Retinopathy and Macro-albuminuria in Type 2 Diabetic Patients

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Objective: *To identify the correlation between the development of retinopathy and macro-albuminuria and the other risk factors for the retinopathy in type 2 diabetic patients.*
Material and Method: *This is a cross-sectional study. The authors studied 201 patients suffering from diabetes type 2. Fundoscopy was performed by ophthalmologists. Macro-albuminuria was assessed by urine strip (URICAN). Duration of diabetes, hypertension, and history of peripheral neuropathy were also evaluated.*
Results: *The over all prevalence of retinopathy was 26.4% (53 patients). The diabetic retinopathy had significant correlation with the history of peripheral neuropathy ($p = 0.01$). There was no significant correlation between high blood pressure and retinopathy ($p = 0.32$). The prevalence of macro-albuminuria was 14.43% (30 patients). Diabetic retinopathy and macro-albuminuria were strongly correlated ($p < 0.001$).*
Conclusion: *Macro-albuminuria is associated with diabetic retinopathy in type 2 diabetic patients and is a reliable marker for the retinopathy.*

Keywords: *Retinopathy, Macroalbuminuria, Type 2 diabetic patients*

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Diabetes Mellitus is one of the common metabolic disorders. There is also multiple organs involvement in diabetes such as retinopathy, nephropathy, neuropathy, cardiovascular disorders etc. The prevalence of diabetes in Thai adults is around 9.6% (2.4 million people)[1] and one-half of all cases are undiagnosed.

Diabetic retinopathy is one of the leading causes of blindness in the world. Patients with diabetic retinopathy have a higher chance of loosing vision about 25 times compared to the normal population[2]. Diabetic patients with good blood sugar control have better prognosis for development of retinopathy. Many studies have been performed to evaluate the precipitating factors of retinopathy such as duration of diabetes, fluctuation of blood sugar, micro-albuminuria etc. Some studies have been carried out to find the relationship between micro-albuminuria and the other diabetic complications. In diabetes type 1 the presence of micro-albuminuria is highly predictive of renal and cardiovascular diseases whereas less association is observed in type 2[3].

The purpose of the present study was to evaluate the occurrence of macro-albuminuria and its association with diabetic retinopathy. The other risk factors such as hypertension, duration of diabetes, and peripheral neuropathy were also evaluated.

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Material and Method

Patients

The present cross-sectional study was conducted on the patients with diabetes type 2 who came to the diabetic clinic at Mettapracharak Hospital from October 2005 to May 2006.

Diagnosis of Diabetes Mellitus was performed in accordance with World Health Organization (WHO) criteria, which had been reported by the WHO study group (1999). Preliminary questionnaires included personal data, duration of diabetes, and history of peripheral neuropathy.

Method

Macro-albuminuria was assessed by urine strip (URISCAN) by using tetrabromphenal blue indicator. Urine sample was taken on the day the patients came to the hospital. If the sample was positive 1+ or more, macro-albuminuria was affirmed (1+ indicated 30 mg of protein in 100 ml of urine). Microscopic sediment of the urine was also evaluated. Patients who had urine with white blood cell > 5 /HP were excluded from the present study.

All the patients were referred to ophthalmologists for ocular examination including visual acuity (by mean of Snellen charts), intraocular pressure (by Goldmann applanation tonometry) , anterior segment examination, and fundoscopy (using indirect ophthalmoscopy and slit lamp examination with contact lens if required). Diagnosis of diabetic retinopathy was made by retinal examination on dilated pupils by ophthalmologists. Patients with cloudy media that obscured the view of fundoscopy were excluded from the present study.

The patients' blood pressure was measured by mercury Sphygmomanometer. Blood pressure > 140/90 or history of taking anti-hypertensive medications were considered abnormal.

