Further Analysis on Characteristic of Diabetic Reinopathy - A Case in Thai Binh Province in Vietnam

Vu Thanh Binh[1], Dinh Tran Ngoc Huy[2*], Le Dinh Tuan[3]

Abstract

Objective: to study the characteristics of the diabetic retinopathy and some related factors in patients with type 2 diabetes.

Subject and research methods: a cross-sectional descriptive study on 80 patients with type 2 diabetes to be examined and treated at the Internal Medicine Department of Thai Binh Medical University Hospital from January to December 2019.

Result:

- The percentage of patients with damage to the retina accounts for 42.5%; of which, 38.8% were non-proliferative retinopathy, 17.5% were macular disease, 2.5% were pre-proliferative retinopathy and 1.2% were proliferative retinopathy.
- The risk of retinal damage increased higher in women than in men; the OR coeffecient of subgroups, namely age ≥ 70 years; diabetic duration ≥ 10 years; BMI ≥ 23 (kg/m2), hypertension, was 1.4; 2.5; 4.0; 4.5; 2.5, respectively. Patients with blood glucose ≥ 7 mmol/L, HbA1c ≥ 7%; total cholesterol > 5.2 mmol/L, triglyceride > 1.88 mmol/L had higher risk of retinopathy with OR coefficient of 2.3; 2.5; 3.2; 2.0, respectively. Patients who were non-compliance with treatment had 3.8 times higher risk of retinopathy than those who complied with treatment.

Conclusion: the percentage of patients with retinopathy was 42.5%, the risk of retinopathy increased in patients with one of the following characteristics: female, age ≥ 70 years, duration of diabetes ≥ 10 years, BMI ≥ 23 (kg / m2), hypertension, blood glucose concentration ≥ 7 mmol/L, HbA1c ≥ 7%; cholesterol> 5.2 mmol/L, triglyceride> 1.88 mmol/L.

Key Words: Type 2 Diabetes Mellitus, Retinopathy.

DOI Number: 10.14704/nq.2021.19.6.NQ21069 **NeuroQuantology 2021; 19(6):61-66**

Introduction

Diabetes mellitus (DM) affects more than 400 million people worldwide and is expected to affect 642 million people by 2040. In Vietnam, the proportion of adults with diabetes is increasing with the increasing prevalence of diabetes. Socio-economic development (Hoa, 2008), (Shotlift and Duncan, 2005). Diabetic retinopathy (diabetic retinopathy) is one of the most common complications of diabetes and a cause of blindness in adults. The early stages of diabetic retinopathy are characterized by microvascular lesions, punctate and mottled hemorrhages, and exudates. In the later stages, retinal neovascularization and its complications are obvious. Diabetic macular edema that can occur at any stage of diabetic retinopathy is caused by increased vascular permeability and leads to protein leakage and lipid secretions in the macula (Shotlift and Duncan, 2005).

Corresponding author: Dinh Tran Ngoc Huy
Address: [1]Thai Binh University of Medicine and Pharmacy, Vietnam; [2*]Banking University, HCMC Ho Chi Minh City, Vietnam. International University of Japan, Japan; [3]Thai Binh University of Medicine and Pharmacy, Vietnam.
[2*]E-mail: Dtnhuy2010@gmail.com
Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.
Received: 28 March 2021 **Accepted:** 14 May 2021

The pathogenesis of diabetic retinopathy is complex and is related to the chronic inflammatory process in the pathophysiology of diabetes (Nam, 2012). Studies have shown that diabetic retinopathy complications appear in one third of people with type 2 diabetes with an average duration of 9 years, this rate increases with the longer the time of diagnosis, up to 20 years after the diagnosis. 100% of patients have diabetic retinopathy, so it is necessary to screen for diabetic retinopathy to help detect patients at risk of developing diabetic retinopathy early and intervene promptly (Shotlift and Duncan, 2005). Currently, studies on diabetic retinopathy in Vietnam are still limited, therefore, we carried out this study with the aim of: understanding the characteristics of retinal damage and some related factors in patients. Type 2 diabetes.

Methodology

Research Subjects and Methods

1. Research Object

Including 80 patients (patients) diagnosed with type 2 diabetes were examined and treated at the Internal Medicine Department of Thai Binh Medical University Hospital from 1/2019 to 12/2019.

- Criteria for selection:

+ The patient was diagnosed with type 2 diabetes aged 30 - 80 years old, both eyes were ophthalmoscopy to diagnose retinopathy.

