PREVALENCE OF DIABETES MELLITUS AND DIABETIC RETINOPATHY IN THE NATIVE POPULATION OF PAWNEE, OK

by

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ABSTRACT

Background: Diabetes mellitus and associated diabetic retinopathy are serious, vision threatening conditions. The prevalence of diabetes within American Native populations has increased and has been documented as higher than national averages. This research study assesses the prevalence of diabetes and diabetic retinopathy within a select population of American Natives in Pawnee, Oklahoma. Further analysis compares this data to national averages. *Methods*: Data for this project was gathered through complete patient examination at an Indian Health Service located in Pawnee, Oklahoma. Collection of data occurred from August to December 2013, resulting in 408 patient data entries. *Results*: Cross sectional analysis was performed on data collected. The prevalence of diabetes was assessed at 25.5%. The prevalence of diabetes for female patients was found to be 28.8% and 21.7% for male patients. The prevalence of diabetic retinopathy was found to be 10.57%. *Conclusions*: Compared to national averages, American Natives of Pawnee have an increased prevalence of diabetes. For accurate comparison of the prevalence of diabetic retinopathy found in this study, further national research needs to be completed. Based on these findings, further educational and preventative programs should be initiated to properly manage diabetes and the potential diabetes related eye disease.

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Introduction

Diabetes Mellitus Type II is characterized by elevated blood glucose levels as a result of poor insulin production, insulin action, or both[1]. Current statistics show diabetes and prediabetes in the United States has and will continue to grow. 8.3% of the US population, or roughly 25.8 million Americans have diabetes, while 7 million are unaware they have the disease[1]. Among American adults age 20-74, diabetes is the leading cause of new cases of blindness[2].

The detrimental effects of this disease cause the risk of death to increase to twice that of people of similar age without diabetes[3]. The prevalence of diabetes in American Indians has often been described as higher than the general population of the United States. The Indian Health Service reports 14.2% of American Indians and Alaska Natives have diagnosed diabetes, as compared to 8.3% of the US population as a whole[4].

The number of new cases of diabetic retinopathy has also increased, and is predicted to continue to increase. According to the National Eye Institute, the number of cases of diabetic retinopathy in the year 2000 was 4.06 million, compared to 7.68 million in 2010[5].

This study examined diabetes in a select population of American Natives in Pawnee, Oklahoma. A retrospective study was performed looking specifically at the prevalence of diabetes mellitus type II and diabetic retinopathy. This data was then compared to national averages, hypothesizing the rates to be much higher for American Indians in Pawnee, Oklahoma.

Methods

All subjects for this retrospective study were patients at the Pawnee Indian Health

Center of Pawnee, Oklahoma. This facility is a federally funded medical service unit of the Indian Health Service[6]. Patients either have Native American ancestry or have enrolled in a federally recognized Native American Tribe[6].

Data for this study was gathered between September 13, 2013 and December 13, 2013. Comprehensive ocular examinations were performed on all patients; including case history, refraction, anterior segment evaluation, and dilated posterior segment evaluation. Diabetic patients were further categorized as having no diabetic retinopathy, mild non-proliferative diabetic retinopathy (NPDR), moderate NPDR, severe NPDR, or proliferative diabetic retinopathy (PDR). Diabetic patients presenting for follow up care or for consultation with a retinal specialist were excluded from this study.

Results

Patients were categorized based on complete ocular examination, age, gender, and subtype of diabetic retinopathy. Of a total of 408 patients, 215 were identified as female and 193 as male. Female diabetics had an average age of 59.3 compared to the male average age of 61.2. The total number of female and male patients identified as diabetic was 104, or 25.5%. Of these patients, 62 or 59.61% were female with the remaining 42 or 40.39% male. This leads to a female diabetes prevalence of 28.8% and a male diabetes prevalence of 21.7% (See Table 1).