Statistical analysis

Mean (± Standard deviation, SD), range and frequency (%) were used to describe patients' characteristics. Chi-square test was used to find the association between duration of diabetes and retinopathy. Logistic regression with odds ratio and 95% confidence interval (CI) were used to determine the risk factors for macroalbuminuria and retinopathy. A p-value of less than 0.05 was considered significant.

Results

Two hundred and one patients (120 females and 81 males) were included in the present study. The average age (±SD) was 64.66 (± 10.56) years. Fifty-three patients (26.37%) had diabetic retinopathy divided between female at 24.17% and male at 29.63%. Table 1 demonstrates the relationship between the duration of diabetes and diabetic retinopathy. The duration of diabetes was strongly associated with the presence of retinopathy ($p < 0.01$).

Urine examination in 30 patients (14.9%) showed macro-albuminuria. Table 2 demonstrates a significant relationship between macro-albuminuria and retinopathy ($p < 0.001$). Macro-albuminuria was a strong predictor of the retinopathy in type 2 diabetic patients (Odd ratio, 4.904; 95%CI, 2.181-11.027)

One hundred and six patients (52.7%) were found to have a history of peripheral neuropathy. 34.0% of the patients with a history of peripheral neuropathy and 17.9% of patients without it had diabetic retinopathy. History of peripheral neuropathy had a significant relationship with retinopathy in patients with diabetes type 2 ($p = 0.01$).

Hypertension was found in 174 patients (86.57%). There was no significant relationship between high blood pressure and retinopathy ($p = 0.32$).

Discussion

The prevalence of retinopathy in patients with diabetes type 2 was determined by many studies. These studies showed different rates between 16-53.4%[4-11]. The present study showed the prevalence rate of 26.34% which is somewhere in between. The result of different rate could be from a different population and different methods used in each study. Jenchitr et al reported the prevalence rate of 22.91% and 42.86% of retinopathy in patients with diabetes type 2 less

Table 1. Relationship between duration of diabetes and retinopathy

Duration of diabetes (yrs)	Retinopathy		Total
	Yes	No	
1-5	15 (14.9%)	86 (85.1%)	101 (100%)
6-10	18 (32.1%)	38 (67.9%)	56 (100%)
11-15	9 (45.0%)	11 (55%)	20 (100%)
16-20	8 (42.1%)	11 (57.9%)	19 (100%)
≥ 21	3 (60.0%)	2 (40.0%)	5 (100%)
Total	53 (26.4%)	148 (73.6%)	201 (100%)

Table 2. Relationship between macroalbuminuria and retinopathy

	Retinopathy		Total
	Yes	No	
Macroalbuminuria			
Yes	17 (56.7%)	13 (43.3%)	30 (100%)
No	36 (21.1%)	135 (78.9%)	171 (100%)
Total	53	148	

Odds ratio = 4.904 with 95%CI = 2.181-11.027 ($p < 0.001$)

and more than 10 years respectively[4]. The present study showed the prevalence of retinopathy of 21.02% (33/157) in patients with diabetes type 2 of less than 10 years and 45.45% (20/44) in patients with diabetes of more than 10 years (Table 1) which were very close. Both the present and their studies demonstrated a high relationship between duration of diabetes and prevalence of retinopathy. Manaviat MR et al reported the incidence of 25.9% of micro-albuminuria and 14.5% of macro-albuminuria in diabetes type 2[5], whereas the prevalence of macro-albuminuria in the present study was 14.9%. The above-mentioned studies showed a significant relationship between retinopathy and macro-albuminuria in diabetes type 2. However, there are some studies apposing such a result. Erasmus et al demonstrated a high prevalence of micro-albuminuria among NIDDM Nigerian people and concluded that micro-albuminuria may not predict retinopathy and occur independently of either glycemic control or elevated blood pressure level[10].

In addition to duration of diabetes and macro-albuminuria, the present study showed a significant relationship between the history of peripheral neuropathy and retinopathy in diabetes type 2 ($p = 0.01$). However, the data of peripheral neuropathy in the present study were collected by interview. They were not from objective measurement. Further studies should be carried out to determine such a relationship.

