Risk Factors of Diabetic Retinopathy in Non-insulin Dependent Diabetes Mellitus

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Abstract

A prospective study was carried out in non-insulin dependent diabetic patients who attended the Diabetic Clinic of Chonburi Hospital from 1991 to 1992. Laboratory investigations, physical examination of vascular disorders, and fundus examination were done. 198 cases with complete data were analysed. Of these patients, sixty three cases had retinopathy, 54 cases had background diabetic retinopathy and 9 cases had proliferative diabetic retinopathy. The average duration of diabetes with diabetic retinopathy was 7.4 $\pm$ 5.0 years compared to 4.8 $\pm$ 3.6 years of diabetes without diabetic retinopathy. The mean age of patients with and without diabetic retinopathy was significantly different. The highest rate of diabetic retinopathy was in the range of 51-60 age group. Fasting blood levels of glucose, glycosylated hemoglobin, cholesterol, triglyceride, high density lipoprotein, blood pressure (both systolic and diastolic), alcohol drinking, and cigarette smoking were not different between diabetic retinopathy and non-detected diabetic retinopathy patients but inadequate exercise might be related to retinopathy.

Diabetes mellitus (DM) is the leading cause of blindness in developed countries. In the United States and Great Britain, DM is the most important systemic disease which causes blindness, approximately 10 per cent of the blind population in both of these countries is diabetic(1).

In Thailand, diabetic retinopathy (DR) contributes to less than 0.5 per cent of the causes of blindness(2). However, the tendency of the prevalence of DR is high due to early diagnosis of DR, longer life-span, and some major preventable and curable diseases such as glaucoma and cataract are resolved.

There are several risk factors associated with retinopathy in diabetic patients, such as long duration of diabetes, old age of the patients. Dia-

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betes mellitus in old age usually develops retinopathy sooner than in the young age[1].

This study was designed to focus on prevalence of retinopathy in non-insulin dependent diabetes mellitus (NIDDM) and the risk factors involved.

MATERIAL AND METHOD

A prospective study was carried out on 205 NIDDM patients who attended the Diabetic Clinic of Chonburi Hospital during the period of 1991 to 1992. Questionaires were used to interview patients on family history, age at the time of onset, duration of diabetes, level of exercise, cigarette smoking, and alcohol drinking habits. Physical examination of complications of vascular disorders was done. Laboratory investigations of blood glucose, glycosylated hemoglobin, total cholesterol, triglyceride, high density lipoprotein, uric acid levels, and urine analysis were performed.

Fundoscopic examinations of all patients in this study were done through dilated pupils (with 1% tropicamide eye drop and 10% neosynephrine hydrochloride eye drop) with indirect binocular ophthalmoscope and were classified into 3 categories:

1 Non-detected diabetic retinopathy (NDR)

2 Background or non-proliferative diabetic retainopathy (NPDR)

3 Proliferative diabetic retinopathy (PDR).

All treatments of diabetes and other related diseases were also recorded. Statistical analysis was performed using unpaired two-tailed Student's *t*-test, Chi-Squire, and analysis of variance. A value of $P<0.05$ was considered significant.

RESULTS

From a total number of 205 patients, only 198 cases with complete data were analysed. The patients were 37 males and 161 females with an age range from 31 to 86 years. The average ages (±SD) of males and females were 60.5 ± 7.4 and 56.8 ± 9.7 years, respectively. Duration of diabetes until detection of retinopathy was 7.4 ± 5.0 years; whereas, in non-detected retinopathy, it was 4.8 ± 3.6 years. Of these patients, sixty-three cases (31.8%) had retinopathy of which 15 were males (average age was 59.7 ± 4.1 years), and 48 were females (average age was 59.2 ± 9.2 years). From these 63 cases, 54 (27.3%) had NPDR, and 9 (4.5%) had PDR. The average age of patients with diabetic retinopathy and non-detected diabetic retinopathy was 59.3 ± 8.3 and 56.6 ± 9.8 years, respectively (Table 1). Both were statistically significantly different ($P=0.04$). Among the DR patients, the age of the males and females was not different ($P=0.83$). Neither was the prevalence rate of DR in male and female patients ($P=0.10$) different. The highest rate of DR found in this study was in the range of 51-60 age group (Fig.1).

