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ORIGINAL ARTICLE

THE OCCURRENCE AND SEVERITY OF DIABETIC RETINOPATHY IN NEWLY DIAGNOSED TYPE 2 DIABETES PATIENTS AT MENILIK II HOSPITAL IN ADDIS ABABA

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ABSTRACT

Introduction*: Diabetic Retinopathy, one of the chronic micro vascular complications, is a major global cause of total blindness. As the global prevalence of diabetes mellitus increases, so will the number of people with diabetic retinopathy.*

Objective: *This study aimed to determine the occurrence and severity of diabetic retinopathy in newly diagnosed type 2 diabetes patients.*

Method*: Institution based cross-section study was conducted with prospective data collection on newly diagnosed type 2 diabetes mellitus patients. Data were analyzed using the statistical package for social science (SPSS) 20 version software.*

Result*: A total of 111 patients with newly diagnosed type II diabetes mellitus participated in the study. The prevalence of diabetic retinopathy among patients with type II diabetes mellitus was 21.6% at the time of diagnosis. The mean (standard deviation) age of the study participants was 50.5 (±10.6) years with a range of 30-70 years. Almost half of the participants (47.7%) completed their secondary school education. The mean (standard deviation) body mass index of the participants was 25 (±3.6) kg/m^2. Diabetic retinopathy was detected in 24 (21.6%) of the patients, of which seven (29.2%) had mild proliferative diabetic retinopathy, eight (33.3%) had moderate non-proliferative, and five (20.8%) had severe non-proliferative, and four (16.7%) had proliferative diabetic retinopathy.*

Conclusion*: The high number of undiagnosed diabetic retinopathy among diabetic patients in our series is a call for an early and regular screening for this complication and more aggressive management of modifiable risk factors could reduce the numbers of people who develop vision-threatening retinopathy.*

Keywords: *Prevalence, Type II Diabetes, Retinopathy, Ethiopia*

INTRODUCTION

Diabetes mellitus (DM) is one of the most serious metabolic disorders that is alarmingly going up in its incidence and prevalence worldwide. The number of adults with DM in the world will rise from 135 million in 1995 to 300 million in the year 2025 (1). The prevalence of type 2 DM increases in developing countries and it mainly affects the younger age group (2). Ethiopia is at risk of having an increased DM incidence (3). According to the WHO, the diabetic population in the country will rise to about 1.8 million by 2030 from a baseline 796,000 in 2000 (4).

The incidence and prevalence of DM are unknown among the Ethiopian population. As a result, the national estimate is based on neighboring countries with similar socio-economic situation. Accordingly, 2%-3% of the population is estimated to live with DM in Ethiopia (3).

Chronic complications of DM affect multiple organ systems and are responsible for the majority of morbidity and mortality associated with the disease. Since type 2 DM often has a long asymptomatic period of hyperglycemia, many individuals with type 2 DM may have complications at the time of diagnosis (5).

Diabetic retinopathy, one of the chronic micro vascular complications, is a major global cause of total blindness. According to the global update on visual impairment in 2002, its prevalence was estimated to be as high as 4.8% of the total blindness (6). As the global prevalence of DM increases, so does the number of people with diabetic retinopathy. Therefore, the aim of the study was to determine the occurrence and severity of diabetic retinopathy in newly diagnosed type 2 DM patients. The findings of this study would provide baseline information for further studies.

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PATIENTS AND METHOD

Institution based cross-sectional study with prospective data collection in newly diagnosed type 2 DM patients at Menelik II Hospital was conducted from May 2014- September 2016. Menelik II Hospital is one of the regional referral hospitals under the auspices of Addis Ababa City Administration Health Bureau. Its diabetic clinic is one of the follow-up clinics, which give service to patients with DM two days per week for an average of 30 patients per day. It is run by two internists and four nurses. A total of 1,000 diabetic patients were enrolled in the follow-up.

During the study period, all newly diagnosed patient seen within the previous six months diagnosed to have had type II DM were included. The patients were referred to the retinal clinic for complete eye examination. Patients who were less than 30 years of age, had type II DM and were in care, had media opacity, and retinopathy other than diabetic retinopathy (diseases requiring steroid treatment, retinal vein occlusion, retinal vasculitis) were excluded in the study. Grading of the degree of retinopathy was determined before the launch of the study by two retina specialists who were investigators using a standardized method.

At the retinal clinic, data on patients' age, sex, educational status, marital status, personal report of fasting blood sugar (FBS) at diagnosis (mild <200mg/dl), moderate 200-250mg/dl and severe (>250mg/dl) (5), history of hypertension and personal habits (physical exercise, smoking and alcohol intake) were documented. Physical exercise was graded as sedentary if the patient rarely participates in physical activity, active if the patient walks or rides a bicycle for at least 30 minutes a day and fit if the patient does regular and vigorous activity at least three times per week.

