Characteristic of Diabetic Reinopathy in Patients with Type 2 Diabetes Mellitus in Thai Binh Medical University Hospital

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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.

Keywords: Type 2 Diabetes Mellitus, Retinopathy.

1. INTRODUCTION

Diabetes (diabetes) 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 with the socio-economic development. Diabetic retinopathy (diabetic retinopathy) is one of the most common complications of diabetes and a cause of blindness in adults. The first stage of diabetic retinopathy is characterized by microvascular damage, spot and spot hemorrhage, and exudation. At a later stage, the retinal neovascularization and its complications are apparent. Diabetic macular edema can occur at any stage of diabetic retinopathy caused by increased vascular permeability and leads to leakage of proteins and lipid secretion in the macular. The pathogenetic mechanism of diabetic retinopathy is complex and is associated with chronic inflammatory processes in the pathophysiology of diabetes. Studies

have shown that complications of diabetic retinopathy appear in 1/3 of people with type 2 diabetes with an average time of 9 years, this rate increases when the time of detection is longer, until after 20 years of disease. 100% of patients suffer from diabetic retinopathy.

2. METHODOLOGY AND DATA

2.1 Subjects

Including 80 patients (patients) diagnosed with type 2 diabetes were examined and treated at the Internal Medicine Department of Thai Binh Medical University from January 2019 to December 2019.
- Standard selection:
+ Patient is diagnosed with type 2 diabetes from 30 - 80 years old, fundoscopy in both eyes to diagnose retinopathy.
+ The patients agree to participate in the study.
- Exclusion criteria:
+ Patients with severe or acute illness: coma, pre-coma, hypoglycemia, paroxysmal hypertension, tuberculosis, pneumonia, HIV, hepatitis, severe kidney failure, severe anemia, hemorrhage pregnancy, unstable angina, cerebral vascular accident, myocardial infarction, blood clotting disorder, severe depression, mental disorder.
+ Patients with pre-existing retinopathy: glaucom, eye intervention.
+ The patient does not cooperate, does not collect enough research quotas.

2.2 Method

- Research design: research, cross-section description.
- Select the research sample: by the convenient sampling method.
- Research content: clinical examination: asking about time to detect diabetes, medical history. General examination of organs: respiratory, cardiovascular, digestive, nervous, urinary. Subclinical and functional exploration: basic biochemical indicators of blood: blood glucose, HbA1c and tests other basic solutions.
- Standards used in research:
  + Diabetes diagnostic criteria as recommended by ADA (American Diabetes Association) 2015 [3].
  + Classification of hypertension is based on the standards of the European Association for Hypertension and Cardiology (2013).
  + Classification BMI (Body Mass Index) according to the classification standard of the Association for Diabetes Asia - Pacific 2000.
  + Criteria for diagnosis and classification of eye lesions: All patients undergo fundoscopy, performed by an ophthalmologist. Evaluation of the stages of diabetic dystrophy classified according to ETDRS (Early Treatment Diabetic Retinopathy Study).

Non-proliferative retinopathy: damage includes: retinal capillary aneurysm, mild hemorrhage, retinal secretions, retinal edema.
Diabetic macular pathology: focal macular pathology: limited leaky area with hard secretion; diffuse macular pathology: cystic macular edema; ischemic macular pathology: vision loss with relatively normal manifestations of the macula despite bleeding or excretion elsewhere; pathological mixed macular pathology diffuse macular, ischemic
Pre-proliferative diabetic retinopathy: ischemic injury, hemorrhage, exudation and retinal edema.

Hypertrophic diabetic retinopathy: there is an increase in abnormal neovascularity, recurrent hemorrhage, retinal stimulation and reorganization, severe retinal damage, retinal tear or detachment, blind.

