Status of Diabetic Retinopathy Among Diabetics Registered to the Diabetic Eye Registry, National Eye Database, 2007

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SUMMARY

Diabetic Eye Registry, a web based registry hosted at the National Eye Database (www.acrm.org.my/end) collects data in a systematic and prospective nature on status of diabetic retinopathy (DR) among diabetics seen for the first time at Ministry of Health ophthalmology clinics. The 2007 report on 10, 586 diabetics revealed that 63.3% of eyes examined had no DR, 36.8% had any form of DR, of which 7.1% had proliferative diabetic retinopathy. Up to 15.0% of eyes had vision threatening DR requiring laser or surgery at their first visit. Data on diabetic eye registry is useful in monitoring the quality of diabetic management, particularly in eye screening as reflected by the proportion of patients with severe DR needing intervention at the first visit to Ophthalmology clinics.

KEY WORDS:

Diabetes mellitus, Diabetic retinopathy, Diabetic complication, Diabetic eye screening

INTRODUCTION

Diabetic retinopathy (DR) is not only a common complication of diabetes mellitus (DM) [1] but it leads to disability. It is the main contributor to blindness among working age group[1,2,3]. Every year, 10,000 American diabetics become blind [4] and globally 2% diabetics become blind and 10% visually impaired after 15 years of diabetes[2].

The prevalence of DR differs by regions and it is best estimated from population based survey. The recent Singapore Malay Eye Study on 3280 Malay adults 40 to 80 years with diabetes revealed 35.0% prevalence of any form of DR, 4.9% with proliferative DR (PDR) and 35.0% with macular edema. Among those known DM, 35.3% have any DR, 6.8% has PDR and 10.8% has vision threatening DR[5]. However, population based survey is labour intensive and costly. Thus, hospital based multi centre studies have been conducted to assess the magnitude of DR among diabetics. Results from these studies may serve as proxy indicator to prevalence of DR [6,7,8,9,10,11,12,13]. Table I shows results from studies done on DR in Malaysia and other countries.

The prevalence of DR varies with type of DM. Among Malaysian diagnosed to have DM before the age of 40 years, the prevalence of DR was 12.3% in type I and 22.3% in type II DM, and prevalence of proliferative DR was 4.0% in type I and 9.3% in type II DM [14]. In advanced country like the United State prevalence of DR for all diabetics was 86.4% for type I and 40.3% for type II DM, and vision threatening DR was 42.1% for type I and 8.2% for Type II DM [15,16].

The prevalence of DR increases with duration of DM. In Malaysia, prevalence of DR among type I DM was 9.9% after 5 years, increased to 35.8% after 10 years of diagnosis, and for type II DM, it was 10.0% and 42.9% respectively 14 In the United State, the prevalence was 5% after 5 years, increased to 60% after 10 years for type I DM, and for type II DM taking insulin, it was 40% and 84% respectively, for type II DM not taking insulin, it was 24% and 53% respectively [17,18].

Data on diabetic patients seen at hospitals provide essential information on severity of DR and the proportion of patients who need treatment. The Diabetic Eye Registry was established in 2007. It is a web based registry hosted by the National Eye Database. It collects data on diabetic patients seen at the first time at ophthalmology clinics. We present here some descriptive findings of the first year data.

MATERIALS AND METHODS

Details of the NED methods is presented in this same issue. Data on diabetic patients who were seen for the first time at ophthalmology clinics were recorded on data collection forms. This was done by trained paramedical staff or medical doctors who saw the patients. The forms were later entered into the web based registry.

Thirty three MOH ophthalmology departments took part in the registry. Participation is voluntary and thus the completeness of data ascertainment on diabetics seen at each centre is difficult to determine. Though features such as range check and compulsory fields to reduce error and missing data are in place in the web based application, there remained a small percentage of variables with missing data.

Grading of DR is based on the International Clinical Diabetic Retinopathy Disease Severity Scale [19] (Table II). Maculopathy is presence if there is evidence of hard exudates or retinal thickening at the posterior pole. Clinical significant macular edema (CSME) is presence when retinal thickening or hard exudates is $\leq$5000 um from the centre of fovea or retinal thickening is $\geq$one disc size in an area $\leq$ one disc diameter from the centre of fovea. Vision threatening retinopathy (VTR) includes severe NPDR, PDR and maculopathy. The data were analysed using Stata software[20].

