OPHTHALMIC SCREENING FOR DIABETICS : THE IMPORTANCE OF PHYSICIAN-OPHTHALMOLOGIST COLLABORATION IN THE PREVENTION OF BLINDNESS

S J Chew, P M Hart, B C Ang, A S M Lim

ABSTRACT

Diabetes mellitus as a disease is a dragon with many heads. To cope with it, each manifestation must be deftly handled by family physician and specialists in unison. Similarly, the spectre of diabetic retinopathy is best exorcised before it manifests - by effective prophylactic screening. This programme can only be successful through a co-ordinated effort of both physicians and ophthalmologists.
In this paper, we present one such agenda which we have adopted, The results indicate that a fifth of diabetics have retinopathy, and that sight threatening disease affects 7% of those screened. More critically, it also establishes that a cost-effective method of screening can be achieved through a synergetic endeavour of primary care physician and specialist.

Keywords: Diabetic retinopathy, screening

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INTRODUCTION

Availability of effective therapy in diabetic retinopathy shifts the healthcare focus to effective prophylaxis of this blinding condition (1-3). This, of course, places emphasis on detection programmes for this problem.

In our efforts to devise an efficient screening method, we first reviewed the chief factors responsible for an adverse prognosis in diabetic eye disease:

1. Maculopathy - cystoid macular edema, hard yellow exudates in the fovea and capillary non-perfusion of the fovea.
2. Proliferative retinopathy - intraocular haemorrhage, traction on the fovea, widespread vaso-occlusion involving the larger retinal vessels.
3. Corneal opacity, cataract, rubeosis and vitreous opacity may make adequate photocoagulation more difficult or ineffective.
4. Glaucoma - rubeotic or primary open angle glaucoma, both of which are associated with diabetes.

Department of Ophthalmology
National University of Singapore
Lower Kent Ridge Road
Singapore 0511

S J Chew, FRCSEd, FCOphth
Senior Registrar

P M Hart, FRCSEd
Visiting Specialist

B C Ang, FRACS
Visiting Consultant

A S M Lim, FRCS, FRACS, FRACO, FCOphth
Chief

Correspondence to : Dr Chew

We then designed a screening protocol, for known diabetics, to detect the above conditions. The procedures had to be sensitive, specific, cost-effective and not dependent on limited manpower resources.

This ultimately involved the use of Polaroid fundus photography, non-contact tonometry and blood pressure measurement. Of greater importance, the method placed **equal responsibility on physicians and ophthalmologists** in the care of these patients.

METHOD

THE PATIENTS

A circular on the scheme was sent to the Singapore Diabetic Association, all general practitioners in Singapore and the medical staff of the Internal Medicine Department at our institution. It was clearly stated that the programme did not attempt to provide a full ophthalmic evaluation, but was targetted at the major blinding factors associated with diabetes.

In addition, any diabetic person referred by a physician to the retinal clinic was eligible for screening.

THE SCREENING PROGRAMME

This ongoing programme is conducted on a weekly basis. The patient was charged S$6.00 for the service, including the cost of photography. The following describes a typical visit -

1. The patients were told that the examination would take about half an hour.
2. Snellen distance acuity and near vision were recorded on the standardized form. Pinhole acuity was determined if vision was impaired.
   Refraction is often the most frequently overlooked part of the ocular examination, especially following successful treatment. A change of spectacles may considerably improve a patient's vision.

3. A-O non-contact tonometry was done to determine intraocular pressure. Values exceeding 21 mm Hg were rechecked and the ophthalmologist informed.
4. 40° Polaroid photographs of the posterior pole with a non-mydriatic fundus camera. Pupillary dilation was avoided to minimise waiting time and inconvenience for the patient.
5. Sitting blood pressure was measured.
6. A brief interview was conducted. Attention was paid to the following complaints:

   a. Irritation of the eyes - corneal epithelial erosions may result from a peripheral neuropathy (neurotrophic kertopathy). This may occur in up to half of long-standing diabetics.

   b. Blurred vision associated with hyperglycaemia or the initiation of therapy - a spectacle prescription is not advised until the blood glucose level is stablilized.

7. Review of photographs and the patient by a specialist from the retina service. Fundoscopy and slit lamp examination were done if needed.

   a. Media opacities were easily detected as blurring of photographic details. In addition to cataract, vitreous degeneration such as asteroid hyalosis or syneresis could also be diagnosed.
   b. Some patients with juvenile onset diabetes have a "snowflake" type of cataract with subcapsular vacuoles. However, most diabetic cataracts represent an earlier onset of age-related cortical and nuclear opacities. There may even be transient lens opacities comitant with induced myopia in patients with episodes of marked hyperglycaemia.
   c. Direct ophthalmoscopy was done if retinopathy was detected on the photographs. This enabled the examiner to evaluate the macula more critically as well as to detect early neovascularization of the disc. The use of red-free (green) light gives a greater contrast and enhances the visualization of the retinal vessels and intraretinal microvascular abnormalities.
   d. Indirect ophthalmoscopy was occasionally done. This offers a panoramic view of the ocular fundus and not only facilitates the examination of the peripheral fundus but also permits an integration of manifestations of disease that would otherwise be visualised as isolated fields. The stereopsis possible using indirect ophthalmoscopy helps to evaluate tractional elevation of the retina.

