Factors affecting diabetic retinopathy screening uptake among adult patients attending diabetic clinic in a tertiary hospital in Tanzania

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ABSTRACT

Objective: To determine the factors affecting diabetic retinopathy screening uptake among adult patients attending diabetic clinic in a tertiary hospital in Tanzania.

Methods: This study was a hospital based analytical cross-sectional study which was conducted at the diabetic clinic of Muhimbili National Hospital from June to July 2021. All adult patients with diabetes mellitus who met inclusion criteria were enrolled in the study. A stratified random sampling method was used to recruit participants. Data was collected using a structured questionnaire and analysed by using Statistical Package for Social Sciences (SPSS) version 26.

Results: A total of 322 participants were enrolled in this study. Median age was 58 years with a range of 18 to 83 years. Less than half (43.8%) of participants were screened for diabetic retinopathy within 12 months. Physician recommendation had influence on diabetic retinopathy screening uptake (63.6%). Awareness of diabetic retinopathy screening and tolerability of mydriatic eye drops were significantly associated with screening for diabetic retinopathy within 12 months ($p<0.001$)**.**

Conclusion: Improving health education on diabetic retinopathy and diabetic retinopathy screening as well as ensuring comfortability during and after pupillary dilatation is necessary to enhance diabetic retinopathy screening uptake.

Key words: Diabetic retinopathy, Diabetic retinopathy screening, Eye-care Tanzania

INTRODUCTION

Diabetic Retinopathy (DR) is a vascular disease of the retina caused by long standing Diabetes Mellitus (DM). It is among the commonest complication of DM, which accounted for the global prevalence of 35.4% in 2010. According to the World Health Organization (WHO), DR is the fifth chief cause of blindness worldwide and the foremost cause of blindness in working age population, accounting for the overall prevalence of blindness and visual impairment of 2.6% and 1.9% respectively in 2019 [1–3].

Diabetic Retinopathy Screening (DRS) refers to detection of retinal changes by fundus examination or imaging of patients with DM. DRS is of importance as DR may be asymptomatic, and this may lead to patients reporting late with complications. Early diagnosis through screening and timely treatment can prevent more than 90% of DR related visual impairment and blindness[4]. Unfortunately, regardless of good control of blood sugar, more than 90% of patients with type 1 DM and about 60% of patients with type 2 DM will get some form of DR over 20 years. Some of these patients will end up with blindness if not detected early through screening and treated on time, exerting a significant public health problem[5]. The International Diabetes Federation guideline recommends annual screenings for DR to all patients with DM and every 3 months to pregnant women. For patients with type 1 DM screening starts 5 years after diagnosis and for patients with type 2 DM screening starts at the time of diagnosis[3-8].

The rate of DRS uptake varies from place to place and there is a wide range, making difficulties in estimating global screening rates. Despite the availability of screening programs, the rate of screening for DR within 12 months is below the required standard especially in developing countries ranging from 7.4% to 33%, where 75% is considered as minimum acceptable and 85% as achievable[9-12].

Efficacious uptake of screening for DR depends on a number of factors, ranging from health care related factors, disease (DM) related factors and patients related factors. Physician recommendation to screen for DR, longer duration of DM and presence of comorbidities has shown to increase DRS uptake while lack of awareness and knowledge on DR and DRS decreases screening uptake[11,13-16].

Despite having established DR screening services at the DM clinic at Muhimbili National Hospital (MNH), it was noted that a good number of DM patients with good

attendance at the DM clinic still comes to eye clinic with some form of advanced DR. Little was known on the factors affecting DRS uptake. Therefore, this study aimed to provide an updated information on the proportion of DRS uptake within 12 months as well as the factors affecting DRS uptake at MNH.

MATERIALS AND METHODS

Study design: This was a hospital based analytical cross-sectional study conducted for one month from June to July 2021.

Study setting: The study was conducted at the diabetic clinic of MNH in Dar es salaam,Tanzania.

Study population: All patients attending diabetic clinic during the study period.

Inclusion criteria: All adult patients attending diabetic clinic during the study period.

Exlusion criteria: All patients who were on treatment for DR, patients with type 1 DM with duration of disease of less than 5 years and patients with mental or physical conditions that prevented them from participating in the study.

Sample size detarmination: Minimum sample size was estimated using Kish and Leslie formula for proportion in cross-sectional studies ($N= Z^2 p(1-p)/ e^2$). Where N=minimum sample size, Z= standard normal deviation corresponding to 95% confidence level (1.96), e= marginal error (5%) and p= 28.8% a proportion of DR screening uptake in a study done at KCMC, Tanzania[17]. Therefore from the above formula the minimum sample size calculated was 315 participants. In this study a total of 322 participants were enrolled.