By the *t*-test analysis, fasting blood sugar (FBS) level in DR and NDR groups was not statistically significantly different ($P>0.05$). Glycosylated hemoglobin (HbA1c) of these two groups, detected by column chromatography, was higher than normal. The HbA1c of the DR group was slightly higher than that of the NDR group but was not statistically significant ($P>0.05$). Total cholesterol, triglyceride, and high density lipoprotein (HDL) levels in both groups were not different ($P>0.05$) (Table 2). Blood pressure, systolic and diastolic, in both groups was not different ($P>0.05$).

Table 1. Data of non-insulin dependent diabetic patients.

Variables	Total	DM with DR	DM without DR
Age, yrs (mean±SD)		59.3±8.3	56.6±9.8
Males	60.5±7.4		
Females	56.8±9.7		
Gender (number)			
Male	37	15	22
Female	161	48	113
Duration of diabetes (yr) (mean±SD)		7.4±5.0	4.8±3.6

DM = diabetes mellitus, DR = diabetic retinopathy.

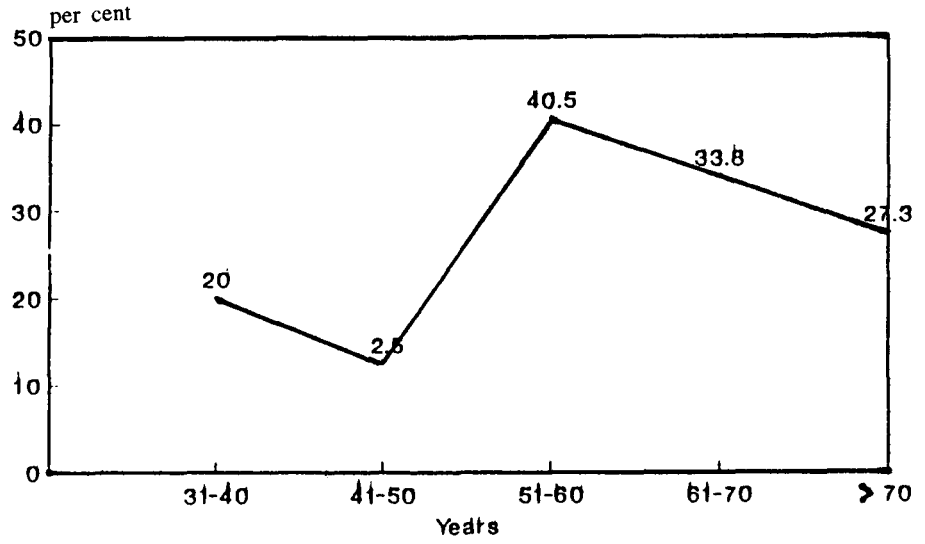

Fig. 1. Prevalence of diabetic retinopathy in non-insulin dependent diabetic patients.

Table 2. Laboratory data of DR and NDR in non-insulin dependent diabetic patients.

	DR	NDR	P value
	(mean±SD)	(mean±SD)	
Fasting blood sugar (mg/dL)	191.78±54.51	176.58±49.63	0.06
Glycosylated hemoglobin (%)	15.16±5.34	14.24±6.10	0.28
Cholesterol (mg/dL)	259.78±51.07	250.25±53.19	0.23
Triglyceride (mg/dL)	186.28±113.45	197.22±111.66	0.53
High density lipoprotein (mg/dL)	55.71±13.67	54.25±11.90	0.47
Blood pressure (mmHg)			
Systolic	138.81±24.21	134.85±21.18	0.27
Diastolic	87.86±14.22	89.37±12.52	0.47

DR = diabetic retinopathy, NDR = non-detected diabetic retinopathy.

By Chi-Square test, alcohol drinking and smoking in both groups were not different (P=0.86 and 0.92), but regular exercise was found to be significantly less in the DR group compared to the NDR group (P=0.03) (Table 3).

