

Self-reported eye diseases among American Indian individuals with type 2 diabetes from the northern Midwest

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Abstract

Purpose. To determine the prevalence of self-reported eye diseases and self-reported utilization of dilated eye exams among a sample of American Indian (AI) individuals with type 2 diabetes.

Methods. AI adults with type 2 diabetes utilizing health care at two reservation clinics were randomly sampled and recruited for interviewer-assisted paper surveys. The prevalence of eye diseases was compared across gender, age, income, and educational attainment.

Results. The prevalence of self-reported diabetic retinopathy, cataract, macular degeneration, and glaucoma were 9.4%, 26.7%, 5.2%, and 10.6% respectively, and 59.2% reported past year dilated eye exams. Older participants were more likely to report cataract ($p < 0.001$) and glaucoma ($p = .003$). Those with lower income were more likely to report cataract ($p = 0.001$).

Conclusions. Rates of self-reported eye diseases in this sample were higher, and dilated eye exams

lower than other samples of the general United States population with diabetes, suggesting improvement can be made to improve the provision of care for AI individuals with type 2 diabetes.

Introduction

Diabetes is one of the leading causes of blindness in the United States (US). The prevalence of visual impairment, cataract, and glaucoma are higher among individuals with diabetes than those without.^{1,2} In addition, diabetic retinopathy afflicts a substantial portion of individuals with diabetes, and about half of those with diabetic retinopathy report visual impairment.¹⁻⁴ American Indians and Alaska Natives (AI/AN) have disparate burden of diabetes and its related complications. AI/ANs are two times more likely than non-Hispanic Whites to be living with diabetes, and have the highest age-adjusted prevalence of diabetes in the US of any racial and ethnic group.⁵⁻⁶ Rates of disease morbidity are also higher for AI/ANs compared to other US adults.⁷⁻⁹ Importantly, however,

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the prevalence of diabetes varies widely across AI/AN cultural groups, ranging from 5.5% for AN to 33.5% for AI adults in Arizona.⁶

Due to the disparate diabetes burden and impact of diabetes on the eyes, it is salient to focus on eye health in AI/AN communities. In general, there is a comparatively higher incidence of ophthalmologic disease among AI/AN without diabetes. Data from the 2002 NHIS reveal that AI/AN individuals had higher rates of visual impairment compared to non-Hispanic whites, Hispanics, and Asians (13.5%, 9.1%, 9.3%, and 6.5% respectively).¹ In a population-based study of AN, rates of cataract, glaucoma, and diabetic eye disease were higher than the general US adult population.¹⁰ For those with diabetes, prior literature has documented a prevalence of diabetic retinopathy ranging from 16.8% to 49% for different AI/AN tribal groups, with a wide breadth of regional variation, and variation by method of ascertaining retinopathy.¹⁰⁻¹⁸ Overall, indigenous individuals have a higher rate of diabetic retinopathy compared to other racial/ethnic groups.¹⁹⁻²⁰ Regional and cultural differences between AI/AN groups warrant further investigation of comorbid eye diseases for individuals with type 2 diabetes from different communities.

The purpose of this paper is to assess the prevalence of ophthalmologic conditions and correlates of diabetic retinopathy among an AI population with type 2 diabetes living on or near two reservations in Minnesota and Wisconsin. We examine participant self-reports of eye diseases, receipt of dilated eye examination, and potential differences by gender, age, income, and educational attainment.

Materials and Methods

Data source. The Mino Giizhigad (A Good Day) Study is a community-based participatory research (CBPR) project with the Lac Courte Oreilles and Bois Forte Bands of Chippewa (although the term “Chippewa” is a corruption of Ojibwe, this terminology is incorporated into the formal Band names for the two communities participating in the

study) and the University of Minnesota Medical School-Duluth. Tribal resolutions from both communities were obtained prior to application submission for funding, and both tribal communities consented to be named in public dissemination of research findings. Written informed consent was obtained from all participants. The University of Minnesota Institutional Review Board (IRB) and Indian Health Service National IRB approved this study. The complete purpose and methodology of this study is described elsewhere.²¹ In brief, a random sample was generated from clinic records. Inclusion criteria included age (18 years or older), a diagnosis of type 2 diabetes, and self-identification as AI. Two hundred eighteen participants of the 289 sampled individuals (75.4% study response rate) agreed to participate in an interviewer administered paper-and-pencil survey.

Measures. Respondents were classified as having eye diseases (cataract, glaucoma, macular degeneration, diabetic retinopathy, macular edema, or blindness), if they responded yes when asked if a health care provider had told them that they had that condition. Receipt of last dilated eye exam was assessed by asking when they last had an eye exam “during which the doctor put drops in your eyes that made your pupils large.” Response categories for this question were, ‘Within the last 12 months’, ‘1-2 years ago’, ‘2-3 years ago’, ‘More than 3 years ago’, or ‘Never’. Participants self-reported age in years, number of years with diabetes, and gender as either male or female. Educational attainment was assessed by highest level of education completed, with response categories being grouped together for analysis into ‘High school or less’ and ‘Some college or more’. Participants were asked their total household income within \$10,000 ranges. Using the midpoint of this range and the number of people living within the household, the federal poverty calculation was used to categorize participants as above or below 200% of the federal poverty level.

Results

The average age of participants was 56.5 years (standard deviation, 13.7; range, 21 to 87 years) and 56.4% were female. The average number of years a participant had diabetes was 14.7 (standard deviation, 12.2). The mean per capita household income was \$10,331 (standard deviation, \$9,365) and 78% (169) people lived on reservation land. In total, 85.8% had received a dilated eye exam in the past two years, with 59.2% reporting it in the past year.