Sampling procedure: The study employed stratified random sampling technique, where the participants were divided into two strata as there are two special DM clinics. Stratum one included those aged 18-25 years old, who attend clinic on Mondays. Stratum two were those above 25 years of age who attend clinic on Tuesdays, Wednesdays and Thursdays. A predetermined sample size in each group was calculated in percentage based on clinic attendance register per week. In stratum one 12 participants (7.4%) attend per week and 150 participants (92.6%) in stratum two attend per week. Systematic random sampling was used to recruit participants from each stratum, where every 2nd patient was interviewed from each stratum until the sample size was reached.

Data collection: Data was collected by using researcher administered structured questionnaire. Prior to data collection, the questionnaire was reviewed by two senior ophthalmologists and one statistician. The questionnaire was in Swahili language. Knowledge on DRS was assessed using questions adopted from a study done by Almalki *et al*[18], which was also used in previous studies and its reliability was checked. Permission of using the tool was obtained from the author and translated to Swahili language. The questions consisted of 10 items aiming at assessing knowledge on DRS. Those participants who scored 60% and above were regarded as knowledgeable and those who scored below 60% were regarded as not having knowledge on DRS.

Data analysis: Data were analyzed using IBM SPSS version 26 software. In the bivariate analysis, significant difference between variables was tested using Pearson's chi-square test. For values with p-value of less than 0.2 from bivariate analysis were entered into multivariate regression model. A p-value of less than 0.05 was considered to be statistically significant.

Ethical consideration: Ethical clearance was obtained from MUHAS Institution review board. Permission to conduct the study was obtained from MNH research committee. Written informed consent from all participants was taken after fully explaining the purpose of the study. There was no risk associated with participating in this study.

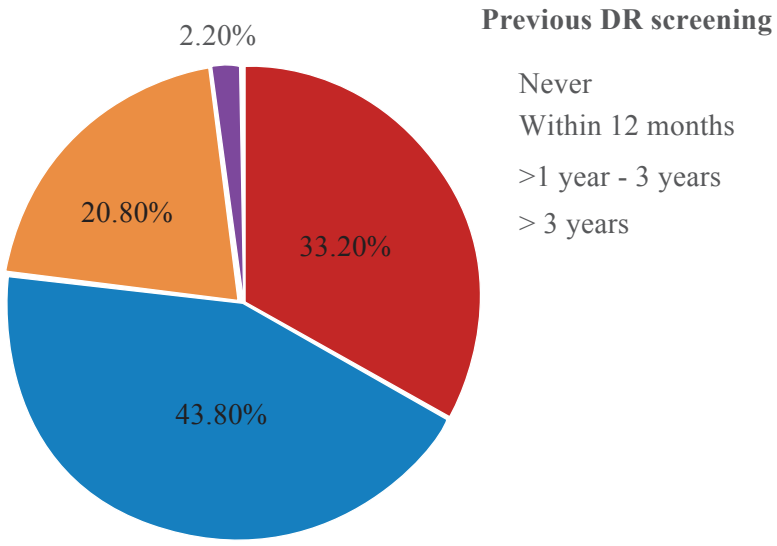
RESULTS

Three hundred and twenty-two participants were recruited and all were included in the analysis. The median age was 58 years with a range of 18-83 years and most participants were females (58.4%). (Table 1). Among the participants 33.2% were recommended to screen for DR.

Table 1: Socio-demographic characteristics of the study participants (n=322)

Characteristic	Frequency		P - value
	No.	(%)	
Age group (years)			
18 - 35	41	12.7	< 0.001
36 - 60	141	43.8	
>60	140	43.5	
Median age in years (range)	58 (18, 83)		
Sex			
Male	134	41.6	0.003
Female	188	58.4	
Marital status			
Single	43	13.4	< 0.001
Married	218	67.7	
Divorced	12	3.7	
Widow	49	15.2	
Residence			
Dar es salaam	272	84.5	< 0.001
Other regions	50	15.5	
Level of education			
No formal education	12	3.7	< 0.001
Primary education	130	40.4	
Secondary education	115	35.7	
College	65	20.2	
Occupation			
Employed	169	52.5	< 0.001
Unemployed	83	25.8	
Retired	70	21.7	
Income status (USD)			
< 124	224	69.6	< 0.001
124 - 506	85	26.4	
>506	13	4.0	
Health insurance coverage			
Insurance	217	67.4	< 0.001
No insurance	105	32.6	

Figure 1: Proportion of diabetic retinopathy screening uptake among study participants (n=322)



Less than half of the participants had screened for diabetic retinopathy within 12 months (43.8%) (Figure 1). Disease related factors (treatment regimen, duration of DM and comorbidities) did not show statistical significant difference in screening for DR within 12 months (Table 2).