Smoking was categorized as non-smoker and current smoker and alcohol intake as none, occasional and regular drinking (7), blood pressure was measured in the sitting position and in right hand at using sphygmomanometer. Patients were labeled as hypertensive based on WHO definition of systolic pressure of >140mmHg, diastolic >90mmHg or if the patients were already taking antihypertensive drugs (8). BMI was calculated using the formula (weight/Height^2) after measuring the weight in Kg and height in meters. According to WHO a BMI of 18.5 – 25 kg/m2 was considered normal, 25-29.9kg/m2 overweight and >30kg/m2 obese (9).

Best corrected visual acuity (BCVA) was determined using Snellen chart and pin hole. Intraocular pressure was measured using Schiotz tonometer before dilating the pupils. Slit lamp examination was performed to document any abnormality in the anterior segment of the eye. Tropicamide 1% was used to dilate the pupil .Two retina specialists did fundus examination with 90 diopter lens. Retinopathy and diabetic macular edema (DME) were graded using international council of ophthalmology (ICO) guidelines for diabetic eye care (10), and final diagnosis was determined by the grading of worse eye. Patients were then enrolled to regular retina clinic for follow-up and management.

Study in investigators competed and compiled the data by using a structured questionnaire. The data was entered onto and analyzed using the statistical package for social science (SPSS) version 20. Frequency distribution, mean (±SD), range and ratio were used to summarize data on independent variables. Bivariate analysis using Chi square test was computed to identify predictor for the outcome variable. $P<0.05$ was taken as threshold of statistically significance. Ethical clearance for the study was obtained from the Research and Publication Committee of the Department of Ophthalmology, Medical Faculty Addis Ababa University. Verbal consent was obtained from each participant, who was informed of his or her right to withdraw from the study at any time.

RESULTS

Socio-demographic characteristics

The study population consisted of 111 patients whose age ranged from 30-70 years, with a mean (SD) age of 50.5 (±10.6) years. Of the total participants, 72 (64.9%) were males and (47.7%) completed secondary school. The average BMI and FBS were 25.0 ±(3.6) kg/m^2. and 265.3 (0±99.4) mg/dl, respectively (Table-1).

Table 1: Demographic characteristics of newly diagnosed type 2 DM patients in Menilik II Hospital, 2016.

Variables	Diabetes mellitus with retinopathy n=24 (52.8 ±9.7)	Diabetes mellitus without retinopathy (n=87) 49.8 ± 10.7
Age		
30 – 39	2	17
40 – 49	5	21
50 – 59	10	32
60 – 70	7	17
Sex		
Male	17	55
Female	7	32
Marital status		
Single	7	16
Married	17	64
Divorced	-	1
Widowed	-	3
Separated	-	3
Educational Level		
Illiterate	5	15
Primary	3	17
Secondary	7	26
Diploma	5	16
Degree	3	9
Masters	1	2
Postgraduate	0	2

Prevalence of Diabetic Retinopathy

Diabetic retinopathy was detected in 24 (21.6%) of the patients with mean (SD) age of 52.8 (±9.7); 23.6 % (17/72) in men compared with 17.9 % (7/39) in women. The mean (SD) FBS of patients with retinopathy was 256.1 (±109.6) mg/dl. Of the patients with diabetic retinopathy, 37.5% had hypertension. Mean SBP and DBP in patients with diabetic retinopathy were 132.1 (±11.7) mmHg and 130 (±8.9) mmHg, respectively.

Among the retinopathy patients, mean (SD) BMI was 24 (± 3.1) kg/$m^{2.}$ Six (25%) of the patients were overweight and one (4.2%) was obese. Visual acuity was between 6/6 - 6/12 in 20 (83.3%) and between 6/18 - 6/60 in four (16.7%) of patients with diabetic retinopathy (Table-2).

Among patients with diabetic retinopathy, five (20.8%) were unable to read and write, three (12.5%) attended primary school, seven (29.2%) secondary school, 5 (20.8%) had diploma, 3(12.5%) were degree holders and 1(4.2%) had masters.

Four (16.7%) of diabetic retinopathy patients were smokers and 15 (62.5%) consumed alcohol (Table 1).

Out of the 24 patients with diabetic retinopathy, seven (29.2%), had mild non-proliferative diabetic neuropathy (NPDR) 8 (33.3%) had moderate NPDR 5(20.8%) had severe NPDR and 4 (16.7%) had proliferative diabetic retinopathy (PDR). Among the PDR patients, 12.5% were males and 4.2% were females. Mild diabetic macular edema was detected in 5 (20.8%) cases but didn't cause significant reduction in visual acuity.

Variables Association with Diabetic Retinopathy

In this study, only regular alcohol consumption has shown statistically significantly associated with diabetic neuropathy (p=0.003). No statistically significant association was observed between age (p=0.53), gender (p=0.49), FBS (p=0.68), hypertension (p=0.15), being overweight (p=0.16), obesity (p=0.15), smoking (p 0.10) and diabetic retinopathy(Table 3).

