study showed that there was not a statistically significant difference in whether it took patients less or more than a month from their appointment referral date until their actual appointment. Overall, this study is critical in understanding how clinicians can ensure patients with diabetes receive appropriate ophthalmic referral and early evaluation of vision-threatening consequences of diabetes such as diabetic retinopathy, particularly for black and Hispanic patients.

Previous studies have shown that early intervention and frequent monitoring for diabetic retinopathy preserves vision, improves outcomes, and aids in maintaining a patient's quality of life.[18] Recent research has shown that early treatment with anti-VEGF does not yield benefits for a patient's visual acuity, making regular monitoring of patients to be able to treat only as needed crucial.[19] Because diabetic retinopathy can be asymptomatic or present with only mild symptoms such as blurry vision or floaters in the early stages of the disease course, it is unreasonable to rely on patients to recognize the warning signs and see specialized ophthalmic care on their own accord. Instead, this duty falls on clinicians, particularly primary care physicians, to recognize the need for an evaluation by an ophthalmologist or optometrist in this patient population and give appropriate referrals. In fact, the American Diabetes Association recommends that all patients who have Type II Diabetes Mellitus should have a comprehensive eye examination by an ophthalmic specialist at the time of their diabetes diagnosis.[20] The long-term implications of delayed diabetic retinopathy care in minorities are of utmost importance, especially considering that black and Hispanic populations suffer from diabetes and diabetic retinopathy at higher rates than other groups.[13]

Strengths and Weaknesses of the Study

This study's strengths include a large sample size from a multi-center practice, subgroups from different races and ethnicities, and patients with a wide range of comorbidities. Another primary strength of this study was that patient

demographics, insurance status, and ocular comorbidities were controlled for in the primary analyses, ensuring these factors did not affect the subsequent statistical analysis.

Weaknesses of this study are limited, but those that exist stem from the fact that this study is a retrospective study and as such, there are patient characteristics that are either unknown or difficult to control for. Furthermore, the vast majority of the patients in this study utilized Medicare or Medicaid for their insurance, potentially underrepresenting patients with private insurance. This study was conducted at a single institution, potentially limiting the generalizability of the findings. Lastly, this study only included patients who attended their referral appointment and did not examine patients who were referred but never attended their ophthalmology appointment, a subgroup that possibly had financial or social barriers to attending their appointment.

Implications for Patient Care

While it is not known the exact causes for the disparities seen in this study, there are many possible reasons for the findings presented here. One such explanation is that clinicians have implicit bias when they are deciding whether to refer patients to subspecialists for additional evaluations and care. Implicit bias has been implicated as a contributing factor to the broader disparities seen within the healthcare system, as well as disparities specific to healthcare referral patterns.[21,22] In our previous studies, as well as those conducted by others, implicit bias has been suggested to contribute to the ophthalmic care disparities seen in racial and ethnic minority groups.[16,23] Another possible explanation could be patient factors that were not studied directly here, such as socioeconomic status or geographic location. Insurance coverage issues not accounted for within this analysis could also be to blame, at least in part, for the racial and ethnic disparities in ophthalmic referrals seen in this patient population. For instance, patients whose vision insurance did not cover care at the institution that they were referred to might choose not to attend their referral appointment.

The findings from this study have direct implications to patient care, particularly for primary care physicians tasked with caring for diabetes mellitus patients and optometrists who see these patients in their clinics frequently. Clinicians and optometrists should be mindful of the fact that disparities exist in the referral rates among different racial and ethnic populations and work to give referrals to all patients early in their disease course. It is important for primary care physicians and referring eye care providers to be mindful of implicit bias when referring patients for specialty care, as this can disproportionately affect minority populations. Additionally, it is crucially important to ensure patients from all groups receive education on early diabetic retinopathy symptoms to look out for and on how monitoring their diabetes can improve their vision prognosis long-term.

Conclusion

In conclusion, this large retrospective study underscores significant racial disparities in the referral patterns for diabetic retinopathy exams, with black patients exhibiting lower rates of referral at the time of diabetes diagnosis compared to their white and Hispanic counterparts. Moreover, both black and Hispanic patients were found to have a higher burden of disease at the time of their initial ophthalmologic referral, with Hispanic patients also having a higher rate of having Hg A1c greater than 7.0% at time of diagnosis and needing initiation of intravitreal anti-VEGF therapy. These findings highlight critical gaps in the timely detection and management of diabetic retinopathy among minority populations, which may contribute to the disproportionate impact of vision-threatening complications in these groups. Addressing these disparities requires not only improving referral practices at the point of diabetes diagnosis but also enhancing healthcare accessibility, provider education, and patient outreach to ensure more equitable care. Additional studies are warranted to explore this topic at multiple institutions to assess potential disparities in other geographical locations. Further research is needed to identify and target the underlying systemic, structural, and clinical factors contributing to these disparities, ultimately aiming to reduce the visual morbidity associated with diabetic retinopathy in vulnerable populations.

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Disclosure

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