+ The patients agreed to participate in the study.

- Exclusion criteria:

+ Patients with severe or acute illness: coma, pre-coma, hypoglycemia, paroxysmal hypertensive crisis, tuberculosis, pneumonia, HIV, hepatitis, severe renal failure, severe anemia, hemorrhage pregnancy, unstable angina, cerebrovascular accident, myocardial infarction, coagulopathy, severe exhaustion, mental disorder.

+ The patient has had pre-existing retinal disease: glaucoma, ocular interventional surgery.

+ Patients did not cooperate, did not collect enough research criteria.

2. Research Methods

- Study design: prospective, cross-sectional description.

- Select the research sample: by the convenient sampling method.

- Research content: clinical examination: asking time of diabetes detection, medical history...; General examination of organs: respiratory, cardiovascular, digestive, neurological, urinary... Subclinical and functional exploration: basic blood biochemical indicators: blood glucose, HbA1c and other tests other basic tests.

- Standards used in the study:

+ Diagnostic criteria for diabetes according to the recommendations of the ADA (American Diabetes Association) in 2015 (Nam, 2012).

+ Classification of hypertension based on the criteria of the European Society of Hypertension and Cardiology (2013).

+ Classification of BMI (Body Mass Index) according to the classification criteria of the Asia-Pacific Diabetes Association 2000.

+ Criteria for diagnosis and classification of eye lesions: all patients had ophthalmoscopy, performed by an ophthalmologist. Evaluation of the stages of DR is classified according to the ETDRS (Early Treatment Diabetic Retinopathy Study) (Omolase, 2010):

Non-proliferative retinopathy: lesions include: retinal capillary aneurysm, slight hemorrhage, stagnation of secretions in the retina, retinal edema.

Diabetic macular disease: focal macular disease: well-defined leaky areas with hard exudates; diffuse macular disease: cystic macular edema; ischemic macular disease: visual impairment with relatively normal macular manifestations despite bleeding and exudation elsewhere; mixed macular disease, diffuse macular edema, ischemia

Pre-proliferative diabetic retinopathy: ischemic lesions, hemorrhages, exudates and retinal edema.

Proliferative diabetic retinopathy: abnormal proliferation of new vessels, continuous bleeding, organization and contraction of retinal fluid, severe retinal damage, retinal tear or detachment, blind.

Data processing: using SPSS 20.0 software

Main Results

The rate of male patients is 33.7%, female patients 66.3%; average age 67.2 ± 13.9 years; BMI ≥ 23 (kg/m2) is 21.3%; 65.0% increase in blood pressure; average glucose concentration was 9.8 ± 6.1 mmol/L (ratio ≥ 7 mmol/L was 38.7%); Mean HbA1c 8.3 ± 4.9% (prevalence ≥ 7% is 35.0%); average cholesterol 5.6 ± 3.1 mmol/L (ratio ≥ 5.2 mmol/L is 40.0%); the average triglyceride was 3.3 ± 2.4 mmol/L (ratio ≥ 1.88 mmol/L was 32.5%); the rate of patients diagnosed with diabetes over 10 years is 37.5%.

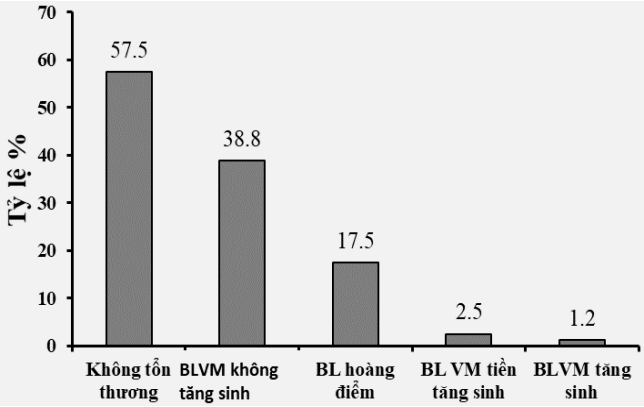

Chart 1. Rate of retinal damage of study subjects (n=160 eyes)

The percentage of eyes with retinal damage accounted for 42.5%, of which non-proliferative retinal disease (BL) accounted for 38.8%, macular disease accounted for 17.5%. Proliferative pathology accounted for a low rate with pre-proliferative and proliferative 2.5% and 1.2%, respectively.