By analysis of variance, the levels of exercise in all diabetic patients were not significantly related to serum FBS, HbA1c, cholesterol, and triglyceride levels (P=0.90, 0.28, 0.25, and 0.76, respectively). Interaction of DR and NDR groups to the levels of exercise also showed no significant difference to the levels of FBS, HbA1c, cholesterol, and triglyceride (P=0.09, 0.24, 0.72, and 0.65, respectively).

DISCUSSION

In this study, the prevalence rate of DR in NIDDM patients was 31.8 per cent being similar to that reported by Chen et al[3]. However, Lee et al[4], Sparrow et al[5] and Segato et al[6] found that DR in NIDDM patients was 72.3, 52 and 24.6 per cent, respectively. Lee et al[7] found that diagnosis of retinopathy using ophthalmoscope and fundus photography showed good overall agreement of 86.3 per cent (kappa = 0.74). In addition, Kinyoun et al[8] also found fair to good (kappa = 0.58-0.79) agreement between the retina specialist's ophthalmoscopic findings and the specialist's reading of fundus photograph. Analysis of

Table 3. Levels of exercise, alcohol drinking, and cigarette smoking in non-insulin dependent diabetic patients.

	NDR (number)	DR (number)
Exercise		
No	23	12
Light exercise or not regular	75	43
Regular	35	6
Alcohol drinking		
Nondrinker	114	52
Drinker, not regular	6	3
Drinker (1-30 drinks/day)	4	1
Former drinker	11	7
Smoking cigarette		
Nonsmoker	113	53
Smoker (3-20 cigarettes/day)	10	5
Former smoker	11	5
Unknown	1	

NDR = non-detected diabetic retinopathy, DR = diabetic retinopathy.

the disagreement confirmed earlier reports that ophthalmoscopy missed approximately 50 per cent of eyes with microaneurysms only.

Several reports[3,5,9-11] illustrated that the longer duration of diabetes, the more prevalence rate of DR was found. Klein et al[12] showed that the incidence of retinopathy was 67 per cent in patients with 10 years duration of diabetes. This study showed that retinopathy was more than 50 per cent (8 in 14) in NIDDM patients with duration longer than 10 years.

Jain et al[13] found that the prevalence rate of DR in the age group of 50-60 years was highest which was the same as this study. The prevalence rate of DR in NIDDM patients was higher than that in IDDM patients and the duration of onset of DR in NIDDM patients was shorter than that of IDDM patients. In the study of Frank[14], prevalence of PDR in IDDM was found to be more than that in NIDDM, which may be related to the hormonal effect, oxygen utility, and glucose consumption of the retina in younger more than in older patients.

The average duration of diabetes in patients without retinopathy examined in this study was 4.8 years but was 7.4 years in diabetic patients with retinopathy, so diabetic patients should receive awareness and surveillance of eye complications after five years of detected diabetes. In well-controlled NIDDM with mild DR patients, Miki and Kikuchi[10] found that microaneurysm rapidly disappeared in the first year and then slowly changed after that. Early detection and diagnosis of DR and treatment in suitable time will prevent visual loss[15-17]. Diabetologists should be trained for screening of DR. The study of Nathan[18] showed no difference between ophthalmologists with good equipment and trained diabetologists with direct ophthalmoscope in looking for diabetic retinopathy. Screening of DR, not only saves years of vision but also saves disability[19]. Diabetic patients with PDR should be evaluated for other systemic disorders because it is an indicator for the presence and development of systemic disease from DM[20]. Patel et al[21] found that retinal blood flow was significantly increased in all grades of untreated diabetic retinopathy of diabetic patients in comparison with non-diabetic controls and diabetic patients with non-detected retinopathy. In another report[4], patients with FBS $\geq$ 200 mg/dl had increased risk of DR 1.7 times of patients with FBS < 140 mg/dl. Poor glycemic control assessed by HbA1c was associated with diabetic retinopathy[11]. Klein et al[22] showed that serum cholesterol had no effect on ocular condition in patients with later onset of diabetes. Both HDL and cholesterol did not have any relation to the severity of lesions. Klein[23] reported that patients with HbA1c at highest quartile at baseline will develop retinopathy more often than patients with HbA1c at lowest quartile. Funatsu et al[24] reported that too rapid a decrease in blood sugar at the initiation of glycemic control could cause severe or transient exacerbation of the progression of retinopathy. Klein et al[25] showed that decreased FBS level would decrease occurrance of macular edema. In this study, HbA1c and FBS in both groups (DR and NDR) were higher than the normal level, however, they were not significantly different. Singh et al[26] showed that HbA1c level was high in diabetic patients with and without DR compared to the control group but Lui et al[27] found that HbA1c, FBS, 2-hour plasma glucose levels were related to DR.

