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Patron: Jones, Desiree

Call #: **W1 JO855OE v.68 1997**
Location:

Pages: 511-7

Journal Title: Journal of the American
Optometric Association

Volume: 68
Issue: 8
Month/Year: 08 1997

Need by: 12/05/2011



CUSTOMER INFORMATION:

Article Author: Rearwin DT, Tang JH, Hughes JW

Article Title: Causes of blindness among Navajo
Indians: an update.

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Causes of blindness among Navajo Indians: an update

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A B S T R A C T

BACKGROUND

The causes of blindness among Navajo Indians, an ethnically distinct community within the United States, were last studied in 1982. This article presents an updated report on the causes of blindness among the Navajo.

METHODS

Staff optometrists at each of the hospitals and clinics on the Navajo Reservation collected information for each affected eye: date of onset, cause, blinding process, and best visual acuity. In terms of the total number of eyes affected, it was found that the most frequently encountered etiology was trauma, followed by congenital causes, diabetes mellitus, primary open-angle glaucoma, age-related macular degeneration, and trachoma.

CONCLUSIONS

Considering raw numbers as well as preventability, it is suggested that trauma, diabetes mellitus, and primary open-angle glaucoma be targeted for a focused intervention of patient—as well as public—education aimed at reducing blindness from these causes.

KEY WORDS

Navajo, Native Americans, blindness, trauma, diabetes mellitus, glaucoma

Rearwin DT, Tang JHE, and Hughes JW. Causes of blindness among Navajo Indians: an update. *J Am Optom Assoc* 1997;68:511-7.

The ocular disease status of Navajo Indians has been previously studied for several reasons. *First*, there is a high degree of genetic homogeneity among older members of the population because marriage to non-Indians was uncommon in the past. *Second*, the Navajo tend toward outdoor lifestyles, which result in exposure to wind, intense sunlight, varying seasonal temperatures, and other adverse environmental factors. *Third*, as a result of cultural factors and because the Navajo often live in isolated locations, delays often occur in the provision of adequate eye care.¹ These conditions characterize a population that is both unique and distinct from others in America.

Pathologic etiologies such as trauma, diabetic retinopathy, trachoma, iridocyclitis, retinoblastoma, and hereditary conditions have been identified in the past as major ocular diseases among Native American populations.¹

It has been 15 years since a study on the causes of blindness among Navajo Indians was last undertaken (by Friederich in 1982).¹ As discussed by Friederich, difficult living conditions, coupled with strong genetic components among the Navajo Indians, accounted for the types of ocular diseases encountered in this population. He reported the leading cause of monocular blindness to be trauma from assaults, which were often associated with ingestion of alcohol.¹ However, he provided no data on the leading causes of binocular blindness.

Other studies have observed specific conditions, such as moraxella conjunctivitis² and retinitis pigmentosa,³ and their effects on the Navajo population. The most recent studies have focused on the ocular complications of diabetes mellitus⁴ among the Navajo. The prevalence of adult-onset diabetes mellitus has been estimated to be almost four times that found in the general U.S. population in the 45- to 64-year-old age group, such that diabetic retinopathy has become a major focus of attention among eye care providers on the reservation. Furthermore, hypertension has been found to afflict a large number of these diabetic individuals,⁵ thereby elevating the risk of eye-related problems.

Table 1. Total decreased vision

Etiology	No. of eyes affected	% of total
Trauma	135	29.7%
Congenital/hereditary	68	14.9%
Diabetes mellitus	45	9.9%
Primary open-angle glaucoma	40	8.8%
Macular degeneration	17	3.7%
Trachoma	15	3.3%
Other/miscellaneous	45	9.9%
Unidentified	90	19.8%
Total	455	100.0%

Table 2. Breakdown of congenital/hereditary etiology

Congenital/hereditary	No. of eyes affected	% of total
Retinitis pigmentosa	29	42.6%
Oculocutaneous albinism	7	10.3%
Miscellaneous	32	47.1%
Total	68	100.0%

With these developments in mind—and because optometrists are playing an increasingly active role as primary eye care providers within the Indian Health Service (IHS)⁶⁹—this study was undertaken to obtain an updated assessment of the causes of blindness among Navajo.