Table 1. Relationship between retinopathy and gender, time to diabetes detection and treatment adherence (n = 80)

Features		*Retinal injury (n=34)*	*No damage (n=46)*	*OR (95% CI)*	*P*
Sex	*Female*	24 (70,6)	29 (63,0)	1,4 (0,9 - 1,7)	< 0,05
	Male	10 (29,4)	17 (37,0)		
TIme to detect diabete (years)	*≥ 10*	19 (55,9)	11 (23,9)	4,0 (2,5 - 5,3)	< 0,05
	< 10	15 (44,1)	35 (70,1)		
Treatment compliance	*No*	9 (26,5)	4 (9,0)	3,8 (2,7 – 4,3)	< 0,05
	Yes	25 (73,5)	42 (91,0)		

Female diabetic patients have a risk of retinal damage 1.4 times higher than male patients (p <0.05). Patients with type 2 diabetes for 10 years or more have a risk of retinal damage 4.0 times higher than those with less than 10 years (p <0.05). Patients who do not adhere to the treatment regimen have a risk of retinal damage 3.8 times higher than those who adhere to treatment (p < 0.05).

Table 2. Relationship between retinopathy and BMI and blood pressure of patients (n = 80)

Data		*Retinal injury (n=34)*	*No damage (n=46)*	*OR (95% CI)*	*p*
BMI (kg/m²)	*≥ 23*	12 (35,3)	5 (10,9)	4,5 (3,6 – 6,1)	< 0,05
	< 23	22 (64,7)	41 (89,1)		
Hypertension	*Có*	26 (76,5)	26 (56,5)	2,5 (1,8 – 3,6)	< 0,05
	Không	8 (23,5)	20 (43,5)		

Patients with type 2 diabetes with BMI ≥ 23 (kg/m2) had 4.5 times the risk of retinal damage compared with patients with BMI < 23 (kg/m2) (OR: 4.5). In patients with hypertension, the risk of retinal damage was 2.5 times higher than those without hypertension (OR: 2.5) (p <0.05).

Table 3. Relationship between retinopathy and blood glucose and HbA1c levels (n = 80)

Data		*Retinal injury (n=34)*	*No damage (n=46)*	*OR (95% CI)*	*p*
Glucose (mmol/L)	*≥ 7*	17 (50,0)	14 (30,4)	2,3 (1,6 – 3,1)	< 0,05
	< 7	17 (50,0)	32 (69,6)		
HbA1c (%)	*≥ 7*	16 (47,1)	12 (26,1)	2,5 (1,4 – 3,2)	< 0,05
	< 7	18 (52,9)	34 (79,9)		

The group with glucose ≥ 7 mmol/L; HbA1c ≥ 7.0% had 2.3 and 2.5 times higher risk of retinal damage than those with blood glucose < 7 mmol/L and HbA1c < 7% (p < 0.05).

Table 4. Relationship between retinopathy and blood lipid status (n = 80)

Data		*Retinal injury (n=34)*	*No damage (n=46)*	*OR (95% CI)*	*p*
Cholesterol (mmol/L)	*> 5,2*	19 (55,9)	13 (28,3)	3,2 (2,7 – 4,2)	< 0,05
	≤ 5,2	15 (44,1)	33 (71,7)		
Triglycerid (mmol/L)	*> 1,88*	14 (41,2)	12 (26,1)	2,0 (1,5 – 2,8)	< 0,05
	≤ 1,88	20 (58,8)	34 (73,9)		

Group of patients with cholesterol ≥ 5.2 mmol/L; Triglycerides ≥ 1.88 mmol/L have 3.2 and 2.0 times higher risk of retinal damage compared with patients with cholesterol < 5.2 mmol/L; triglycerides < 1.88 mmol/L (p < 0.05).

Discussion

Many studies have confirmed that the rate of diabetic patients in general with retinopathy ranges from 20 to 30%. People with diabetes are 10 to 20 times more likely to go blind than the general population (Shotlift and Duncan, 2005). There are many risk factors leading to diabetic retinopathy such as: duration of diabetes, poor blood glucose control, hypertension, peripheral neuropathy (Nam, 2012). Currently, there are many methods of diagnosing diabetes. Early and fairly accurate DR symptoms such as fundus photography under fluorescent screens, CT scans, ophthalmoscopy, etc. However, due to conditions at Thai Binh Medical University Hospital, new methods could not be deployed. In diagnosing DR, the conventional ophthalmoscopy method is still applied, so it is somewhat limited in assessing fundus damage compared with other methods.

