The Intra-Ocular Pressure of Type 2 Diabetic Patients Comparison in Diabetic Retinopathy Grades

Mehdi Moeini[1], Reza Soleimanizad[2], Akram Ghadiri-Anari[3], Masoud Reza Manaviat[4], Farimah Shamsi[5], Masoud Rahmanian[3*]

1. Medical Student, Shahid Sadoughi Medical University, Yazd, Iran.
2. Department of Ophtalmology, Shahid Sadoughi University of Medical Sciences and Health Services, Yazd, Iran.
3. Diabetes Research Center, Shahid Sadoughi University of Medical Science, Yazd, Iran.
4. Yazd Research and Clinical Center for OB\GYN Shahid Sadoughi University of Medical Sciences, Yazd, Iran.
5. Statistics PhD, Shahid Sadoughi Medical University, Yazd, Iran.

***Correspondence:**
Reza Soleimanizad, Department of Ophtalmology, Shahid Sadoughi University of Medical Sciences and Health Services, Yazd, Iran.
Tel: (98) 824 8787
Email: Dr.r.soleimanizad@gmail.com

Received: 02 July 2017

Accepted: 01 August 2017

Published in September 2017

Abstract

Objective: Retinopathy is a microvascular complication of diabetes in the retina. It is hypothesized the aqueous flow decrease in patients with retinopathy which effects the Intra-ocular pressure (IOP). The purpose of this study is to determine whether a significant correlation exists between IOP and diabetic retinopathy grades.

Materials and Methods: Our study is analytic cross sectional. About 413 type 2 diabetic patients were studied. They were between 40 to 70 years and did not have glaucoma. They were examined in the ophthalmologist's clinic and grading of retinopathy was done. IOP was recorded in each cases. Data was then analyzed in SPSS.

Results: Of the 413 type 2 diabetic patients, 329 were diagnosed with diabetic retinopathy and 84 without diabetic retinopathy. There was no significant difference between the mean IOP of patients with diabetic retinopathy and without diabetic retinopathy (*P*-value=0.53). Also there was no significant difference between the diabetic retinopathy grades. (*P*-value=0.07).

Discussion: In conclusion, our findings showed that there was no a significant correlation between IOP and grade of diabetic retinopathy.

Keywords: Intra-ocular pressure, Type 2 diabetes, Diabetic retinopathy.

Introduction

Diabetic retinopathy is the disorder of microvascular in the retina. So it is the leading cause of blindness (3,4). A correlation exists between diabetic retinopathy and increased risk of life threatening vascular complications like coronary artery disease. (1) The stages of diabetic retinopathy categorized as; non-proliferative diabetic retinopathy to proliferative diabetic retinopathy. The signs of non-proliferative in retina are dot blot hemorrhages, microaneurysms, hard exudates and cotton wool spots. The proliferative

[Downloaded from ijdo.ssu.ac.ir on 2026-11-18]

diabetic retinopathy is retinal neovascularization. (3,5)

The aqueous flow is formed by ciliary body and exists from the eye through trabecular meshwork and uveoscleral outflow pathways. So the balance between them, cause the intraocular pressure (IOP) (7). Keeping the IOP within the normal range is necessary for health of the eye. It is hypothesized that in the presence of diabetic retinopathy, we will have decreased aqueous flow which could affect the IOP. (8)

Thus the purpose of this study was to determine a significant correlation between IOP and the steps of diabetic retinopathy.

Materials and Methods

We carried out an analytic cross sectional study from March 2015 through August 2016 in the experienced ophthalmologist's clinic in Yazd, Iran.

At the initial examination, all patients were interviewed regarding their medical history. The exclusion criteria were; patients who were younger 40 years old , had ocular inflammatory disease , fundus disease except for diabetic retinopathy, corneal disease, uveitis, glaucoma, any intraocular surgery and those who were receiving IOP lowering treatments.

The patients underwent a slit-lamp examination and a dilated fundus examination for retinopathy grading. The stage of diabetic retinopathy was determined by ophthalmoscopy and fluorescein angiography and the findings were classified as no apparent diabetic retinopathy, mild to moderate nonproliferative diabetic retinopathy, severe nonproliferative diabetic retinopathy and proliferative diabetic retinopathy. The patients with proliferative diabetic retinopathy underwent gonioscopy to exclude neovascular glaucoma. The IOP was measured by Goldmann applanation tonometry .All exams were done by the experienced ophthalmologist.

Data were entered into and analyzed using SPSS V.20. Statistically significant values were derived using independent T-test. The *P*-value less than 0.05 was accepted as significant.

Results

Totally 413 patients were studied. About 46.2 % (N=191) were males and 53.8 % (N=222) were females. Their ages ranged from 40 to 70 years. All of them were diagnosed with type 2 diabetes and 329 patients (79.7 %) had diabetic retinopathy.

The mean (±SD) IOP was 15.52 ± 3.37 mmHg in the diabetic retinopathy group and 15.27 ± 3.24 mmHg in the non-diabetic retinopathy group. So there was not a significant correlation between IOP and suffering from diabetic retinopathy. (*P*-value=0.53).

Also in the males, the mean IOP was 15.56 ± 3.24 mmHg in the diabetic retinopathy group (N=152), and 15.33 ± 3.09 mmHg in the non-diabetic retinopathy group (N=39), (*P*-value=0.68). In the females, the mean IOP was 15.49 ± 3.49 mmHg in the diabetic retinopathy group (N=177), and 15.22 ± 3.39 mmHg in the non-diabetic retinopathy group. (N=45), (*P*-value=0.64, T-test). Also there was not a significant correlation between IOP and suffering from diabetic retinopathy in the gender.