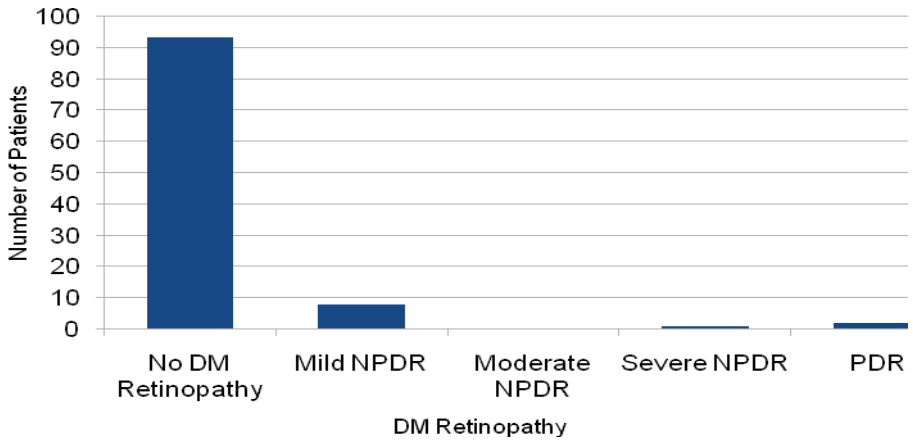
Table 1: Total percentage of patients with diabetes

	All patients	Female patients	Male patients
Percentage with diabetes	25.50%	28.80%	21.70%

Of the 104 diabetic male and female subjects, 11 or 10.57% presented with diabetic retinopathy. Delving deeper into the 104 diabetic patients reveals 93 or 89.42% without retinopathy, 8 or 7.69% with mild NPDR, 0 with moderate NPDR, 1 or 0.96%

with severe NPDR, and 2 or 1.92% with PDR (See Chart 1).

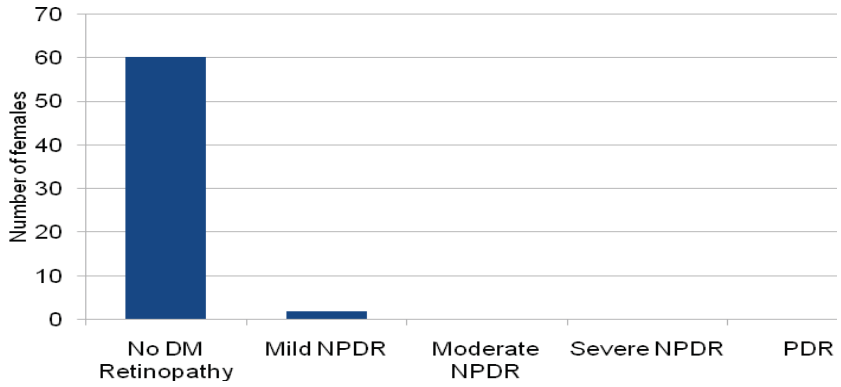
Chart 1: Diabetic patients with and without retinopathy



Relating each female and male diabetic patient to their respective posterior segment ocular examination reveals additional information.

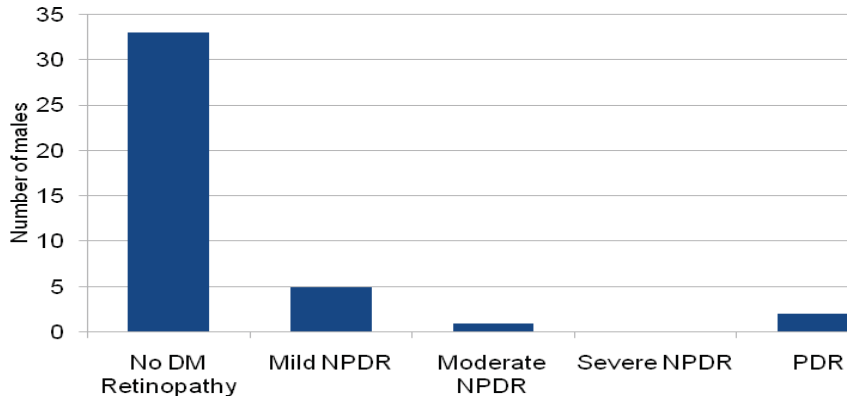
The total number of female diabetic patients was 62. Of these patients, 60 or 96.77% of all diabetic females presented with no diabetic retinopathy. 3.23% or 2 female diabetic patients had mild NPDR, while no subjects exhibited moderate NPDR, severe NPDR, or PDR (See Chart 2)

Chart 2: Female Diabetic Patients With and Without Retinopathy



The total number of male diabetic subjects was 42. Of these patients, 33 or 78.57% revealed no diabetic retinopathy. 11.90% or 5 patients had mild NPDR, 2.38% or 1 patient had severe NPDR, and 4.76% or 2 patients had PDR. No diabetic male patients presented with moderate NPDR (See Chart 3).