Alcohol drinking and cigarette smoking were not associated with DR as shown in other previous reports[3,28,29,30]. Systolic and diastolic blood pressure in DR and NDR groups were also not different. Chen[3] and Klein[31] showed the same finding as ours but Rassam et al[32] found that increased blood pressure would disturb autoregulation of retinal blood circulation in dia-

betic patients with poor glycemic control so that control of hypertension and hyperglycemia will decrease morbidity from DR and retinal blood flow will be significantly decreased after pan-retinal photocoagulation. Chen[3] found that the age and sex in patients with and without DR were not different but this study showed difference in age between these two groups but not in sex.

Regular exercise was associated with a lower prevalence rate of DR, and the levels of exercise were not significantly related to the levels of serum FBS, HbA1c, cholesterol, and triglyceride.

SUMMARY

A prospective study of 198 non-insulin dependent diabetic patients who attended the Diabetic Clinic at Chonburi Hospital during the year 1991-1992 were analysed. Sixty three cases (31.8%) of diabetic retinopathy were found, of which 54 cases were NPDR, and 9 cases were PDR. Average duration of diabetes with DR was 7.4±5.0 years compared to 4.8±3.6 years of diabetes without DR. The mean age between patients with and without DR was significantly different. The highest rate of DR was in the range of 51-60 age group. Levels of FBS, HbA1c, cholesterol, triglyceride, HDL, BP, alcohol drinking, and cigarette smoking were not different between diabetic retinopathy and non-detected diabetic retinopathy patients but regular exercise showed decreased proportion of DR finding.

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ปัจจัยเสี่ยงของเบาหวานที่จอประสาทตาในผู้ป่วยเบาหวานชนิดไม่พึ่งอินซูลิน

สมศักดิ์ รัศมิทัต, พ.บ., เขมรัศมี ขุนศึกเม็งราย, พ.บ.**, ชัยยศ วรัญญูวงศ์, พ.บ.****

ได้ทำการศึกษาผู้ป่วยเบาหวานชนิดไม่พึ่งอินซูลินจำนวน 198 รายที่มารับการตรวจรักษาที่คลินิกเบาหวาน โรงพยาบาลชลบุรี ระหว่างปี พ.ศ. 2534-2535 พบเบาหวานที่จอประสาทตาจำนวน 63 ราย ในจำนวนนี้ 54 ราย เป็นเบาหวานชนิดพื้นหลัง อีก 9 รายเป็นเบาหวานชนิดฟู ระยะเวลาเฉลี่ยที่พบเบาหวานที่จอประสาทตา 7.4 ปี ต่างกับกลุ่มที่ไม่พบเบาหวานที่จอประสาทตาที่มีเวลาเฉลี่ย 4.8 ปี กลุ่มที่พบเบาหวานที่จอประสาทตามีอายุเฉลี่ยมากกว่ากลุ่มที่ไม่พบเบาหวานที่จอประสาทตา อัตราส่วนการพบเบาหวานที่จอประสาทตาในผู้ชายและผู้หญิงไม่แตกต่างกัน กลุ่มอายุที่พบเบาหวานที่จอประสาทตามากที่สุดคืออายุระหว่าง 51-60 ปี ระดับน้ำตาลในเลือด ไกลโคไซเลทฮีโมโกลบิน คอเลสเทอรอล ไทรกลีเซอไรด์ ลิโพโปรตีนชนิดความหนาแน่นสูง ความดันโลหิต การดื่มแอลกอฮอล์ และการสูบบุหรี่ ไม่มีความเกี่ยวข้องกับการเกิดเบาหวานที่จอประสาทตา แต่การออกกำลังกายสม่ำเสมออาจลดอัตราการเกิดได้

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