RESULTS

Coverage

From 1st January to 31st December 2007, 15,564 new diabetics patients were seen at MOH Ophthalmology clinics and these data were registered to the Monthly Ophthalmology Service Census at National Eye Database website[21]. Of these, 10,856 (69.8%) patients were registered to diabetic eye registry.

Characteristic of Diabetic Patients

The mean age of patients registered was 57.2 years; About half were at working age group; between 30 to 60 years (52.8%). There were slightly more female (54.6%) and Malay (54.0%) patients formed the majority. (Table III)

Medical and Ocular History

Most of the patients (92.0%) have type II DM, 64.1% with less than 10 years of DM and 82.0% was treated with oral medication. About 2/3 has hypertension and 9% was current smokers. (Table IV). Majority of the patients seen were referred from government healthcare facility (91.7%). (Table V)

One hundred and sixty patients seen were pregnant. Although the current protocol for pregnant diabetics states that these women should have their eye examined at the time of conception or at least during the first trimester, only in 41.2% had eye examination. Majority of the patients seen were referred from government health care facility (91.7%). (Table V)

Status of Eye

More than two third of the patients has never had any prior eye examination. Among those who have had eye examination, 71.9% had it done about one year ago. (Table VI) More than one third of eyes had unaided vision of 6/12 and better, one third had vision between 6/18 to 3/60 and about 10% was blind with worse than 3/60 vision. Among those examined, 40.9% did not have other ocular disease, 44.2% patients had evidence of cataract, 3.1% had glaucoma and 0.5% had rubeosis irides, a sign which signifies retinal ischemia. (Table IV)

More than half of the eyes (63.3%) examined did not have diabetic retinopathy and 36.8% had any form of DR, 16.5% had mild non-proliferative DR (NPDR), 9.8% had moderate NPDR, 3.4% has severe NPDR, 7.1% has proliferative DR. About 9.5% of eyes have maculopathy, of which, 4.2% had clinical significant macular edema (CSME). As such, 14.7% of eyes had vision threatening retinopathy (VTR). (Table VII)

Treatment plan

Of the 10,856 patients registered majority (83.3%) were given an appointment for routine follow up eye examination, 10.2% required laser photocoagulation, 3.1% needed diabetic vitrectomy and 0.5% needed fundal fluorecence angiogram to assess extend of retinal ischaemia or maculopathy. (Table VIII)

Table I: Literature Review of Recent Studies by Types of DR and in Comparison with Present Study

Study, year	Sample Size	No DR	Any DR	PDR*	VTR**
Universiti Sains Malaysia Hospital, 1996[6]	140		48.6%	6.2%	
DiabCare Asia in 29 public hospitals,1997[7]			23.5%, (background DR)		
DiabCare Asia Project in 10 public hospitals, 1998[8],			37% (background DR)		
DiabCare Asia Project in 49 private clinics in Malaysia, 2001[9]	438		23.5% (background DR)	5.4%	(0.8%- legal blindness)
DiabCare Asia Project at 19 public hospitals in Malaysia, 2003[10]	1244		11.1%		
University Malaya Medical Centre, Malaysia, 2005[11]	217		51.6%	28.1%	
Veterans Affairs Medical Center in USA, 2005[12]	1219	63.0%	23.4%	0.9%	3.8%
An inner-city primary care clinic in Australia, 2007[13]	495	51.7%	37.3%	-	11.0%
Singapore Malay Eye Study 2008[5] 2006,	3280	65.0%	35.3%	6.8%	10.8%
Present study, 2007	10,856	63.3%	36.8%	7.1%	14.7%

*PDR - Proliferative diabetic retinopathy
*VTR - Vision threatening retinopathy

Table II: International Clinical Diabetic Retinopathy Disease Severity Scale (adapted from ref?)

Proposed disease severity level	Findings observable upon dilated ophthalmoscopy
No apparent retinopathy	No abnormalities
Mild NPDR***	Microaneurysms only
Moderate NPDR	More than just microaneurysms but less than severe NPDR
Severe NPDR	Any of the following: >20 intraretinal hemorrhages in each of 4 quadrants Definite venous beading in 2+ quadrants Prominent intraretinal microvascular abnormalities in 1+ quadrant And no signs of proliferative retinopathy
PDR	One or more of the following: Neovascularization Vitreous/ preretinal hemorrhage

***NPDR = Non proliferative diabetic retinopathy,

Table III: Demographics of Diabetic Patients by Status of DR, National Eye Database, 2007