Methods

From December 1993 through August 1995, the Indian Health Service collected data relating to the causes of blindness at its ten hospitals and clinics on the Navajo Indian Reservation. Criteria for inclusion in the Blindness Registry were: one or both eyes with untreatable acuity of 20/200 or worse, or visual fields of less than 20°. For the purposes of this study, persons with both eyes affected will be referred to as *legally blind*; those with one eye affected will be described as having a *monocular vision loss*. Both groups together (i.e., all eyes included in this study) will constitute *total decreased vision*.

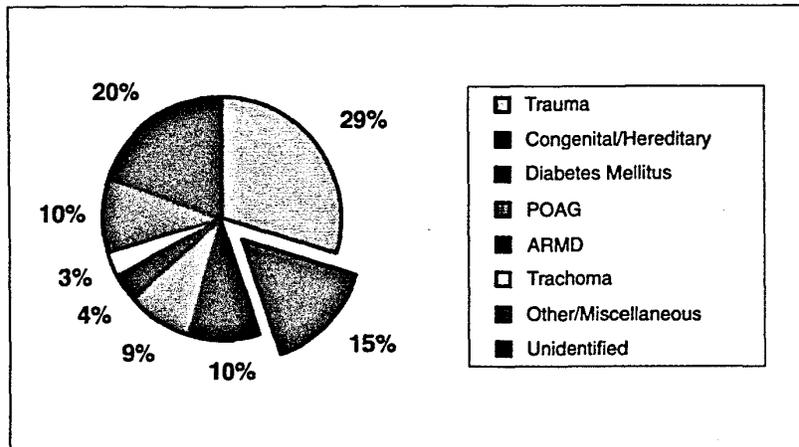


Figure 1 Distribution of etiologies of total decreased vision.

Results

Data were collected on 361 persons, with a total of 455 affected eyes. There were 94 cases of legal blindness and 267 cases of monocular vision loss.

Considering all 455 affected eyes, Table 1 classifies the cases by etiology (also, see Figure 1). The main causes of total decreased vision were found to be (in descending order): trauma, congenital/hereditary conditions (see Table 2),

Table 3. Etiology versus known age of onset

Etiology	Known age of onset (years of age)			Total
	0 to 17	18 to 49	>50	
Trauma	15	53	10	78
Congenital/hereditary	54	3	0	57
Diabetes mellitus	0	10	9	19
POAG	0	1	2	3
ARMD	0	0	6	6
Trachoma	0	0	0	0
Other/miscellaneous	7	9	5	21
Unidentified	7	11	12	30
Total	83	87	44	214

Table 4. Legal blindness from known, preventable causes in the Navajo population sample

Etiology	No. of patients affected	% of total
Diabetes mellitus	14	24.6%
POAG	9	15.8%
Trauma	8	14.0%
ARMD	5	8.8%
Trachoma	4	7.0%
Other/miscellaneous	10	17.5%
Mixed etiology	7	12.3%
Total	57	100.0%

diabetes mellitus, primary open-angle glaucoma (POAG), age-related macular degeneration (ARMD), and trachoma. There were also a variety of causes that make up the other/miscellaneous category, and a significant number of cases for which etiology was not identified.

Table 3 lists the causes of decreased vision (total number of eyes affected) versus known age of onset. Age of onset was reported in 214 cases (47%) of the total of 455 cases. In descending order of number of cases reported, these cases were: trauma, congenital/hereditary, diabetes mellitus, ARMD, and primary open-angle glaucoma. For trachoma patients, no known age of onset was reported. There were, however, known ages of onset for patients with other/miscellaneous and unidentified causes.

Table 4 lists cases of legal blindness from known preventable causes (i.e., 57 of the 94 cases of

legal blindness). The leading preventable cause in this category was diabetes mellitus, followed by primary open-angle glaucoma, trauma, ARMD, other, and mixed etiology.

Table 5 contains the causes of monocular vision loss, listed in descending order. These conditions were trauma, congenital/hereditary, primary open-angle glaucoma, diabetes mellitus, trachoma, and ARMD. Again, there were other/miscellaneous and unidentified causes.