3. MAIN RESULTS

The percentage of male patients is 33.7%, female patients are 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%); Average HbA1c 8.3 ± 4.9% (ratio ≥ 7% is 35.0%); average cholestrol 5.6 ± 3.1 mmol / L (ratio ≥ 5.2 mmol / L is 40.0%); The mean triglyceride was 3.3 ± 2.4 mmol / L (ratio ≥ 1.88 mmol / L was 32.5%); the rate of patients with diabetes detection over 10 years was 37.5%.
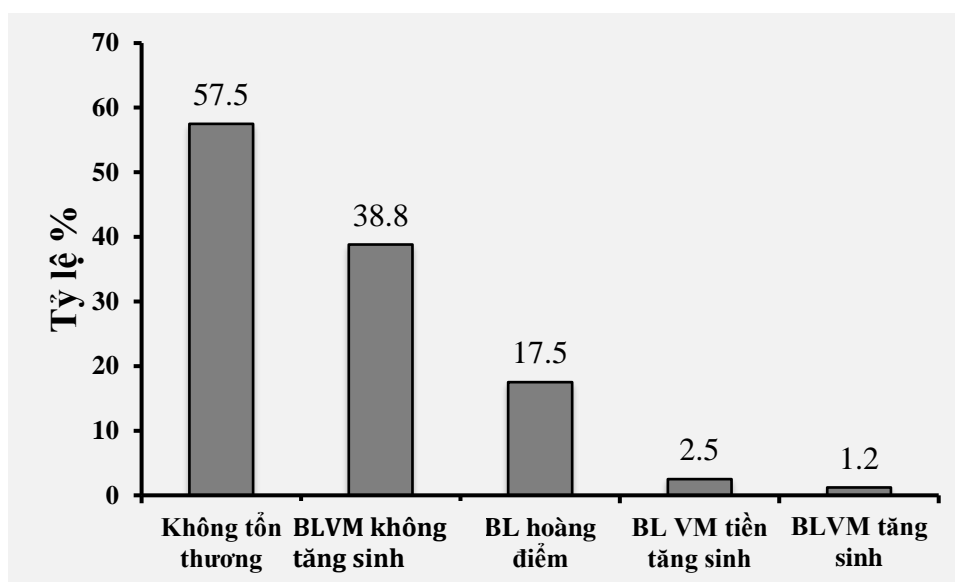

Figure 1 Prevalence of Retinal Damage of Study Subject (n = 160 eyes)

The percentage of eyes with damage to the retina accounts for 42.5%, of which, the pathology (BL) of the retina is not proliferated, accounting for 38.8%, and macular disease accounts for 17.5%. The incidence of hyperplasia is low with pre-proliferation and proliferation of 2.5% and 1.2%, respectively.

Table 1: Relationship between Retinopathy and Sex, Time to Detect Diabetes and Adherence to Treatment (n = 80)

Characteristics		Injury retinal (n=34)	Not injured (n=46)	OR (95% CI)	P
Sex	Female	24 (70,6)	29 (63,0)	1,4	<
	Male	10 (29,4)	17 (37,0)	(0,9 - 1,7)	0,05
Time of diabetes discovery (years)	≥ 10	19 (55,9)	11 (23,9)	4,0	<
	< 10	15 (44,1)	35 (70,1)	(2,5 - 5,3)	0,05
Adherence	No	9 (26,5)	4 (9,0)	3,8	<
	Yes	25 (73,5)	42 (91,0)	(2,7 – 4,3)	0,05

Female diabetic patients have 1.4 times higher risk of retinal damage than male patients (p <0.05). Patients with type 2 diabetes 10 years or more at risk of retinal damage 4.0 times compared with patients with less than 10 years (p <0.05). Patients who did not comply with the treatment regimen had a risk of retinal damage 3.8 times higher than that of compliance patients (p <0.05).

Table 2: Relationship of Retinopathy with BMI and Patient Blood Pressure (n = 80)

Parameters		Injury retinal (n=34)	Not injured (n=46)	OR (95% CI)	p
BMI (kg/m^2)	≥ 23	12 (35,3)	5 (10,9)	4,5 (3,6 – 6,1)	< 0,05
	< 23	22 (64,7)	41 (89,1)		
Hypertension	Yes	26 (76,5)	26 (56,5)	2,5 (1,8 – 3,6)	< 0,05
	No	8 (23,5)	20 (43,5)		

Type 2 diabetic patients with BMI ≥ 23 (kg / m2) were 4.5 times more likely to develop retinal damage than 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 of Retinopathy with Blood Glucose and HbA1c (n = 80)

Thông số		Tổn thương võng mạc (n=34)	Không tổn thương (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 has glucose ≥ 7 mmol / L; HbA1c ≥ 7.0% had 2.3 and 2.5 times higher risk of retinal damage compared with groups with blood glucose <7 mmol / L and HbA1c <7% (p <0.05).