	All N=10856		Without DR N=5558		With DR N=4145		
Mean Age, years	57.2		56.7		56.8		
	No.	%	No.	%	No.	%	% within the group
Age group, years							
<30	196	1.8	156	2.8	33	0.8	16.8
30-<60	5725	52.8	2960	56	2412	58.2	42.1
>=60	4232	38.9	2080	41	1404	33.9	33.2
Missing	703	6.5	362	6.5	296	7.1	42.1
Gender							
Male	4863	44.8	2481	44.6	1907	46.0	39.2
Female	5927	54.6	3060	55.1	2211	53.3	37.3
Missing	66	0.6	17	0.3	27	0.7	40.9
Ethnic							
Malay	5857	54.0	2877	51.8	2324	56.1	39.7
Chinese	2523	23.2	1309	23.6	970	23.4	38.4
Indian	1996	18.4	1101	19.7	729	17.6	36.5
Other	395	3.6	232	4.2	96	2.3	24.3
Missing	85	0.8	114	2.1	47	1.1	55.3

Table IV: Number and percentages of diabetic patients by past medical and ocular history, National Eye Database, 2007

Types of DM	**No.**	**%**
Type II	9995	92.0
Type I	571	5.3
Missing	290	2.7
Duration of DM, years		
<5	3612	33.3
5-10	3355	30.8
>10-20	1625	15.0
>20	333	3.1
Missing	1931	17.8
Types of treatment		
Oral medication	8958	82.0
Insulin	1393	11.8
Other	727	6.2
Systematic co-morbidity		
None	2463	22.7
HPT	6935	63.9
Hypercholesterolemia	1981	18.2
IHD	1203	11.1
Renal Impairment	632	5.8
CVA	260	2.4
Amputation	70	0.6
Others	1064	9.7
Smoking	991	9.1
Pregnant	160	3.3% among female
Ocular co-morbidity		
None	4435	40.9
Cataract	4799	44.2
Glaucoma	337	3.1
Rubeosis irides	58	0.5
Others	445	4.1

Table V: Number and percentages of diabetic patients by sources of referral to Ophthalmology clinics, National Eye Database, 2007

Sources of referral	**N=10856**	
	No.	**%**
Government OPD clinic/Klinik Kesihatan/Klinik Desa	6576	60.6
Government hospital-MO or specialist	3378	31.1
General Practitioner (GP)	133	1.2
Private Hospital-MO or specialists	82	0.8
Optometrists	14	0.1
Others	38	0.4
Missing	635	5.8

Table VI : Number and percentages of diabetic patients by past history of eye examination, National Eye Database, 2007

Eye examination	N=10856	
	No.	%
Never had eye examination before	7701	70.9
Had eye examination before	1871	17.2
• Last 1 year	1354	71.9
• Last 1-2 years	79	4.2
• > 2 years	1	0.1
• Missing	450	23.9
Missing	1284	11.8

Table VII: Number and percentages of diabetic patients by severity of diabetic retinopathy and maculopathy, National Eye Database, 2007

Severity of Diabetic Retinopathy	Right Eye n=9575		Left Eye n=9556		All eyes N=19131	
	No.	%	No.	%	No.	%
No apparent diabetic retinopathy	6058	63.3	6051	63.3	12109	63.3
Mild non proliferative diabetic retinopathy	1578	16.5	1573	16.5	3151	16.5
Moderate non proliferative diabetic retinopathy	931	9.7	944	9.9	1875	9.8
Severe non proliferative diabetic retinopathy	337	3.5	307	3.2	644	3.4
Proliferative diabetic retinopathy	671	7.0	681	7.1	1352	7.1
	n=10381		n=10428		n=20809	
Maculopathy	1002	9.7	979	9.4	1981	9.5
Clinical significant macular edema	432	4.2	434	4.2	866	4.2
Vision threatening retinopathy	1440	14.7	1422	14.5	2862	14.7

Table VIII: Number and percentages of diabetic patients by treatment plans, National Eye Database, 2007

Treatment plans	N=10856	
	No.	%
Follow up only	9038	83.3
Need laser	1103	10.2
Need vitrectomy	332	3.1
Need further assessment such as FFA	49	0.5
Missing	631	5.8

DISCUSSION

With 69.8% coverage, data collected on 10,856 at diabetic eye registry is relatively representative of all new diabetic patients seen at MOH Ophthalmology clinics.

