FREQUENCY OF DIABETIC RETINOPATHY IN A TERTIARY CARE HOSPITAL USING DIGITAL RETINAL IMAGING TECHNOLOGY

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ABSTRACT

Objective: The objective of this study was to determine the frequency of diabetic retinopathy in a tertiary care hospital using digital retinal imaging technology.

Methodology: This descriptive study was carried out in the department of Diabetes, Endocrinology and Metabolic Diseases, Hayatabad medical complex Peshawar. Patients referred from outpatient department, general practitioners and from private clinics were included and after taking their basic demographic data were referred to the department of Diabetes for Fundus Photograph using Canon CR1 non-mydriatic digital retinal camera. Photographs were analyzed first by Endocrinologist and later by an Ophthalmologist to assess the severity of retinopathy.

Results: Two thousand one hundred and twenty three patients with type 2 diabetes were evaluated clinically followed by fundus photography by retinal digital imaging.The frequency retinopathy and maculopathy was 32.03 % and 6.31 % respectively (both retinopathy and maculopathy 38.34%). Three seventy four patients (17.6% patients) received laser treatment for prevention of blindness.

Conclusion: Screening for Diabetic retinopathy using digital camera is a useful technique and detects DR effectively in diabetic patients in a tertiary care setting. This technique is useful in mass screening and can detect, reduce and prevent blindness due to diabetes in our population.

Keywords: diabetic retinopathy, digital retinal imaging, diabetic retinopathy severity scales.

INTRODUCTION

As more and more people are being affected with diabetes and with poor metabolic control, treating physicians, diabetologist and ophthalmologists are seeing diabetics with multiple complications. Diabetic Retinopathy is the commonest complication of diabetes mellitus and is the earliest manifestation of the microvascular complications of diabetes mellitus[1]. In the Wisconsin Epidemiologic Study of Diabetic Retinopathy (WESDR), a large population based study in 10 countries in southern Wisconsin, USA, the prevalence of any retinopathy in those with onset of diabetes after the age of 30 years (mostly with Type 2 DM) is 29% those within 5 years of diagnosis and 78% in those with diabetes duration more than 15 years[2]. Diabetic retinopathy is the commonest cause of blindness in the working age population in the developed countries. It's now accepted that early detection of retinopathy and subsequent treatment with laser reduces the incidence of blindness due to diabetes, if screening is done in the community[3, 4]. Diabetic retinopathy fulfils all the criteria for a screening program. It occurs as a continuum, where in the early subclinical stages, changes in the retina can only be demonstrated by the use of fluorescein angiography, to the stages whereby ophthalmologic examination reveals retinopathy but the visual acuity is still unaffected, to the final stages whereby severe visual impairment and blindness

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occur.

In the local context, well organised screening programmes for diabetic retinopathy is still lacking in the private practice or the government hospitals. We were of the impression that screening for diabetic retinopathy in primary care by routine fundoscopy or at tertiary care are infrequently done and that some general practitioners may find the procedure difficult due to the time required carrying out the procedure.

The objective of our study was to determine the frequency of diabetic retinopathy amongst diabetic patients attending in a tertiary care center using digital retinopathy imaging technology as the sole screening instrument.

METHODOLOGY

The study was conducted in a tertiary care centre at department of Diabetes, Endocrinology and Metabolic diseases Postgraduate medical institute Hayatabad medical complex Peshawar Pakistan. This hospital provides healthcare facilities to local population as well as surrounding Afghan refugee population from refugee camps as well as patients coming from neighboring Afghanistan.

This was a descriptive study of all patients with type 2 diabetes mellitus 18 years and above who attended the clinic from January 2011 till July 2011. The diagnosis of diabetes mellitus was based on the currently accepted criteria[5]. We included all diabetic patients seen during the study period if they gave consent but excluded those who were acutely ill or non-ambulant.