Table 6 details the causes of decreased vision, in terms of total number of eyes affected, according to gender. For males, these causes (in descending order) were trauma, congenital/hereditary, primary open-angle glaucoma, diabetes mellitus, ARMD, and trachoma. For females, the descending order of frequency was trauma, followed by congenital/hereditary and diabetes mellitus (of equal prevalence), primary open-angle glaucoma, trachoma, and ARMD. For both males and females, there were other/miscellaneous as well as unidentified causes.

Discussion

Trauma represented the largest single cause (overall) of decreased vision in this study, as well as being the largest preventable cause. A significant proportion (32%) of trauma-related eye injuries resulted from fist fights and various types of assaults, with weapons such as firearms, baseball bats, and knives. Alcohol consumption

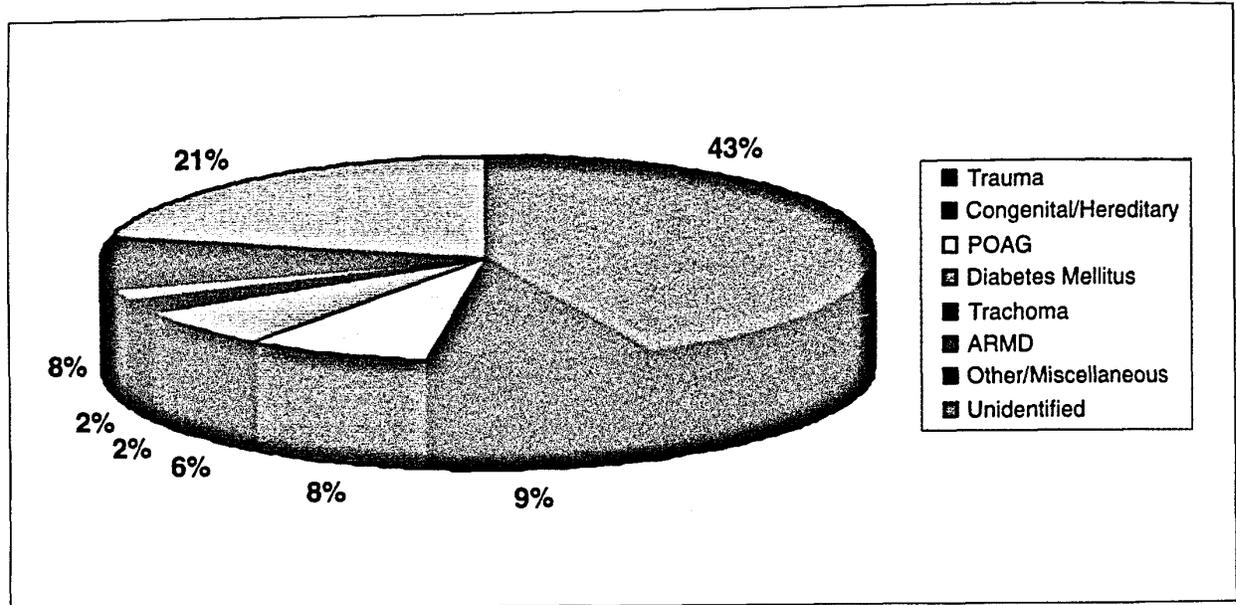


Figure 2 Distribution of etiologies of monocular vision loss.

was mentioned in a number of incidents. There were also many eye injuries resulting from work and home accidents (23%), of which 44% were wood-chip injuries. The largest group of traumatic eye injuries (37%) were of unknown etiology, as a result of the patients' reluctance to divulge the causes or because of poor memory. Only 8% of eye trauma cases correlated with miscellaneous causes such as automobile accidents, boxing, and domestic violence. Trauma was, by far, the largest cause of monocular vision loss (43%), and the number one cause of total decreased vision among both males (40%) and females (16%). The lower percentage of vision loss among females indicates, possibly, a lower propensity toward violent altercations; however, the figure for traumatic decrease in vision for females may also be influenced by a reluctance to report instances of domestic violence.

While occurrences of violence relate to socioeconomic conditions beyond the scope of optometry, traumatic vision loss remains an immense challenge to eye care providers on the Navajo reservation.