Table 2: Clinical characteristics of newly diagnosed type 2 DM patients in Menilik II Hospital, 2016.

Variables		Diabetes mellitus with retinopathy (n=24)	Diabetes mellitus without retinopathy (n=87)
Alcohol	None	9	61
	Occasional	15	26
Smoking	Never	17	75
	X-smoker	3	8
	Current	4	4
FBS at diagnosis		256.1 (±109.6) mg/dl	267.8 (±96.9) mg/dl
	< 200mg/dl	7	23
	200 -250mg/dl	7	18
	>250mg/dl	10	46
Hypertension	Yes	9	18
	No	15	69
Blood pressure	Systolic	132.08 ± 11.7mmHg	130.9 (± 8.9) mmHg
(mmHg)	Diastolic	132.08 ± 11.7mmHg	81.2 (±6.8_mmHg
BMI	Male		
	<18.5	0	3
	18.5-24.99	12	31
	25-29	5	19
	>30	0	2
	Female		
	<18.5	0	0
	18.5-24.99	5	12
	25-29	1	12
	>30	1	8

Table 3: Variable associated with diabetic retinopathy at Menelik II referral Hospital 2016.

Variables	DR present (n=24)	DR absent (n= 87)	P value
Age >50	14 (58.3%)	41 (47.1%)	0.57
Sex Male	17 (70.8%)	55 (63.1%)	0.48
Female	7 (29.2%)	32 (36.8%)	
FBS> 250mg/dl	10 (41.7%)	46 (52.9%)	0.83
Hypertension	9 (37.5%)	18 (20.7%)	0.08
overweight	6 (25%)	31(35.6%)	0.59
Obesity	1 (4.2%)	10 (11.5%)	0.17
Smokers	4 (16.6%)	4 (4.6%)	0.10
Alcohol consump-tion	15 (62.5%)	26 (29.9%)	0.003

DISCUSSION

The result of this study showed that the prevalence of diabetic retinopathy in newly diagnosed type II DM patients was 21.6%. Multiple studies done worldwide showed varied prevalence rates. Diabetic retinopathy in this study showed almost the same result as the study done in Jordan 22.6% (16). However, diabetic neuropathy in this study had been higher than the studies done in other countries such as in Iran 7.3% (11), Pakistan7.6% (12) and 9% (13), Urban India 5.1% (14), Kuwait 6.2% (15) and 7.6% in Kuwait (17).

This variation might be explained with higher blood glucose level of our study population than other studies at time of diagnosis which is a major known risk factor for development of diabetic retinopathy among diabetes patients. Additional there was a difference in methods used, specifically differences in sample size and sampling of the study population among these studies.

Most studies done worldwide on newly diagnosed patients showed that majority of diabetic retinopathy diagnosed at presentation was NPDR. A study done in Tehran (11) showed 48.4% of NPDR and 45.4% of PDR cases. Another study from Pakistan (13) reported background retinopathy in 12%, pre-proliferative in 4% and proliferative in 1%. Rema M et.al. (14) in their study in urban India identified mild and moderate NPDR in 5.1% of newly diagnosed patients and a study done by Ereifej Iet.al in Jordan found 77.2% NPDR and 22.8% PDR cases. (16)

Our study also found non-PDR cases to be the presentation (83.3%) which was comparable to the Jordan study. Most studies showed high rate of diabetic retinopathy among type II DM at time of diagnosis This was explained by long time undiagnosed diabetes as a result of asymptomatic nature of the diseases. Most of the time types II DM patients diagnosed while they are seeking medical advice for other illness. Additionally, lack of screening programs to diagnose and treat type II DM in time might be a reason to have a lot of retinopathy at the time of diagnosis.

Although this study found that only alcohol consumption had statistically significant association with diabetic retinopathy (P=0.003), different studies showed that older age, high FBS, high hemoglobin (Hg)A1c, high BMI, serum cholesterol, smoking and alcohol consumption are associated with diabetic retinopathy (7-13).

Our findings did not concur with those findings of studies, which reported association between risk factors and development of diabetic retinopathy. Most of our cases were not smokers and obese. However, other important parameters like lipid profile and HgA1c were not done because of limited access to this diagnostic modality.

There was also a difference in the methods, including study population sampling. Additionally, there was difference in lifestyle between our study population and those in other studies. This could be a reason for most of the risk factors which did not have strong association resulting in the development of diabetic retinopathy in this study. Large and multicenter study is recommended to see association between potential risk factor and development of diabetic retinopathy.

Conclusion

Diabetic retinopathy among newly diagnosed type 2 diabetic patients at the time of diagnosis was a common occurrence in our setting. Therefore, early screening for diabetic retinopathy among type II diabetic patients could help early identification of the condition, thereby reducing the number of people who develop vision-threatening retinopathy.

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Competing interest

The authors declare that this manuscript was approved by all authors in its current form and that no competing interest exists.

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