Table 2: The relationship between patient related factors and DRS uptake

Patient related factor	Diabetic retinopathy screening within 12 months		
	Yes	No	P - value
	No. (%)	No. (%)	
Age group (years)			
18 - 35	20 (48.8)	21 (51.2)	0.307
36 - 60	55 (39.0)	86 (61.0)	
>60	66 (47.1)	74 (52.9)	
Sex			
Male	57 (42.5)	77 (57.5)	0.702
Female	84 (44.7)	104 (55.3)	
Residence			
Dar es salaam	116 (42.6)	156 (57.4)	0.335
Other regions	25 (50.0)	25 (50.0)	
Level of education			
No formal education	4 (33.3)	8 (66.7)	0.541
Primary education	53 (40.8)	77 (59.2)	
Secondary education	56 (48.7)	59 (51.3)	
College	28 (43.1)	37 (56.9)	
Income status (USD)			
< 124	104 (46.4)	120 (53.6)	0.183
124 - 506	34 (40.0)	51 (60.0)	
>506	3 (23.1)	10 (76.9)	

Awareness of DR			
Yes	131 (58.5)	93 (41.5)	< 0.001
No	10 (10.2)	88 (89.8)	
Awareness of DRS			
Yes	132 (61.7)	82 (38.3)	< 0.001
No	9 (8.3)	99 (91.7)	
Knowledge on DRS			
Knowledgeable (score ≥ 60%)	91 (61.5)	57 (38.5)	< 0.001
Unknowledgeable (score < 60%)	50 (28.7)	124 (71.3)	
History of decreased vision			
Yes	97 (53.6)	84 (46.4)	< 0.001
No	44 (31.2)	97 (68.8)	
Fear of results			
Yes	10 (66.7)	5 (33.3)	0.067
No	131 (42.7)	176 (57.3)	

Majority of those who were not aware of DR (89.85%) and DRS (91.7%) and most of those who were unknowledgeable about DRS (71.3%), did not screen for DR. Additionally, 68.8% of those who had no history of decreased vision did not screen for DR (Table 2).

Table 3: The relationship between healthcare related factors and DRS uptake

Healthcare related factors	Diabetic retinopathy screening within 12 months		
	Yes	No	P - value
	No. (%)	No. (%)	
Physician recommended to screen for DR			
Yes	68 (63.6)	39 (36.4)	**< 0.001**
No	73 (34.0)	142 (66.0)	
Waiting time for screening*			
0 – 15 minutes	15 (88.2)	2 (11.8)	0.052
16 – 30 minutes	81 (65.9)	42 (34.1)	
31 – 60 minutes	44 (56.4)	34 (43.6)	
>1 hour	1 (50.0)	1 (50.0)	
Number of clinic visit			
One visit	0 (0.0)	17 (100.0)	**< 0.001**
Two to three visits	16 (57.1)	12 (42.9)	
More than three visits	125 (45.1)	152 (54.9)	

Cost interfering with screening			
Yes	27 (39.1)	42 (60.9)	0.379
No	114 (45.1)	139 (54.9)	
Tolerability of mydriatic eye drops			
Yes	91 (53.2)	80 (46.8)	**< 0.001**
No	50 (33.1)	101 (66.9)	
Health financing			
Insurance	90 (41.5)	127 (58.5)	0.229
Non insured	51 (48.6)	54 (51.4)	

Key: *Variable with less than total (n < N) due to analysis of subtotal.

All participants with one clinic visit had not screened for DR. Most of those whom DR screening was not recommended by their physician (66%) and those who thought/heard that mydriatic eye drop was not tolerable (66.9%), had not screened for DR (Table 3).