Table 5. Monocular vision loss

Etiology	No. of patients affected	% of total
Trauma	115	43.1%
Congenital/hereditary	25	9.4%
POAG	21	7.9%
Diabetes mellitus	17	6.4%
Trachoma	6	2.2%
ARMD	5	1.9%
Other/miscellaneous	22	8.2%
Unidentified	56	20.9%
Total	267	100.0%

Table 6. Etiology versus gender

Etiology	Males		Females	
	No.	%	No.	%
Trauma	102	40.2%	33	16.4%
Congenital/hereditary	36	14.2%	32	15.9%
Diabetes mellitus	13	5.1%	32	15.9%
POAG	24	9.4%	16	8.0%
ARMD	8	3.1%	9	4.5%
Trachoma	4	1.6%	11	5.5%
Other/miscellaneous	21	8.3%	24	11.9%
Unidentified	46	18.1%	44	21.9%
Total	254	100.0%	201	100.0%

It must be noted, however, that 68% of reported trauma cases (53 of 78) occurred in the 18- to 49-year-old age range—a relatively youthful population. This fact allows for opportunities in terms of raising awareness as to the causes and consequences of eye trauma; patient education efforts might reduce the number of cases seen in the future.

Congenital/hereditary causes of decreased vision were second (overall) in terms of the number of cases encountered in this study, and they accounted for the greatest number of nonpreventable cases. Retinitis pigmentosa (RP) represented the largest single etiology of congenital/hereditary causes (43%), followed by oculocutaneous albinism (10%). Also reported were cases of Stargardt's disease, congenital toxoplasmosis, microphthalmus, nanophthalmus, congenital cataracts, congenital nystagmus, retinopathy of prematurity, cortical blindness, optic nerve hypoplasia, chorioretinal coloboma, and amblyopia.

Retinitis pigmentosa among the Navajo has already been reported to occur in higher frequencies (about four times higher than whites) in previous studies: a frequency of approximately 1/1800 among Navajo versus 1/7000 among whites.^{1,3} While the visual prognosis for RP and albinism patients may sometimes be poor, optometrists can still be of service to such individuals by providing low-vision rehabilitation. Practitioners can also help by referring patients for Braille training and for social, educational, and transportation services. Referral to trained Navajo nurses³ for genetic counseling must be emphasized as well.

Diabetes mellitus was the number three cause of decreased vision (10%) identified in this study. Diabetes mellitus was also the number one known cause of preventable legal blindness. This finding is significant, considering that preventative measures such as panretinal laser photocoagulation therapy are available without charge to Navajos from the IHS.⁴ An interesting point was that females accounted for 71% of cases of vision loss (32 of 45) in this category. This may be a result of females having less access to the transportation needed to convey them to the treatment facilities. Lack of available transportation was mentioned by Sugarman⁴ as a major factor in patients not receiving adequate treatment for diabetic retinopathy. It is also possible that patients with diabetes are not convinced that therapy is needed, however, because of the lack of symptoms (e.g., patients with retinopathy that has not significantly affected visual acuity).

Among diabetic individuals in the study, 52.6% experienced the onset of disease between the ages of 18 and 49 years, whereas 47.4% reported the onset of disease after 50 years of age. This finding tends to indicate that type II (adult-onset) disease was predominant in the study sample, since it is usually associated with an onset in excess of 30 years of age.¹⁰ Accordingly, type I diabetes commonly begins at 10 to 20 years of age,¹¹ and has been reported as rarely occurring among American Indians.^{12,13} Further, type II diabetes has been reported as having a 40% higher prevalence in Native Americans than white Americans.¹⁴

It has been well documented that the prevalence of type II diabetes mellitus among Navajo Indians has increased substantially¹⁵—concomitant with a parallel increase in obesity—over the past half century. Sugarman and associates⁴ have suggested that this increase in obesity may be attributed to higher levels of caloric consumption, facilitated through government commodity programs and “fast food” restaurants. Reduced physical activity as a result of modern transportation and technology, along with a genetic propensity to obesity, might have also contributed to this trend.