Chart 3: Male Diabetic Patients With and Without Retinopathy



Discussion

According to the Centers for Disease Control and Prevention, 25.6 million Americans or 11.3% of the population, for ages 20 or older, have diabetes[4]. Native Americans in Pawnee revealed an elevated incidence of diabetes as compared to that of the national average. 25.5% of Pawnee American Indians presenting for ocular examination were identified as diabetic.

Furthermore, data from the Indian Health Service National Patient Information Reporting Service (IHS NPIRS) from 2009-2011 found that 14.2% of American Indians and Alaska Natives aged 20 years or older who received care from the IHS had diagnosed diabetes[4]. Additionally, 8.4% of Asian Americans, 11.8% of Hispanics, and 12.6% of non-Hispanic blacks had diagnosed diabetes[4]. All of the aforementioned figures are lower than the incidence of 25.5% this study found (See Table 2).

Table 2: Prevalence of Diabetes in the United States, >20 years of Age, by Race

Group	Pawnee, OK	American Indians/ Alaska Natives	Non-Hispanic whites	Non-Hispanic blacks	Asian Americans	Hispanic Americans
Percentage diagnosed with diabetes	25.5%	14.2%	10.2%	12.6%	8.4%	11.8%

The Centers for Disease Control and Prevention also reported 13.0 million, or 11.8% of all men aged 20 years or older have diabetes[4]. This study found a diabetic incidence of 21.7% among male American Indians in Pawnee, Oklahoma. Female American Indians in this study revealed a prevalence of diabetes of 28.8%, compared to

the national prevalence of 10.8%[4]. These figures depict an increased prevalence of diabetes for both male and female American Indians in Pawnee as compared to national averages.

Currently, there is no recent population based data reporting the prevalence of diabetic retinopathy within the United States[7]. Two separate studies published in the Journal of the American Medical Association used population based eye surveys to estimate the prevalence of diabetic retinopathy, separating the data into diabetic retinopathy and vision threatening diabetic retinopathy[7,8]. Diabetic retinopathy was considered with the presence of at least one microaneurysm, while vision threatening was considered in cases revealing severe non-proliferative diabetic retinopathy or proliferative diabetic retinopathy[7,8]. The first study published in 2004 by Kempen et al, revealed an estimated prevalence of diabetic retinopathy of 40.3% and vision threatening diabetic retinopathy at 8.2%[8]. A subsequent study published in 2010 by Zhang et al, found the estimated prevalence of diabetic retinopathy at 28.5%, with the prevalence of vision threatening at 4.4%[7]. This study found a prevalence of diabetic retinopathy of 10.57% in American Indians in Pawnee, Oklahoma. Applying the same criterion for vision threatening diabetic retinopathy reveals a prevalence of 2.98%. Comparing these values to the estimated national prevalence, reveals a decreased prevalence of diabetic retinopathy and vision threatening diabetic retinopathy among American Natives in Pawnee.

These results show significantly elevated rates of diabetes for both male and female American Indians as compared to national averages. These results could be artificially high since all data was collected at a medical service unit, with many diabetic

patients being referred for ocular examination from their primary care physician. Additionally, this study depicts a decreased prevalence of diabetic retinopathy and vision threatening diabetic retinopathy as compared to estimated national averages. Since the national prevalence of diabetic retinopathy and vision threatening diabetic retinopathy are not well researched, this study compared data from one specific subgroup of the population to an estimated prevalence of the population as a whole. The comparative value of this could be perceived as relatively low because of study design differences. Additionally, these results could be artificially low due to the size of this study as compared to the much larger study performed on the national level.

Conclusion

Results from this study indicate an increased prevalence of diabetes within a select population of American Indians in Pawnee, Oklahoma. These results may be artificially high due to the study design. For example, many diabetic patients are referred for ocular examination by their primary care physician. These results do align with previous data showing an increased prevalence of diabetes for American Indians when compared to national norms. Large scale research into the prevalence of diabetes within American Native populations needs to be completed for continued development of appropriate prevention and treatment programs. Furthermore, more research into the prevalence of diabetic retinopathy and vision threatening diabetic retinopathy needs to be completed for a more complete view of the detrimental effects of diabetes within the population of the United States.

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Library Approval and Release

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Doctoral Candidate

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