NHMS III estimated the prevalence of known diabetics among population 18 years and older as 7.0% [22]. This gives an estimate of 1,492,665 people who needed regular eye examinations in Malaysia.

Through NHMS indicated as prevalence of known DM is highest among Indians (14.7%) as compared to Malays (7.4%) and Chinese (6.2%)[22], and Indians has the highest rate of lower limb amputation (Indian, 4.6%, Malay, 4.1%, Chinese 4.5%), strokes (Indian, 3.1%, Malay, 2.9%, Chinese 5.5%), and kidney transplant or dialysis (Indian, 2.4%, Malay, 1.2%, Chinese 2.3%). They are also most likely to have higher rate of DR, only 18.4% of those seen at eye clinics are Indians. Barriers for asccessing health care, especially in terms of affordability and equity, as well as compliance to medical advice among Indian patients warrants a special study.

The diabetic eye registry also showed very few Type I DM (572, 5.3%) patients. This needs further assessement as patients with Type I DM have a higher proportion of DR when compare to Type II DM [15,17].

Majority of patients seen were referred from government health care facilities (91.7%) with only 2.0% from private clinics or hospitals. This low rate of referral is compounded by a disturbing fact from the NHMS III that indicated a significant lower proportion of diabetic patients treated at private healthcare facilities ever having fundal examination as compared to patients in the government healthcare facilities (40.3% vs. 50.6%)[22]. Although only 22.3% diabetics gets treatment from private clinics[22], unless their eyes are examined by treating doctors or private ophthalmologists, those with severe DR who would need to be referred would be denied interventions which can actually retard the disease progression and prevent blindness. Private health care providers need to take a holistic approach in managing diabetic patients and ensure comprehensive medical examination to detect complications which should include annual vision and fundal check as recommended in clinical practice guideline published by MOH/Academy of Medicine [23] and preferred practice pattern by the America Academy of Ophtahlmology [19].

As DM complications escalate during pregnancy, clinical practice guideline [19,23] recommended that diabetics must have their baseline eye examination at the time of conception and at every trimaster. The fact revealed a worrisome finding; where less than half of pregnant diabetic had a first eye examination at first trimester or earlier. The knowledge that

diabetics who become pregnant require eye examination at a shorter interval needs to be made known to all doctors and antinatal nurses.

Only one third of the patients who were seen for the first time at ophthalmology clincis has ever had a prior eye examiantion. This figure is worst than the population based survey at NHMS III where 45% reported ever having their eye(s) checked [22].

The distribution of types of DR seen in the patients registered to this registry is comparable to findings from the population based study in Singapore[5], and DiabCare Asia project at 19 hospitals in Malaysia[10], an inner-city primary care clinic in Australia[12] and Veterans Affairs Medical Center in USA[13] as shown in Table I.

However, patients seen at MOH clinics had a higher rate of VTR. For every 10 diabetic patients seen for the first time at ophthalmology clinic, 1.5 of them may become irreversibly blind.

Diabetic eye screening should be done where patients receive his/her medical treatment. Detection of severe DR indicates poor blood sugar or blood pressure control. Immediate action in terms of advice to patient to modify their lifestyle and diet, and adjustment of medication for good DM control is necessary to regress or retard DR progression. Patients with more severe DR or those with maculopathy should be referred early to ophthalmology clinics for closer monitoring and laser photocoagulation when indicated.

Management of diabetics need a coordinated team approach from all parties who come into contact with the patients. Nurses and dietician who provide counseling, pharmacists who dispense and counsel on medicine, doctors who provide diabetic medical treatment and opticians or optometrists who prescribe glasses, should remind diabetics patients of the necessary scheduled eye examination. Patients need to be constantly motivated for best possible metabolic control. Warning of potential disability such as blindness, loss of limbs, renal failure requiring dialysis or kidney transplant may be the best motivation to achieve that.

CONCLUSION

Diabetic eye registry provides reliable and useful information for health care policy makers in evaluating the national diabetic program and for participating ophthalmology departments in assessing magnitude of diabetic retinopathy and the eye status among patients referred. Eye care providers who conduct diabetic eye screening, either public or private, are welcome to participate in this web-based registry.

Findings from the 2007 diabetic eye registry clearly revealed the suboptimal eye screening among diabetics, especially among Indians, Type I DM, diabetics who are pregnant and overall infrequent eye examination which cuts across all diabetics. If remedial actions are not taken, many diabetics who are at their prime, productive age group, will be visually impaired or irreversibly blind from DR.

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