8. The counselling of the patient at the end of screening was an important feature:

   a. Attention was paid to his conception of what the referring doctor had told him about his eyes. The account to the patient was as close to this as possible, because the same information communicated to the patient in different words by two people may be interpreted as two entirely different viewpoints.
   b. Patients with no retinopathy or mild manifestations of background retinopathy not requiring treatment were assured that the fact that they have diabetes mellitus does not mean that they were destined to have ocular disease or blindness. It was emphasized to them that with periodic examination by their family physician or ophthalmologist, vision loss can be prevented by early treatment.
   c. Patients were cautioned against assuming that control of the blood glucose prevents the ocular complications of diabetes. The importance of a periodic screening was stressed. This is especially important because visual acuity has no relationship to the presence or severity of diabetic retinopathy. Patients with extensive decompensated background diabetic retinopathy not yet impinging on the fovea and those with advanced diabetic eye disease may maintain 6/6 vision till the complications of macula edema, haemorrhage or traction retinal detachment occur. The patients were counselled about the considerable difference in the manifestations and severity of diabetic retinopathy between the two eyes and among numerous diabetic patients.
   The patients were also advised that the preservation of vision is dependent on appropriate therapy being given before the disease was advanced, as there is a point after which effective treatment is impossible.
   They were told that periodic re-evaluation is always necessary because the factors causing diabetic retinopathy are presently uncontrollable and further manifestations of diabetic eye disease as a result of the natural history of diabetes may appear at any time.
   d. The patients were told that if there was a persistence of blurred vision in either eye lasting a few days or strings of floaters in the vision, they should consult their physician immediately for a fundus examination.

9. A reply was sent to the referring physician. This included the photographs. Comments were made on the presence of diabetic retinopathy, media opacities, glaucoma and the need for referral (to any ophthalmologist).

RESULTS

428 patients were screened in the first 6 months of the programme. There was an equal sex distribution. 9.3% of men and 7% of women developed diabetes before their 30th birthday (Table I). However, among those over the age of 50, there were 1.5 times more females than males. The onset of diabetes was between the ages of 40 and 59 in 57.5% (Table I).

The ages at the time of ocular examination for the diabetics are detailed in Table II.

The prevalence of cataract in the diabetic population has been reported as varying from 6 to 45%, with increasing age showing a marked effect on the figures. Our survey showed that cataract was more prevalent in IDDs than NIDDs less than 50 years of age, but not in the older age groups (Table III).

Retinopathy was detected in 161 patients (18.8%). The prevalence of retinopathy in IDDs and NIDDs is closely associated with the duration of diabetes (Table IV). Age of onset was of lesser importance (Table V). The ethnic distribution is seen in Table VI.

Table I
AGE OF ONSET OF DIABETES

Age (years)	Male	Female	Both	% of Total
< 10	0	0	0	0.0
10 – 19	3	4	7	1.6
20 – 29	17	11	28	6.5
30 – 39	52	35	87	20.3
40 – 49	72	59	131	30.6
50 – 59	53	62	115	26.9
60 – 69	17	35	52	12.1
70 – 79	0	7	7	1.8
≥ 80	0	1	1	0.2
TOTAL	214	214	428	100.0

Table II
AGE AT TIME OF EXAMINATION FOR IDDs & NIDDs

Age (years)	IDD (%)	NIDD (%)
< 20	2 (3.9)	0 (0.0)
20 – 29	4 (7.8)	3 (0.8)
30 – 39	11 (21.6)	31 (8.2)
40 – 49	7 (13.7)	83 (22.0)
50 – 59	11 (21.5)	128 (33.9)
60 – 69	15 (29.4)	99 (26.3)
70 – 79	1 (2.1)	32 (8.5)
≥ 80	0 (0.0)	1 (0.3)
TOTAL	51 (100)	377 (100)