Diabetic patients answered a brief questionnaire asking for demographic details and information about their diabetes (age of onset, duration of diabetes, co-morbidities, whether the subject had ever been under the care of an ophthalmologist). Visual acuity was tested using Snellen chart at 6 metres. Distant vision was tested with and without spectacles. A general examination of the eyes was done using the penlight to look for clarity of the cornea and to assess the pupil size. Opthalmoscopic examination was performed in a darkened room to look for cataract but the fundus was not examined. Retinal photography was then performed using the Canon CR1 non-mydriatic retinal camera. A single central macular view of the fundus (including the optic disc, the vascular arcades and the macula) was obtained and was used in this study of assessment of diabetic retinopathy. If the image was deemed inadequate 2 drops of a tropicanamide (Mydriacyl) was instilled into the eye and the eye was re-examined when the pupillary dilatation was adequate. The images acquired by the camera were instantly transmitted

to a computer for storage and subsequent retrieval and analysis.

The fundus photographs were carefully analysed by both authors. The retinal abnormalities were classified according to the International Clinical Diabetic Retinopathy Disease Severity Scale (Table 1) and the International Clinical Diabetic Macular Edema Disease Severity Scale (Table2) produced by the International Council of Ophthalmology[6]. Any patient requiring further input from Ophthalmologist were referred to Ophthalmology department where further investigation like detailed eye examination and Angiography were done and Laser treatment if required was offered.

RESULTS

A total of 2123 diabetic patients were seen during the study period and fulfilled the selection criteria. The mean age was 57.4 (SD22) years. Most of the respondents were Pakistani (86%), the rest were Afghan refugees (9.5%) and Afghan nationals (4.5%). Forty nine percent of them were males.

The duration of their diabetes was : <1 year 16%, 1-5 years 32% 5-9years 24% and >10 years 28 %. Concomitant hypertension was present in 54.1%. One-quarter of them had ever been seen by an ophthalmologist. These include the subjects consulting the ophthalmologist for disease other than diabetes, for treatment of cataracts and for screening purpose. Cataracts were present in 2% of the patients studied. Very few patients (9%) ever received laser photocoagulation for their retinopathy prior to screening. Sixteen percent of the patients in the study had visual acuity of 6/12 or worse in the better eye.

Mydriatic eye drops were used in 16% of the patients studied. Retinal photographs of fourteen patients were unreadable. Six hundred and eighty patients (32.03%) were found to have retinopathy. The severity of retinopathy (based on the International Clinical Diabetic Retinopathy Disease Severity Scale) was as follows: mild non-proliferative 59.3%, moderate non-proliferative 18.7%, severe non- proliferative 14.8 %, proliferative 6.4%. The prevalence of maculopathy was 6.31% (based on International Clinical Diabetic Macular Edema Disease Severity Scale): mild (hard exudates the away from the macula) 42.7%, moderate (hard exudates within the macula but not involving the fovea) 37.3%, and severe (hard exudates encroaching upon the centre of the macula) 19.9 %. Overall, 38.34% of these diabetic patients had either retinopathy or maculopathy.. Sight threatening eye disease (STED), defined as moderate non-proliferative diabetic retinopathy or

Table 1: International Clinical Diabetic Retinopathy (DR) Disease Severity Scale

Proposed disease severity level	Finding observable with dilated opthalmoscopy
No apparent DR	No abnormalities
Mild non-proliferative DR	Microaneurysms only
Moderate non-proliferative DR	More than "mild" but less than "severe"
Severe non- proliferative DR	Any of the following: • 20 or more international haemorrhages in 4 quadrants • Definite venous beading in 2 or more quadrants • Prominent IRMA in 1 or more quadrants and no neovascularisation
Proliferative DR	1 or more of the following: • Definite neovascularisation • Pre-retinal or vitreous haemorrhages

Table 2: International Clinical Diabetic Macular Edema (DME) Disease Severity Scale