The prevalence of self-reported eye diseases in this sample is shown in Table 1. No significant gender or

educational attainment differences were found. Age groups were chosen based upon previously reported categories¹, with the 75 years and older age group being collapsed with the 65-74 group due to few participants being 75 or older. Older individuals were more likely to self-report cataract ($p < 0.001$), and glaucoma ($p = 0.003$). More of those with a household income below 200% of the federal poverty level reported cataract ($p = 0.001$). Due to low numbers of individuals reporting macular edema (1.9%) and blindness (1.9%), comparisons for these conditions were not performed.

	Diabetic Retinopathy % (n)	Cataract % (n) ^b	Macular Degeneration % (n)	Glaucoma % (n) ^c
Total	9.4% (20)	26.7% (58)	5.1% (11)	10.6% (23)
Gender				
Male	11% (10)	23.3% (22)	5.3% (5)	9.6% (9)
Female	8.2% (10)	29.5% (36)	5.0% (6)	11.4% (14)
Age				
18-44	10.6% (5)	2.1% (1)	0% (0)	0% (0)
45-54	10.6% (5)	6.1% (3)	4.1% (2)	6.1% (3)
55-64	11.5% (6)	25.5% (13)	3.9% (2)	11.5% (6)
65 and older	6.0% (4)	59.4% (41)	10.3% (7)	20.6% (14)
Income				
Below 200% FPL ^a	9.4% (12)	34.8% (46)	6.9% (9)	12.2% (16)
Above 200% FPL ^a	9.6% (8)	14.5% (12)	2.4% (2)	8.3% (7)
Educational attainment				
High school graduate or less	10.8% (9)	30.2% (26)	7.1% (6)	7.0% (6)
Some college or more	8.5% (11)	23.8% (31)	3.8% (5)	13.0% (17)
^a FPL = federal poverty level				
^b Chi Square test indicated differences between age groups ($p < 0.001$), and differences between income groups ($p = 0.001$)				
^c Chi square test indicated differences between age groups ($p = 0.003$)				

Table 2

The prevalence of self-reported eye disease is stratified by gender, age, income, and educational attainment.

Discussion

This study details the prevalence of eye diseases and dilated eye exams in a northern Midwest clinic sample of AI individuals with type 2 diabetes. The prevalence was higher in this population than the 2002 NHIS general population sample with diabetes for cataracts (26.7% vs. 13.9%), glaucoma (10.6% vs. 3.9%), and macular degeneration (5.1% vs. 1.4%).¹ Older respondents in this study reported significantly higher rates of cataracts and glaucoma than the younger respondents, and those below 200% of the federal poverty level reported higher rates of cataract. In our sample, the prevalence of diabetic retinopathy was 9.4%, comparable to the 2002 NHIS sample prevalence of 9.9% and 8.0% for the raw and age adjusted estimate respectively.¹ These estimates vary greatly from other prevalence estimates of diabetic retinopathy using different methodologies for ascertaining cases.³⁻⁴ Estimates for diabetic retinopathy in AI/AN populations have ranged from 16.8% - 49% depending upon the region surveyed and method of discerning cases (i.e., self-report vs. imaging), demonstrating the ongoing need to consider AI/AN disease burden across distinct tribal groups.¹¹⁻²⁰ In addition, the methodology used for ascertaining cases of diabetic retinopathy may have resulted in a lower than expected prevalence. This study used self-report similar to the NHIS, which may lead to underreporting due to recall bias and not being diagnosed with a condition. In a study of First Nations individuals with type 2 diabetes in Alberta, Canada, an additional 7% of the participants met diagnostic criteria for retinopathy, despite not self-reporting the condition.²²

As a result of the increased risk for and prevalence of ocular manifestations of diabetes, guidelines for the management of diabetes include recommendations for annual or bi-annual dilated eye exams to assess for retinopathy.²³ For patients with diabetes, eye screenings and treatments for diseases of the eye are cost saving for the health care system.²⁴ In this study most participants reported a dilated eye exam in the

past two years (85.8%); however, only 59.2% of participants had this exam in the past year. This rate is lower than those reported elsewhere. In a study of the US population over the age of 40 with diabetes, rates of adherence to an annual eye examination was 74.5%, with the most common reason for non-adherence being “no need”.²⁵ In a study of AN individuals with diabetes, 67.7% had an annual eye examination.¹¹ Education about these preventative measures carries great importance, especially among individuals living with diabetes for whom eye conditions often occur with greater prevalence. Prior literature describes research aimed at understanding methods for improving awareness of diabetes eye disease for AI/ANs.²⁶ There is potential to enhance care through the use of community and culturally tailored programming and communication strategies.

This study must be interpreted in the context it was performed and with an understanding of the methodological limitations. The participants in this study were sampled from clinic records, and thus may be those more likely to seek formal medical care, and therefore may be healthier than individuals who do not seek formal medical care. The study was cross-sectional, and thus we are unable to make temporal inferences. The measures used in this study were self-report, rather than laboratory values, diagnostics, and medical records. As aforementioned, the results presented above may underrepresent the true prevalence of eye diseases in this population.

AI/AN communities face an increasing disease burden of eye conditions, especially among individuals with diabetes. This study documents the levels of eye diseases in a clinic sample of northern Midwest AI individuals with type 2 diabetes. The prevalence of several eye diseases reported here are higher than those reported for the general population, illustrating the need for appropriate provision of eye care for AI individuals with diabetes. Rates of eye care utilization suggest that improvements can be made to maintain or increase the rates of dilated eye exams and provision of eye services to AI individuals.

Clinicians treating AI with diabetes need to be mindful of ophthalmic conditions, because many of these conditions are treatable, and many can be avoided or controlled if detected.

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