Obesity has been well cited as a significant risk factor for type II diabetes mellitus among middle-aged Americans and, more specifically, middle-aged Navajos.⁴ Eighty percent of type II individuals are 15% above their ideal weight;¹⁴ obesity creates insulin resistance and diminished insulin production.¹⁶ Therefore, increased efforts to control obesity and monitor cholesterol levels are of prime importance in prevention of type II diabetes mellitus and reduction of vision loss associated with this form of the disease.

Primary open-angle glaucoma (POAG) was the fourth leading cause of vision loss overall. The most significant finding was that the age of onset was known in only 7.5% of glaucoma cases (3 of 40), as opposed to 47% for all causes (214 of 455). This statistic is an indication that, to a large extent, glaucoma cases may have been diagnosed in the past only after significant progression of the disease. Even today, many patients are probably unaware they have the disease until considerable damage has occurred, and therefore do not seek eye evaluations in a timely manner. On the other hand, poor compliance to therapy may also be a problem. In either case, further investigation is warranted to determine the reasons behind glaucoma-related vision loss.

At present, eye care providers would be wise to consider new efforts aimed at identification of glaucoma suspects within the Navajo community. Glaucoma screenings at chapter houses and senior citizen centers may be a practical way to detect glaucoma suspects.

Age-related macular degeneration and trachoma represented the fifth and sixth leading causes of vision decrease, respectively. Cases of end-stage "wet" ARMD may be managed through the use of laser photocoagulation. Trachoma cases must be observed in a different light: no age of onset was reported for any of these cases—presumably because they had onset many years ago. Trachoma probably does not, therefore, currently represent a significant risk factor for fully-sighted individuals.

The miscellaneous and unidentified causes of decreased vision represented 29.7% of all cases (135 of 455). Unfortunately, for obvious reasons, these cases do not lend themselves well to the type of focused intervention that is the subject of this report.

Recommendations

Currently reported causes of decreased vision (both monocular and binocular) among the Navajo were found to be (in descending order): trauma, congenital/hereditary causes, diabetes mellitus, primary open-angle glaucoma, age-related macular degeneration, and trachoma. Trauma remains today the most common cause of vision loss in this population, as was previously reported by Friederich.¹ The significance of type II diabetes mellitus in our report reflects its currently high prevalence among the Navajo. This finding is noteworthy because Friederich did not report diabetes as a leading cause of blindness—nor even as a minor cause. Glaucoma remains one of the leading causes of blindness (as reported 15 years ago), whereas ARMD was not identified by Friederich as a blindness-causing pathology. Active trachoma has continued to dramatically decline over the years and does not pose a serious problem today. There were also a large number of cases (19.9%) in which etiology was not identified, and a number of cases (10.0%) from a variety of numerically small causes (the 'other/miscellaneous' category).

Considering etiology as well as preventability, it is suggested that trauma, diabetes mellitus, and primary open-angle glaucoma be targeted for

intervention aimed at reducing the occurrence of vision loss among the Navajo. Together, these causes accounted for 48.4% of all cases (220 of 455); of preventable cases, they represented 56.8% of the total (220 of 387). These three causes of vision loss present eye care providers with significant opportunities for reducing preventable blindness in the Navajo community.

Since most cases of trauma are preventable (e.g., cases of assaults, work and home accidents), focused intervention should be possible. Patient education should stress the visual consequences of head trauma and eye injuries. The importance of being examined immediately after trauma must also be addressed. And, finally, the promotion of the use of protective eyewear is essential.

Diabetes mellitus (type II) is another significant cause of preventable blindness. Aggressive measures to control obesity and careful monitoring of cholesterol checkups for overweight patients would certainly be worthwhile, with potential for reducing blindness from this disease. Public and patient education on the importance of eye examinations for diabetic retinopathy would also be useful, as in stressing the possible ocular consequences of unmanaged diabetes. Furthermore, the availability of treatment (i.e., panretinal laser photocoagulation) for late-stage diabetic retinopathy should be promoted; likewise, improving the availability of transportation would be of positive value.