Proposed disease severity level	Findings on dilated opthalmoscopy
DME absent	No retinal thickening or hard exudates present in posterior pole
DME Present	Some retinal thickening or hard exudates present in posterior pole
If DME is present, it can be categorised as follows:	
Mild DME	Some retinal thickening or hard exudates present in posterior pole but distant from the centre of the Macula
Moderate DME	Retinal thickening or hard exudates approaching the centre of the macula but not involving the centre
Severe DME	Retinal thickening or hard exudates involving the centre of the macula

worse, circinate maculopathy and hard exudates within 1 disc diameter from the centre of the fovea) occurred in 189 cases (8.9%) and included some mild cases of NPDR as well. Three seventy four patients (17.6% patients) received laser treatment to prevent deterioration of vision.

Among these diabetic patients with concomitant hypertension, retinopathy was detected in (38.8%). Amongst total number of patients (518) 28% of patients had diabetes for more than 10 years.

DISCUSSION

Our study demonstrated overall retinopathy present in diabetics to be 32.03%. Comparing this to other national studies where it was found to be 22%[7, 8], but difference of this higher percentage of patients could be explained due to patients in present study were in specialized

Diabetes unit and hence higher percentage of complication is expected.

The new international grading system used in the study is a more evidence-based approach to the classification of the disease and it incorporates data found in excellent trials such as the ETDRS and the WESDR. The main classification looks at the visible vascular events from the earliest change (i.e. microaneurysms) to the blot haemorrhages, venous beading, intra-retinal microvascular abnormalities (IRMA) and finally the advance pre-retinal and vitreous haemorrhges. The second part looks at the problem of exudative maculopathy which consist of macular hard exudates and macular oedema. It should be noted that macular oedema can only be appreciated if the digital imaging system has stereoscopic capabilities. However, the best method for looking at retinal thickening is still by indirect ophthalmoscopy or slit-lamp biomicroscopy. It is important also to

note that any stage of diabetic retinopathy can be associated with diabetic macular oedema based on the findings of hard exudates. We realize that the classification was based on "dilated ophthalmoscopy" but our retinal photography was taken through the undilated pupils (in most patients). Since the camera we used was able to capture a clear central view of the fundus in the majority of cases, we think further dilatation of the pupils may not be necessary in most cases. Generally speaking, we find that the classification has assisted us in the early referral of STED to the specialists.

Present study was done in hospital setting, but previously study done has shown that technique using single-image retinal photographs taken with a nonmydriatic retinal camera in primary care offices, with primary care clinicians reading the resulting images, may be a cost-effective way to help reduce vision loss in diabetic patients who have limited access to specialize care[9].

The prevalence of diabetic retinopathy in our community is predictably high[7,8]. Early identification and treatment of diabetic retinopathy through screening is a cost effective strategy for improved health care in diabetic populations[10]. Previous study done in the same department showed low awareness of DR in the patients and it was suggested that mass screening programs using digital camera technologies may be used to detect Diabetic Retinopathy early and also large number of patients can be screened in a shorter duration[11,12]. Digital retinal imaging has offered a new range of imaging possibilities and effective way to help reduce vision loss in diabetic patients who have limited access to ophthalmologists.

This study has its limitations as it was not a community based population study and the observations were conducted in a tertiary care setting. Also the patients referred were representing a wider population and hence looking at the observations of our study a larger community based study will help us get the real prevalence of DR in our set up.

On a positive note this screening programme and collaboration of Ophthalmology and endocrinology department has been able to save potentially (680 X 5) 3400 blind years within a span of 6 months time. Similar linkages and referral with other departments will save millions of people from blindness.

CONCLUSION

Screening for Diabetic retinopathy using digital camera is a useful technique and detects DR more effectively in diabetic patients in a tertiary care setting.

This technique is useful in mass screening and can detect, reduce and prevent blindness due to diabetes in our population.

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CONTRIBUTORS

AHA and SJ contributed equally to the research and preparation of the manuscript. All authors listed contributed significantly to the research that resulted in the submitted manuscript.