Table 4: Relationship between Retinopathy and Lipid Status (n = 80)

Parameters		Injury retinal(n=34)	Not injured (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)		

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

4. DISCUSSION

Many studies have confirmed, the rate of diabetic patients in general with retinopathy ranges from 20-30%. People with diabetes are at risk of blindness 10-20 times more than normal people. There are many risk factors leading to diabetic retinopathy such as: diabetes duration,

poor blood glucose control, hypertension, peripheral neurological complications. Currently, there are many methods to diagnose variables. early and quite accurate diabetic retinopathy such as fundus scan under fluorescence screen, CT scan, fundoscopy... However, due to conditions at Thai Binh Medical University Hospital, it is not possible to deploy new methods. In the diagnosis of diabetic retinopathy, the normal fundoscopy method still applies, so it is somewhat limited in evaluating fundus lesions compared with other methods... However, fundoscopy is also The highly reliable method to diagnose retinopathy that many hospitals are currently applying. The results of this study showed that the rate of retinal damage to the eye accounted for 42.5%, of which, non-proliferative retinopathy accounted for 38.8%, pre-proliferative retinopathy 2.5% and disease 1-eye proliferative retinopathy accounts for 1.2%, 17.5% of eyes suffer from macular disease with the main manifestation of central loss of light. This result is consistent with published world literature showing that at the time of diagnosis, 20-40% of diabetic patients have diabetic retinopathy [9]. The study results are higher than the authors Wang W.Q. (n = 474), the percentage of patients with diabetic retinopathy is 21.9%, Nguyen Thi Thu Thao (2012), the rate of patients with eye complications is 19%. Pham Thi Hong Hoa (2009) found that the percentage of patients with eye complications was 30.0%, of which, retinopathy was not proliferated, accounted for 7.6%, disease retinopathy was 5.2% increase (Hong Hoa, 2009). Nguyen Thi Phi Nga (2009) found that the rate of eye damage was 37.6%. This difference is probably due to the study's subjects of the author have different time to detect diabetes and need 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 percentage of queen edema is more dominant. Many authors hypothesize the role of gender factors in promoting diabetic retinopathy. According to Hejlesen (2000), the female role appears to increase damage to the eyes, possibly the role of female hormones.

Diabetic retinopathy increases with time of illness, according to Françoise, when having diabetes less than 5 years, the rate of diabetic retinopathy is 10-20%, after 15 years of diabetes, diabetic retinopathy has met 40-60% and after 25 years 100% of patients with diabetic retinopathy. According to Helen Mosnier- Pudar when diabetes takes place for 15 years, the majority of patients suffer from diabetic retinopathy. The results of this study also showed that the risk of retinal damage in people with diabetes over 10 years was 4 times higher than in patients with diabetes less than 10 years. According to Nguyen Trong Khai (2018), the likelihood of patients suffering from diabetic retinopathy increases with time of diabetes, the risk of developing diabetic retinopathy increases by 1.76 times in diabetic patients from 5-10 years and 8.78 times with a duration of over 10 year (Shotliff and DUncan, 2005). According to Emeily this rate is 1.25 times (after 5 years); 1.6 times (after 10 years) and the study by Jack J.K with a risk of 6.43 times (after 15 years). In addition, patients who did not adhere to treatment had a 3.8 times higher risk of retinal damage compared to those who did not adhere to it.

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).

At the same time, in this study, type 2 diabetic patients with hypercholesterolemia have a risk of retinal damage 3.2 times; Increased blood triglycerides risk of damage to the retina of the eye 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.

5. CONCLUSION

Through the study of 80 type 2 diabetic patients 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), the group with higher hypertension 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 comply with 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.

REFERENCES

[1] Phạm Thị Hồng Hoa (2009), *"Research on the results of controlling some clinical indicators, subclinical, complications in patients with type 2 diabetes management and outpatient treatment",* Medical Doctoral Dissertation, Military Medical Academy.

[2] Phan Van Nam (2012), "Diabetic retinopathy", *Proceedings of the 6th National Endocrinology - Diabetes Conference,* volume 2, ISSN 1859 - 4727 (7), p. 86-93.

[3] Nguyen Thi Phi Nga (2009), *"Research on serum TNFα, CRP and related to morphology and function of the primary carotid artery by angioplasty of doppler in type 2 diabetic patient",* Doctoral thesis of medicine, Military Medical Academy.

[4] Nguyen Thu Thao (2012), *"Research on clinical features and insulin resistance in newly diagnosed type 2 diabetic patients"*, Doctor of Medicine Thesis, Military Medical Academy.

[5] Emeily, Y. Chew (2000), *Pathophysiology of diabetes retinophaty*, Diabetes mellitius, Secon Edition, pp. 890-897.

[6] Jack. J. K. (2003), *Diabetic retinopathy*. Clinical Ophthalmology, pp. 481-488.

[7] Hejlesen (2000), Virtual Centre 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

[8] Kevin Shotliff and Grant Duncan (2005), "Diabetes and the Eye*", Diabetes in Practice*, 1, pp. 1-19.

[9] Omolase C.O., Adekanle O., Owoeye J.F., et al. (2010), Diabetic retinoparthy in a Nigerian community, Singapore Med J, 51(1), 56-59.