However, ophthalmoscopy is also a highly reliable method for diagnosing retinopathy that many hospitals are currently applying. The results of this study showed that the rate of retinal lesions accounted for 42.5%, of which non-proliferative retinopathy accounted for 38.8%, pre-proliferative retinopathy 2.5% and 2.5% pre-proliferative retinopathy. Proliferative retinopathy has 1 eye accounting for 1.2%, there are 17.5% of eyes with macular disease with the main manifestation of loss of central light. This result is consistent with the published world medical literature showing that at the time of diagnosis, 20-40% of diabetic patients have diabetic retinopathy (Shotlift and Duncan, 2005). The research results are higher than the authors Wang W.Q. (n = 474) shows that the rate of patients with diabetic retinopathy is 21.9%, Nguyen Thi Thu Thao shows that the rate of patients with eye complications is 19% (Thao, 2012). Pham Thi Hong Hoa found that the rate of patients with eye complications was 30.0%, of which non-proliferative retinopathy accounted for 7.6%, proliferative retinopathy 5.2%. Nguyen Thi Phi Nga (2009) found that the rate of eye damage was 37.6%. This difference is probably because the author's research subjects have different time to detect diabetes and need to pay more attention to eye complications in diabetic patients in Thai Binh.

The results of this study show that women have a higher risk of retinal damage than men. According to Nguyen Trong Khai (2018) and Hejlesen (2000), the rate of macular edema in women is more dominant. Many authors hypothesized the role of gender factors in promoting diabetic retinopathy. According to Hejlesen, the female role seems to add to the eye damage, possibly due to the role of female hormones (Omolase, 2010). According to Françoise, when having diabetes for less than 5 years, the rate of retinopathy is 10-20%, over 15 years of diabetes, diabetic retinopathy has been seen in 40-60% and after 25 years 100% of patients have retinopathy (Shotlift and Duncan, 2005). According to Helen Mosnier-Pudar (Shotlift and Duncan, 2005) when diabetes develops 15 years, the majority of patients have diabetic retinopathy. The results of this study also show that the risk of retinal damage in people with diabetes for more than 10 years is 4 times higher than in patients with diabetes for less than 10 years. According to Nguyen Trong Khai (2018), the likelihood of patients with DR increases with the duration of diabetes, the risk of retinopathy increases 1.76 times in patients with diabetes from 5-10 years and 8.78 times with the duration of more than 10 years. year (Shotlift and Duncan, 2005). According to Emeily, this ratio is equivalent to 1.25 times (after 5 years); 1.6 times (after 10 years) and Jack J.K.'s study with a risk of 6.43 times (after 15 years) (Jack, 2003). In addition, non-adherent patients had a 3.8 times higher risk of

retinal damage compared with strictly adherent patients.

Studies show that there is a correlation between nutritional status and risk of diabetic retinopathy, and those with poor nutritional status lead to a very high risk of developing diabetic retinopathy. The results of this study showed that people with BMI ≥ 23 kg / m2 at risk of retinal damage 4.5 times higher. Another study showed that there was a correlation between retinopathy and BMI, waist circumference, waist circumference ... patients with BMI of 25-30 kg / m2 had retinopathy twice as high as those with BMI <25 kg. / m2. Hypertension is also one of the risk factors for the development and progression of diabetic retinopathy, the results of this study show that, in patients with hypertension, the risk of retinal damage is 2.5 times higher than Patients with no hypertension. Research by Nguyen Trong Khai showed that in patients with hypertension, the rate of VMM damage increased by 1.57 times.

The natural progression of diabetes eventually leads to complications, but the early or late onset of complications depends on the effectiveness of multi-factor control, especially glucose and HbA1c, so the Controlled diabetic patient management has helped slow the progression of eye complications for patients. Patients with type 2 diabetes with blood sugar control not reaching the target have an increased risk of diabetes type 2 diabetes and HbA1c higher risk of retinal damage 2.3 and 2.5 times (p <0.05). Nguyen Trong Khai (2018) found that patients with blood sugar levels> 9mmol / l had a double risk of disease compared with patients with normal blood sugar levels, patients with low HbA1c ratio ≤ 7%. have focal macular edema, lighter than the group with high HbA1c rate (Shotlift and Duncan, 2005). At the same time, in this study, type 2 diabetic patients with hypercholesterolemia have a risk of retinal damage 3.2 times; Hypertriglyceridemia, the risk of damage to the retina of the eye is 2.0 higher. Blood lipids have been mentioned by many studies and have an impact on the progression and development of diabetic retinopathy. Many studies have proven that increased lipids, blood triglycerides increase the risk of diabetic retinopathy, retinopathy in patients with progressive increase in cholesterol rate, hypertriglyceridemia ...

