

Magnitude of diabetic retinopathy in newly diagnosed type 2 diabetes patients in Menelik II Hospital, Addis Ababa

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Abstract

Background: Diabetes mellitus (DM) is one of the most common non-communicable diseases with an increasing incidence worldwide. Diabetic retinopathy (DR), one of the chronic micro vascular complications, is a major global cause of total blindness. As the global prevalence of diabetes increases, so will the numbers of people with diabetic retinopathy. Hence, this study aims to determine the magnitude and severity of DR in newly diagnosed type 2 DM patients in Menelik II Hospital. Method: institutional based cross sectional study was conducted on newly diagnosed Type 2 DM patients. Data were analyzed using Statistical Package for Social Science (SPSS) 20 version computer software. Result: A total of 111 patients with newly diagnosed type II diabetes participated in this study. The female to male ration was 1: 1.84. The mean age of study participants was 50.5 (\pm 10.6years) with a range of 30-70 years. Majority of respondents (47.7%) completed secondary school while 18.0% were unable to read and write. The average BMI of participants was $25.0 \pm 3.6\text{kg/m}^2$, 37 (33.3%) were overweight, 11(9.9%) were obese. Average FBS at diagnosis was $265.25 (0 \pm 99.4 \text{ mg/dl})$ for all patients and about 24.3% of the total study population had hypertension. Diabetic retinopathy was detected in 24 (21.6%) patients out of whom 7(29.16%) had mild NPDR, 8 (33.33%) moderate NPDR 5(20.8%)severe NPDR (20.8%) and 4 (16.7%)PDR . Conclusion: The prevalence of diabetic retinopathy at time of diagnosis among type II diabetes showed 21.6%. This high number of undiagnosed DR indicate early and regular screening for diabetic retinopathy among diabetic patients and more aggressive management of modifiable risk factors could reduce the numbers of people who develop vision-threatening retinopathy.

Background

Diabetes mellitus (DM) is one of the serious metabolic disorders that increase alarmingly in its incidence and prevalence worldwide. The prevalence of type 2 DM has been estimated to rise from 150 million to 225 million by the end of 2010 and to as many as 300 million by 2025 [1]. The prevalence of type 2 DM increases markedly in developing country mainly affecting younger age group. [2].

Ethiopia, which is one of the developing nations, is at a risk of increased diabetes incidence [3] and WHO estimates diabetes population to rise to 1,820,000 by year 2030 from its baseline 796,000 in year 2000 [4]. The incidence and prevalence of diabetes mellitus in the general Ethiopian population are unknown. As a result, the national estimate is based on neighboring countries with similar socio-economic situations and accordingly, 2%-3% of the population is estimated to live with diabetes in Ethiopia [3].

The chronic complications of DM affect many organ systems and are responsible for 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 will have complication 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 diabetes increases, so will the numbers of people with diabetic retinopathy. Therefore the aim of the study was to determine the magnitude, and severity of DR in newly diagnosed type 2 DM patients. The findings of this study give base line information for further study to be conducted in similar topics with large sample size that include predisposing factors.

Methods

Institutional based cross sectional study in newly diagnosed type 2 DM patients of Menelik II hospital was conducted from May 2014- Sep2016. Menelik II Hospital is one of the regional referral hospitals under the auspices of Addis Ababa city administration health bureau. Diabetic clinic is one of the follow up clinics which gives service on two days per week for an average of 30 patients per day. It is run by 2 Internists and 4 nurses. A total of 1000 diabetic patients are enrolled in the follow up.

Type 2 DM patients age 30 and above who were diagnosed by physician for the first time, on treatment or not and within the past 6 month of diagnosis were recruited by nurses working at outpatient department of the hospital and sent to Retinal clinic for complete eye exam. All patients newly diagnosed with type II diabetes mellitus during the study period were included in the study. Patients who were less than 30 yrs, known type II diabetic already under care, with media opacity, with retinopathy other than DR (diseases requiring steroid treatment, retinal vein occlusion, Retinal vasculitis) were excluded. Pilot study was done to standardize the grading between the two retina specialists.