Then, we carried out the comparison of IOP in both the subjects and gender according to the grades of retinopathy. In the subjects with mild nonproliferative diabetic retinopathy, the mean IOP was 15.31 ± 2.65 mmHg, in the males was 15.04 ± 2.64 mmHg and in the females was 15.6 ± 2.67 mmHg. (Tables 1-2)

Discussion

The purpose of this study was to determine whether a significant correlation exists between IOP and diabetic retinopathy grades.

We didn't find a significant correlation between them in either the males and females, it is to be noted that, in males, however the *P*-value became significant (*P*=0.002) in association between the IOP and the retinopathy grades.

[Downloaded from ijdo.ssu.ac.ir on 2026-11-18]

Table 1. The mean IOP according to steps of diabetic retinopathy in the subjects

Steps	N	Mean±Std Deviation	*P*-Value
Mild	83	15.31±2.65	**0.07**
Moderate	82	16.30±3.94	
Severe	101	15.01±3.07	
Proliferative	63	15.60±3.73	

Table 2. The mean IOP according to steps of diabetic retinopathy in male and female

Male Step	N	Mean±Std Deviation	*P*-Value
Mild	43	15.04±2.64	**0.002**
Moderate	41	17.12±3.76	
Severe	48	14.68±3.06	
Proliferative	20	15.60±2.68	
Female Steps			
Mild	40	15.6±2.67	**0.97**
Moderate	41	15.48±3.99	
Severe	53	15.32±3.09	
Proliferative	43	15.60±4.16	

Neetens A, et al. reported, when the diabetic retinopathy progresses towards the stage of proliferative, IOP decreases (12). This finding, disagrees with our study, otherwise we didn't find any association between IOP and diabetic retinopathy grades.

The patients with IOP<15 mmHg, have showed greater percentage of retinopathy, reported by Jain Is, et al. Also they found when the IOP increased the diabetic retinopathy frequency decrease. In their study, there were not any diabetic retinopathy with IOP>23 mmHg (11). But our findings are disagreement with these reports moreover in our study some diabetic retinopathy, have IOP>23 mmHg.

Lane JT. et al, studied a total of 20 participants with type 1 diabetes. They found that aqueous flow is slowed even further in patients with microvascular complications like diabetic retinopathy (8). So these findings are disagreement with our findings. In addition, this study was small and included type 1 diabetes patients but our study had greater statistical society and included type 2 diabetes patients.

Matsuoka M, et al found that there was not a significant difference between the IOP and the diabetic retinopathy grades (2) and our findings agree with this study.

Our study has some limitations, first the absence of type 1 diabetes subjects that suffer from retinopathy, including them may help us another relationship between IOP and the grades of retinopathy.

Also we only investigated the Iranian population. So the data from different populations can give us the different statistical results.

Conclusions

Our findings showed that there was not a significant relationship between the IOP and diabetic retinopathy moreover we found that IOP was not significantly associated with diabetic retinopathy.

References

1. Cheung N, Mitchell P, Wong TY. Diabetic retinopathy. Lancet 2010;376(9735):124-36.
2. Matsuoka M, Ogata N, Matsuyama K, Yoshikawa T, Takahashi K. Intraocular pressure in Japanese diabetic patients. Clin Ophthalmol. 2012;6:1005-9.
3. Christina Antonopoulos and Manju Subramanian. Diabetic Macular Edema. In Tech 2012:193-206. Available from: http://www.intechopen.com/books/diabetic-retinopathy/diabetic-macular-edema
4. Kumar B, Gupta SK, Saxena R, Srivastava S. Current trends in the pharmacotherapy of diabetic retinopathy. J Postgrad Med 2012;58:132-9.
5. Jingi AM, Noubiap JJ, Ellong A, Bigna JJ, Mvogo CE. Epidemiology and treatment outcomes of diabetic retinopathy in a diabetic population from Cameroon. BMC Ophthalmol. 2014;14:19.

[Downloaded from ijdo.ssu.ac.ir on 2026-11-18]

6. Verma D. Pathogenesis of diabetic retinopathy--the missing link? Med Hypotheses. 1993;41(3):205-10.
7. Hassan MB, Isawumi MA. Effects of fasting on intraocular pressure in a black population. Middle East Afr J Ophthalmol. 2014;21:328-31.
8. Lane JT, Larson L, Fan S, Stoner JA, Margalit E, Toris CB. Intraocular pressure and aqueous humor flow during a euglycemic-hyperinsulinemic clamp in patients with type 1 diabetes and microvascular complications. BMC Ophthalmol. 2010;10:19.
9. Biswas S, Raman R, Koluthungan V, Sharma T. Intraocular pressure and its determinants in subjects with type 2 diabetes mellitus in India. J Prev Med Public Health 2011;44(4):157-66.
10. Gangwani RA, McGhee SM, Lai JS, Chan CK, Wong D. Detection of Glaucoma and Its Association With Diabetic Retinopathy in a Diabetic Retinopathy Screening Program. J Glaucoma. 2014 Sep 26.
11. Jain I S, Gill M, Rastogi G K. Intraocular pressure in young diabetics and its relationship with diabetic retinopathy. Indian J Ophthalmol 1969;17:91-4
12. Neetens A, Badaniova D. Intraocular pressure and diabetic retinopathy. Bibl Anat. 1977;16(2):437-41.

[Downloaded from ijdo.ssu.ac.ir on 2026-11-18]