Conclusion

Through the study of 80 patients with type 2 diabetes at Thai Binh Medical University Hospital, we draw the following conclusions:

+ The percentage of patients with damage to the retina accounts for 42.5%; Non-proliferative retinopathy 38.8%, macular pathology 17.5%, pre-proliferative retinopathy 2.5% and 1.2% proliferative retinopathy

The risk of damage to the retina is higher in women than in men; Age ≥ 70 years higher than <70 years old; time of detecting diabetes ≥ 10 years, higher than <10 years; BMI ≥ 23 (kg / m2) higher than <23 (kg / m2), higher hypertension group did not increase blood pressure with OR coefficient respectively: 1.4; 2.5; 4.0; 4.5; 2.5.

+ Patients who do not adhere to treatment have the risk of retinal damage 3.8 times higher than that of patients who adhere to treatment.

+ Patients with BMI ≥ 23 have 4.5 times greater risk of retinal damage than patients with BMI <23.

+ Patients with blood glucose concentration ≥ 7 mmol / L, HbA1c concentration ≥ 7%; cholesterol concentration> 5.2 mmol / L, triglyceride concentration> 1.88 mmol / L have higher risk of retinal damage with OR coefficient respectively: 2.3; 2.5; 3.2; 2.0.

Acknowledgement

Thank you editors, friends and Mr Dinh Tran Ngoc Huy (dtnhuy2010@gmail.com) to support this publishing.

References

Hoa PTH. *Research on the results of controlling some clinical indicators, subclinical, complications in patients with type 2 diabetes management and outpatient treatment.* Thesis Tien Doctor of Medicine, Military Medical Academy 2009

Khai NT. *Study on epidemiological and clinical characteristics of diabetic retinopathy and effectiveness of interventions in Ha Nam province*. Doctor of Medicine thesis, Hanoi Medical University 2018.

Nam PV. Diabetic retinopathy. *Proceedings of the 6th National Conference on Endocrinology - Diabetes,* 2012; 2(7): 86-93.

Nga NTP. *Research on serum TNFα, CRP concentrations and related to the morphology and function of the primary carotid artery by vascular doppler ultrasound in type 2 diabetic patients.* Military Medical Academy 2009.

Thao NT. *Research on clinical features and insulin resistance in newly diagnosed type 2 diabetic patients.* Doctor of Medicine Thesis, Military Medical Academy 2012.

Chinh NTM, Ngoc PTB, Lo NM, Hang DTT, Huy DTN, Tung PV. Deepening analysis on preventing fall risk with knowledge and practices of nurses and nursing. *Systematic Reviews in Pharmacy* 2021; 12(3): 417-422. https:/doi.org/10.31838/SRP.2021.3.63

Chew EY. *Pathophysiology of diabetes retinophathy.* Diabetes mellitius, Secon Edition 2000; 890-897.

Jack JK. Diabetic retinopathy. *Clinical Ophthalmology* 2003: 481-488.

Hejlesen. *Virtual Center for Health Informatic.* Department of Medical informatic and image analisia Denmark, Screening for diabetic retinopathy using computer based image analysis and statistical classification, Medline 2000 / 01-2000 / 10, Record 43 of 333 2000.

Shotliff K, Duncan G. *Diabetes and the eye. Diabetes in Practice* 2005; 1: 1-19.

Omolase CO, Adekanle O, Owoeye JFA, Omolase BO. Diabetic retinopathy in a Nigerian community. *Singapore medical journal* 2010; 51(1): 56 – 59.

Huy DTN, Ngoc PTB, Hoang NH, Hang DTT. Evaluating Fall Prevention for Patient at Nam Dinh Hospital in Vietnam. *European Journal of Molecular & Clinical Medicine* 2020, 7(10): 3114-3119.

Hasan ZA. Study the effect of magnetic field on polymer doping Tio2 nanoparticles. *NeuroQuantology* 2019; 17(12): 39-43.