At Retinal clinic data about patient's age, sex, educational status, marital status, personal report of FBS at diagnosis which was graded as mild (<200mg/dl), moderate (200-250mg/dl) and severe (>250mg/dl)[5], history of hypertension and personal habit (physical exercise, smoking and alcohol intake) was documented. Physical exercise was graded as sedentary if patient rarely participate in physical activity, active if patient walk for more than half a day or do bicycle work and fit if patient do regular and vigorous activity at least 3 times per week. Smoking was also categorized as non smoker and current smoker. Alcohol intake was graded as none, occasional and regular [7], Blood pressure was measured seated and the right hand at the level of heart using sphygmomanometer. Patient labeled as hypertensive based on WHO definition of systolic >140mmgh, diastolic >90mmgh or if patient was already taking antihypertensive. (8)BMI was calculated using the formula (weight/Height²) after measuring the weight in Kg and height in meters. According to WHO a BMI of 18.5 – 24.99kg/m² was normal, 25-29.9kg/m² was overweight and >30kg/m² was obese [9]. (BCVA using Snellen chart and pin hole was recorded. Intraocular pressure was measured using Schiotz tonometer before dilating pupils. Slit lamp examination was performed to document any abnormality in the anterior segment. Tropicamide 1% was used to dilate the pupil and fundus examination with 90 diaptor lens was done by two retina specialists. Retinopathy and DME were graded using 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. Ethical clearance was obtained from Addis Ababa University department of ophthalmology and verbal consent was taken for each participant as it was a study done while we were doing a regular

eye checkup for newly diagnosed DM patients and there was no intervention. For this, the ethical committee of the department permitted verbal consent.

Data was entered and analyzed using SPSS version 20. Frequencies in percentage mean and tables were used for univariate analysis. Bivariate analysis using Chi square test was used between the predictor and outcome variables. P<0.05 was taken as statistically significant.

Results

Socio-demographic characteristics of respondents

The study population consisted of 111 patients' age ranging from 30-70 years, with a mean age of 50.5 (± 10.6) years. About 72(64.9%) were male and 39 (35.1%) were female. Majority of respondents (47.7%) completed secondary school while 18.0% were unable to read and write. The average BMI was $25.0 \pm 3.6\text{kg/m}^2$. About 37 (33.3%) were overweight and 11(9.9%) were obese. Average FBS at diagnosis was $265.25.0 \pm 99.4\text{ mg/dl}$ and about 24.3% of the total study population had hypertension.

Prevalence of Diabetic retinopathy

Diabetic retinopathy was detected in 24 patients (21.6%), 17 male and 7 females with mean age of 52.8 (± 9.7) years. The prevalence of DR was 23.6 % (17/72) in men compared with 17.9 % (7/39) in women. The mean FBS of patients with retinopathy was $256.12 \pm 109.6\text{mg/dl}$. Of patients with diabetic retinopathy 37.5% had hypertension. Mean SBP and DBP in DR patients were $132.08 \pm 11.7\text{mmHg}$ and $130 \pm 8.9\text{ mmHg}$ respectively. Among the retinopathy patients average BMI was $24 \pm 3.1\text{kg/m}^2$, and six (25%) 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 4(16.7%) of subjects with DR.

Among DR patients 5 (20.8%) were unable to read and write, 3(12.5%) attended primary school, 7(29.2%) secondary school, 5(20.8%) had diploma, 3(12.5%) were degree holders and 1(4.2%) had masters. About 4(16.7%) of diabetic retinopathy patients were smokers and 15 (62.5%) consumed alcohol. (Annex, Table 1.)

Out of the 24 diabetic retinopathy patients, 7 had mild NPDR (29.2%), 8 moderate NPDR (33.3%), 5 severe NPDR (20.8%) and 4 PDR (16.7%). Among the PDR patients 12.5% were males and 4.2% were females. Mild DME was detected in 5 cases (20.8%) but didn't cause significant reduction in visual acuity.

Variables Association with Diabetic Retinopathy factors

In this study, only alcohol consumption ($p=0.003$) was statistically significant associated factors for DR. No statistically significant association was observed between DR and age ($p=0.53$), gender ($p=0.49$), FBS ($p=0.68$), hypertension ($p=0.15$), being overweight ($p=0.16$), obesity ($p=0.15$) and smoking ($p=0.10$) (Annex, Table 2).

Discussion

This study showed the prevalence of retinopathy in newly diagnosed type II DM patients was found to be 21.6%. Multiple studies done worldwide showed varied prevalence.

The result of this study is higher than study done in Tehran 7.3% (11), Karachi 7.6% (12) and Abbotabad 9% (13), Rema M 5.1% (14), TappRJ 6.2% (15) and Al-ZUBai H 7.6% (17). Whereas lower than study done by Ismat Ereifej 22.6% (16).