Table 4: Univariate and multivariate analysis of the factors associated with DRS uptake

	Univariate analysis			Multivariate analysis		
Factors	cOR	95% CI	P-value	aOR	95% CI	P-value
Income (USD)						
< 124	2.89	0.77 – 10.78	0.114	3.20	0.65 – 15.70	0.152
124 - 506	2.22	0.57 – 8.67	0.250	1.67	0.32 – 8.61	0.539
> 506	Ref					
Awareness of DR						
Yes	12.40	6.12 – 25.11	< 0.001	1.37	0.37 – 5.16	0.638
No	Ref					
Knowledge on DRS						
Knowledgeable	3.96	2.48 – 6.31	< 0.001	1.38	0.73 – 2.59	0.319
Unknowledgeable	Ref					
History of decreased vision						
Yes	2.55	1.61 – 4.04	< 0.001	1.26	0.65 – 2.45	0.490
No	Ref					
Fear of results						
Yes	2.69	0.90 – 8.05	0.077	2.15	0.53 – 8.72	0.286
No	Ref					
Duration of diabetic mellitus (years)						
>20	2.21	0.91 – 5.40	0.082	0.45	0.13 – 1.54	0.203
11 - 20	1.96	0.92 – 4.18	0.083	0.72	0.24 – 2.13	0.550
1 - 10	1.38	0.67 – 2.84	0.382	0.58	0.21 – 1.66	0.314
< 1	Ref					

Physician recommended to screen for DR						
Yes	3.39	2.09 – 5.51	< 0.001	1.83	0.94 – 3.54	0.074
No	Ref					
Tolerability of mydriatic eye drop						
Yes	2.30	1.46 – 3.61	< 0.001	2.89	1.64 – 5.09	<0.001
No	Ref					
Awareness of DRS						
Yes	17.71	8.48 – 36.96	< 0.001	12.47	3.28 – 47.37	<0.001
No	Ref					

Key: cOR: crude Odds Ratio, aOR: adjusted Odds Ratio, Ref: Reference category

Awareness of DRS and the belief of mydriatic eye drop tolerability were the only factors that remained significantly associated with screening for DR within 12 months. (Table 4).

DISCUSSION

Diabetic Retinopathy (DR) is a potentially blinding disease, early diagnosis through screening and timely treatment can prevent more than 90% of DR related visual impairment and blindness[4]. In this study annual screening uptake for DR was found to be 43.8%, which is low. Our findings were higher than those reported in Tanzania by Mumba *et al*[17], 14 years ago 28.8%, and a multicenter study including MNH by Mafwiri *et al*[19], 6 years ago 29.8%. This difference is due to the fact that currently at MNH, DRS services have been incorporated within the diabetic clinic and patients are no longer required to go to the Ophthalmology Department for screening. Additionally, there is an increase of awareness on diabetic retinopathy screening from 5.8% 6 years ago to 61.7%. These findings imply that more interventions are still needed to raise screening uptake.

In this study it was found that 89.8% of participants who were not aware of DR and 91.7% who were not aware of DRS did not screen for DR. This signifies that lack of awareness on DR and DRS is a potential barrier to DRS uptake. Similar findings have been reported in a study done in Kenya by Mwangi *et al*[11], and in northern Tanzania by Mumba *et al*[17].

Physicians play a key role in initiating and monitoring their patient's diabetic retinopathy screening to reduce preventable blindness. In this study it was found that 63.6% of those who were recommended to screen for DR by their physicians screened for DR. These findings were similar to a study done in Netherland by Van Eijk *et al*[16] and in India by Manu *et al*[14]. Although this study pointed out the influence of physician recommendation in DRS uptake, only 33.2% of participants were told by their physicians to go for DRS. Therefore, further studies are needed to establish the reasons why there is less referral for DR screening by physicians at the diabetic clinic.

Mydriatic eye drop has a stingy irritation on instillation and causes temporary blurring of vision as a result of pupillary dilatation. In this study it was observed that those who thought mydriatic eye drop was not tolerable were more likely not to screen for DR within 12 months. Similar results were reported in Sri Lanka by Piyasena *et al*[13] and in Ireland in a study by Dervan *et al*[12]. The Influence from other patients who have been previously dilated has an impact on the turn up of other patients to screen for DR.

CONCLUSION

The proportion of diabetic retinopathy screening at MNH was low. Lack of awareness on diabetic retinopathy screening was a barrier to DRS uptake and the belief that mydriatic eye drop was intolerable discouraged patients to undergo screening for DR.

RECOMMENDATIONS

All diabetic educators should be trained and sensitized to put more emphasis on DR and DRS when providing health education to patients with DM during conduction of the diabetic clinic. Topical anaesthesia should be used before administering mydriatic eye drop to ensure comfort and the use of miotics after examination so as to relieve photophobia. Patients should be informed and reassured on what will happen after pupillary dilatation and they need to be educated on the importance of pupillary dilatation for the detection of the disease.

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Authors' contributions: Denis MN designed the study, collected data, entered data in SPSS for analysis, interpreted the results and prepared the manuscript. Mosenene S, Mhina C, and Mafwiri MM participated in designing the study and revising the manuscript critically for important intellectual content.

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