Table III
NUMBER OF EYES SHOWING CATARACTS FOR IDDs AND NIDDs BY AGE OF EXAMINATION

Age (years)	IDDs		NIDDs	
	No Cataract (%)	Cataract (%)	No Cataract (%)	Cataract (%)
< 50	34 (70.8)	14 (29.2)	202 (86.3)	32 (13.7)
50 – 59	14 (63.6)	8 (36.4)	166 (64.6)	91 (35.4)
60 – 69	17 (56.7)	13 (43.3)	102 (51.5)	96 (48.5)
70 – 79	0 (0.0)	2 (100.0)	12 (18.8)	52 (81.2)
≥ 80	0 (0.0)	0 (0.0)	0 (0.0)	2 (100.0)
TOTAL	65 (63.7)	37 (36.3)	481 (63.8)	273 (36.2)

Table IV
EYES SHOWING RETINOPATHY IN IDDs AND NIDDs BY DURATION OF DIABETES

Years Diabetic	IDDs		NIDDs	
	No retinopathy (%)	Retinopathy (%)	No retinopathy (%)	Retinopathy (%)
< 2	4 (66.7)	2 (33.3)	142 (93.4)	10 (6.6)
2 – 4	6 (100.0)	0 (0.0)	158 (91.9)	14 (8.1)
5 – 9	26 (86.7)	4 (13.3)	151 (85.8)	25 (14.2)
10 – 14	21 (70.0)	9 (30.0)	105 (66.5)	53 (33.5)
15 – 19	8 (44.4)	10 (55.6)	39 (75.0)	13 (25.0)
20+	4 (33.3)	8 (66.7)	31 (70.5)	13 (29.5)
TOTAL	69 (67.6)	33 (32.4)	626 (83.0)	128 (17.0)

Table V
PREVALENCE OF RETINOPATHY BY AGE OF ONSET OF DIABETES

Duration of Diabetes (years)	Age of onset of Diabetes (years)	IDDs		NIDDs	
		No Retinopathy (%)	Retinopathy (%)	No Retinopathy (%)	Retinopathy (%)
<10	<40	10	2 (16.7)	49	5 (9.3)
	40 – 59	6	1 (14.3)	133	11 (7.6)
	60+	2	0 (0.0)	42	10 (19.2)
10+	<40	5	0 (0.0)	26	18 (40.9)
	40 – 59	4	7 (63.6)	56	20 (26.3)
	60+	7	7 (50.0)	3	4 (57.1)

Table VI
PREVALENCE OF RETINOPATHY IN THE 3 MAIN ETHNIC GROUPS

Duration of Diabetes (years)	ETHNIC GROUP		
	Chinese (%)	Malay (%)	Indian (%)
10	22/211 (10.4)	3/23 (13.0)	4/31 (12.9)
10 – 19	37/105 (35.2)	6/11 (54.5)	2/12 (16.6)
20+	5/18 (27.7)	0/0 (0.0)	6/10 (60.0)
TOTAL	64/334 (19.0)	9/34 (26.0)	12/53 (22.6)

Table VII
SEVERITY OF RETINOPATHY (with percentages) for IDD and NIDD eyes

	Nil (%)	Background only (%)	Maculopathy (%)	Proliferative (%)	Advanced (%)
IDD	69 (67.6)	23 (22.5)	6 (5.9)	4 (4.0)	0 (0.0)
NIDD	626 (83.0)	73 (9.7)	51 (6.8)	3 (0.4)	1 (0.1)
TOTAL	695 (81.2)	96 (11.2)	57 (6.6)	7 (0.7)	1 (0.1)

Of the 161 patients with retinopathy, 60% exhibited only background changes (11% of the study population). Sight-threatening retinopathy (maculopathy, proliferative retinopathy and advanced diabetic eye disease) were found in 7.4% of all cases (Table VII).

Scobie et al (4) reviewed 1000 consecutive diabetic patients attending a diabetic clinic. They found 26.7% to have retinopathy. Of these, 9.5% had serious disease, i.e. maculopathy, proliferative changes or retinal ischaemia. Equal numbers of patients had maculopathy or proliferative disease. The latter contrasts with our findings of maculopathy being 9.4 times more prevalent than neovascularisation.

Background retinopathy was found in 22.5% of IDDs as compared with 9.7% of NIDDs, while proliferative retinopathy was 10 times more common in IDDs than NIDDs. No difference was found in the prevalence of maculopathy.

66 patients (15.4%) suffered bilateral disease. Of these, 40 (9.3%) had background retinopathy, and 26 (6%) proliferative retinopathy.

CONCLUSIONS

The use of fundus photographs as a screening tool in diabetics is not a new concept. Rather, we sought to test its cost-effectiveness and accuracy by combining it with the time-honoured method of direct ophthalmoscopy performed by an experienced clinician - the primary health physician (4).

The fundus photos serve as a faithful visual record of the patient's diabetic retinopathy. With interpretations by an ophthalmologist, they compose a useful reference point for continuing care by the family physician.

The results to date are encouraging and form the rationale for our ongoing diabetic screening efforts.

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