Of critical importance is addressing cultural perceptions concerning the nature of diabetes mellitus. Huttlinger et al.¹⁷ have reported that attempts to explain the disease in physiologic terms are generally not successful—and usually do not improve patient compliance with therapy. Huttlinger suggests a more practical approach, involving the use of metaphorical expressions to improve patient cooperation. Clinicians might depict diabetes in terms of its visually destructive nature, rather than focusing on technical terminology—and direct patient attention toward saving their remaining vision. This type of practical approach might serve to improve patient perception of diabetes, as well as compliance with therapeutic regimens. And the importance of treating patients with respect and cultural sensitivity cannot be overstated in this context.¹⁸

Primary open-angle glaucoma, the third leading cause of preventable vision loss in this study, should be addressed as well. Patient instruction on the need for periodic glaucoma screenings must be promoted, along with the necessity of patient compliance with prescribed therapy. Again—as with diabetes—doctor-patient communication should stress practical issues involving the prevention of blindness.

For all three causes of vision loss, it is suggested that a multimedia campaign be implemented involving flyers, brochures, posters, and—where possible—television and radio advertisements aimed at promotion of patient and public awareness of these issues in the Navajo community. It is hoped that such activities might affect a reduction in the number of reported cases of decreased vision resulting from trauma, diabetes mellitus, and primary open-angle glaucoma. Future studies might then assess the impact of these interventions on reported causes of vision loss among the Navajo.

References

1. Friederich R. Eye disease in Navajo Indians. *Ann Ophthalmol* 1982;14:38-40.
2. Schwartz B, Harrison LH, et al. Investigation of an outbreak of *Moraxella conjunctivitis* at a Navajo boarding school. *Am J Ophthalmol* 1989;107:341-7.
3. Heckenlively J, Friederich R, Farson C, et al. Retinitis pigmentosa in the Navajo. *Metabol Ped Ophthalmol* 1981;5:201-6.
4. Sugarman JR, Bauer MC, Barber EL, et al. Factors associated with failure to complete treatment for diabetic retinopathy among Navajo Indians. *Diabetes Care* 1993;16:326-8.
5. Sugarman JR. Prevalence of diagnosed hypertension among diabetic Navajo Indians. *Arch Intern Med* 1990;150:359-62.
6. Caplan L. The American Indian—the long road to eye care. *J Am Optom Assoc* 1978;49:203-5.
7. Ashby E. Indian Health Service eye care manpower and services. In: Goss DA, Edmondson LL, eds. *Eye and vision conditions in the American Indian*. Yukon, Okla.: Pueblo Publishing, 1990:167-72.
8. Hoppe E. A year in the life: Southern California College of Optometry student experiences in the Indian Health Service. *J Am Optom Assoc* 1996;67:257-62.
9. Wong SG. Reflections of the early years of the Indian Health Service Optometry Program. *J Am Optom Assoc* 1996;67:288-93.
10. Cotran RS, Kumar V, Robbins SL. *Robbin's pathologic basis of disease*, 4th ed. Philadelphia: W.B. Saunders Company, 1989:994.
11. Kanski JJ. *Clinical ophthalmology*, 3rd ed. London: Butterworth-Heinemann, 1994:344.
12. Sugarman JR, Hickey M, Hall T, et al. The changing epidemiology of diabetes among Navajo Indians. *West J Med* 1990;153:140-5.
13. Saiki JH, Rimoin DL. Diabetes mellitus among the Navajo. *Arch Intern Med* 1968;122:1-5.
14. Adlin EV. Endocrine and metabolic diseases. In: Myers AR, ed. *Medicine*, 2nd ed. Philadelphia: Harwal Publishing, 1994:424-5.
15. Sugarman J, Gohdes DM. Diabetes among American Indians: epidemiology and non-ocular complications. In: Goss DA, Edmondson LL, eds. *Eye and vision conditions in the American Indian*. Yukon, Okla.: Pueblo Publishing, 1990:19-27.
16. Alexander LJ. Primary care of the posterior segment, 2nd ed. Norwalk, Conn.: Appleton and Lange, 1994:232-4.
17. Huttlinger K, Krefting L, Drevdahl D, et al. A. "Doing battle": A metaphorical analysis of diabetes mellitus among Navajo people. *Am J Occup Therapy*, 1992;46:706-12.
18. Westbrook P, Cauthron S, Thompson LA. Ethnicity and compliance. In: Goss DA, Edmondson LL, eds. *Eye and vision conditions in the American Indian*. Yukon, Okla.: Pueblo Publishing, 1990:181-5.

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