This wide difference could be due to variations in age, race and definition of newly diagnosed DM, method of detecting DR and availability of health care facilities. Most studies done worldwide on newly diagnosed patients showed that majority of cases diagnosed at presentation was non PDR. A study done in Tehran by Abdollahi A (11) showed 48.4% of non PDR and 45.4% of PDR cases. Another study from Pakistan by Hayat AS (13) reported background retinopathy in 12%, preproliferative in 4% and proliferative in 1%. Rema M (14) in his study in Urban India identified mild and moderate NPDR in 5.1% of newly diagnosed patients and a study done by Ereifej I found 77.2% NPDR and 22.8% PDR cases. (16) Our study also found non PDR cases to be the commonest presentation (83.3%).

Although this study found that only alcohol consumption had statistically significant association with DR ($P=0.003$), different literature showed that older age, high FBS, high HgA1c, high BMI, serum cholesterol, smoking and alcohol consumption associated with DR (7-13).

Conclusion

The prevalence of retinopathy among newly diagnosed type 2 diabetic patients was high. This showed how common retinopathy was and that this complication already existed at the time of diagnosis of DM. Alcohol consumption had statistically significant association with DR. Therefore, early and regular screening for diabetic retinopathy among diabetic patients could reduce the numbers of people who develop vision-threatening retinopathy.

Declarations

Ethics approval and consent for participation

Ethical clearance was obtained from College of Health Science, Addis Ababa University, and ethical review committee. Participants were informed the purpose of the study and participation was voluntary for which verbal consent was obtained and was approved by ethical committee of Ophthalmology department of Addis Ababa University. Confidentiality was kept by coding personal identity. Participants with DR were started clinical management by senior retina specialist.

Consent for publication

Not applicable

Availability of data and materials

Dataset on which the conclusion was made is available in software and only available on request from Dr. Rebecca Getachew

Competing interest

The authors declare that they have no competing interest

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Authors' contributions

RG and BG developed the proposal, analyzed and wrote up the paper and DN reviewed the final paper and prepared the manuscript. All the authors reviewed and approved the final manuscript.

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Abbreviations

BCVA: Best Corrected Visual Acuity

BMI: Body Mass Index

DBP: Diastolic Blood pressure

DM: Diabetes Mellitus

DME: Diabetic Macular Edema

DR: Diabetic Retinopathy

FBS: Fasting Blood Glucose

NPDR: Non Proliferative Diabetic Retinopathy

SBP: Systolic Blood Pressure

SPSS: Statistical Package for Social Science

PDR: Proliferative Diabetic Retinopathy

WHO: World Health Organization

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Tables

Table 1 Demographic and clinical characteristics of newly diagnosed type 2 DM patients with and without retinopathy at Menelik II Hospital, 2016

Variables	DM with DR (n=24)	DM without DR (n=87)
Age		
30 – 39	52.8 ±9.7	49.8 ± 10.7
40 – 49	2	17
50 – 59	5	21
60 – 70	10	32
Sex		
Male	17	55
Female	7	32
Marital status		
Single	17	64
Married	-	1
Divorced	-	3
Widowed	-	3
Separated	5	15
Educational Level		
Illiterate	3	17
Primary	7	26
Secondary	5	16
Diploma	3	9
Degree	1	2
Masters	0	2
Post graduate	9	61
Alcohol	15	26
None	17	75
Occasional	3	8
Smoking	4	4
Never	256.12±109.6mg/dl	267.8 ±96.9mg/dl
Ex smoker	7	23
Current	7	18
	10	46

FBS at diagnosis	9	18
< 200mg/dl	15	69
200 -250mg/dl	$132.08 \pm 11.7\text{mmHg}$	$130.9 \pm 8.9\text{mmHg}$
>250mg/dl	$83.5 \pm 8.9\text{mm Hg}$	$81.2 \pm 6.8\text{mmHg}$
Hypertension	0	3
Yes	12	31
No	5	19
Blood pressure (mmhg)	0	2
Systolic	0	0
Diastolic	5	12
BMI	1	12
Male	1	8
<18.5		
18.5-24.99		
25-29		
>30		
Female		
<18.5		
18.5-24.99		
25-29		
>30		

Table 2, Variable associated with diabetic retinopathy at Menelik II referral Hospital 2016

variable	DR present	DR absent	P value
	(n=24)	(n= 87)	
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 consumption	15(62.5%)	26 (29.9%)	0.003