The present study showed a high prevalence of elevated blood pressure (86.57%) and no significant relationship between high blood pressure and retinopathy in patients with diabetes type 2. The different results were demonstrated in some studies. Leske MC et al showed that diabetic retinopathy risk increased by 30% for every 10 mmHg of higher systolic blood pressure at baseline (RR, 1.3 ; 95%CI, 1.1-1.4)[12]. Tapp RJ et al also showed some association between retinopathy and systolic blood pressure.[13]This variation of results could be from a different number and the population studied.

The excretion of albumin in urine can be regarded as a sign of kidney involvement and generalized vessels damage including retinal vessels. Thus albuminuria could be considered as a predictor of retinopathy in diabetes type 2.

Conclusion

The present cross-sectional study demonstrated a strong association between macro-albuminuria and retinopathy in diabetes type 2. The authors suggest that macro-albuminuria may be a marker for the presence of retinopathy. If further studies confirm these findings, diabetic patients who have macro-albuminuria may benefit from close ophthalmologic follow up.

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โครงการการศึกษาหาความสัมพันธ์ของการเกิดภาวะแทรกซ้อนที่ตาและที่ไตจากโรคเบาหวาน

ธนนท์ พกสุนทร, ดวงดาว ทัศณรงค์

วัตถุประสงค์*: เพื่อศึกษาหาความสัมพันธ์ระหว่างการมีโปรตีนในปัสสาวะและภาวะเบาหวานขึ้นจอประสาทตา รวมทั้งปัจจัยเสี่ยงอื่น ๆ ในผู้ป่วยเบาหวานชนิดที่ 2*

วัสดุและวิธีการ*: เป็นการศึกษาในผู้ป่วยเบาหวานชนิดที่ 2 จำนวน 201 ราย โดยผู้ป่วยทุกรายจะได้รับการตรวจตาโดยจักษุแพทย์ และได้รับการตรวจปัสสาวะโดยการใช้แผ่นตรวจหาโปรตีนในปัสสาวะ นอกจากนี้ระยะเวลาของการเป็นเบาหวาน, ภาวะความดันโลหิตสูง, ประวัติการชาปลายมือปลายเท้า ก็ได้รับการบันทึกและนำมาวิเคราะห์หาความสัมพันธ์กับการเกิดภาวะเบาหวานขึ้นจอประสาทตา*

ผลการศึกษา*: จากผู้ป่วยเบาหวานทั้งหมดจำนวน 201 ราย พบว่ามีผู้ป่วยที่มีเบาหวานขึ้นจอประสาทตาทั้งหมดจำนวน 53 ราย (26.4%) ภาวะเบาหวานขึ้นจอประสาทตา มีความสัมพันธ์กับประวัติการมีชาปลายมือปลายเท้าอย่างมีนัยสำคัญทางสถิติ ($p = 0.01$) ภาวะความดันโลหิตสูงไม่มีความสัมพันธ์กับการเกิดเบาหวานขึ้นจอประสาทตา จากผู้ป่วยทั้งหมดพบว่ามีโปรตีนในปัสสาวะจำนวน 30 รายคิดเป็น 14.43 % และพบว่าการมีโปรตีนในปัสสาวะมีความสัมพันธ์เป็นอย่างมากกับการเกิดเบาหวานขึ้นจอประสาทตาในผู้ป่วยเบาหวานชนิดที่ 2 ($p < 0.001$)*

สรุป*: การมีโปรตีนในปัสสาวะมีความสัมพันธ์เป็นอย่างมากกับการเกิดเบาหวานขึ้นจอประสาทตาในผู้ป่วยเบาหวานชนิดที่ 2 ดังนั้นการมีโปรตีนในปัสสาวะ อาจใช้ในการทำนายการเกิดภาวะเบาหวานขึ้นจอประสาทตาในผู้ป่วยเบาหวานชนิดที่ 2*