Uptake of Screening for Diabetic Retinopathy and Associated Factors among Adults with Diabetes Mellitus Aged 18-65 Years: A Descriptive Cross Sectional Study

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***Abstract* — The prevalence of diabetes in Zimbabwe has increased significantly in the past three decades posing serious challenges to the provision of care and prevention of disabling co-morbidities in an already disadvantaged healthcare setting. Studies conducted in Zimbabwe have reported prevalence of 16% to 38%. Diabetic retinopathy, a major complication of diabetes, is a leading cause of blindness globally and of an estimated 285 million people with diabetes worldwide approximately 33.3% have signs of diabetic retinopathy and of these a further 33.3% have vision threatening diabetic retinopathy. The purpose of this study is to examine uptake of screening for diabetic retinopathy and associated factors among adults aged 18-65 years with diabetes at Parirenyatwa Group of Hospitals. This was a cross sectional analytical study on a random sample of 83 adults aged 18-65 years with diabetes mellitus. The study was conducted according to the requirements of the Declaration of Helsinki. A structured questionnaire was used to collect data in strict privacy and confidentiality. Uptake of screening was 53%. The chi-square test was done to analyze demographic factors associated with uptake of screening. Male gender and being married were significantly associated with higher uptake of screening (p=0.029 and p=0.037 respectively). Logistic regression was done to determine predictors of uptake of screening services for diabetic retinopathy. On logistic regression, gender (OR=0.241, 95% CI [0.079 – 0.735]) and misinformation (OR=0.280, 95% CI [0.081 – 0.974]) were significant predictors of uptake of screening. Uptake of diabetic retinopathy screening was sub-optimal. Gender and misinformation were significant barriers to uptake of screening. There is need to address barriers to uptake of retinopathy screening to promote timely identification and management of complications in people with diabetes mellitus.**

***Key words* — diabetes mellitus; retinopathy; screening; uptake.**

I. Introduction

The prevalence of diabetes in Zimbabwe has increased significantly in the past three decades posing serious challenges to the provision of care and prevention of disabling co-morbidities in an already disadvantaged healthcare setting [1]. Studies conducted in Zimbabwe have reported prevalence of 16% to 38% [2]-[4]. Diabetes is associated with complications such as heart attacks, strokes, neuropathy, nephropathy and retinopathy. Diabetic retinopathy is a leading cause of blindness globally and of an estimated 285 million people with diabetes worldwide approximately 33.3% have signs of diabetic retinopathy and of these a further 33.3% have vision threatening diabetic retinopathy[5]. According to WHO, diabetic retinopathy is an important cause of blindness which results from long term accumulated damage to the small blood vessels in the retina and 2.6% of global blindness is attributed to diabetes. It is the fifth commonest cause of blindness and is responsible for a disproportionately larger quantum of associated morbidity [3]. The primary method of screening for diabetic retinopathy is ophthalmoscopy, done with or without pharmacologic dilation [6]. The American Diabetes Association (ADA) 2014 guidelines state that type 1 diabetics should have a comprehensive eye examination done within 5 years after the onset of diabetes while type 2 diabetics require an eye examination at the time of diagnosis and once a year there after. Pregnant women with diabetes need to have their eyes examined in the first trimester of pregnancy, with close monitoring throughout pregnancy and 1 year post-partum as pregnancy can quickly exacerbate underlying diabetic retinopathy [6].

Despite the high prevalence of diabetic retinopathy, research studies have identified reduced uptake of the recommended annual eye screening. Annual diabetic retinopathy screening is recommended by the International Council of Ophthalmology and the World Health Organisation [4]. Adherence to retinopathy screening is sub optimal and multifactorial in nature [6]. The diabetic eye screening program defines 75% as the minimum acceptable level of uptake for the current Quality Assurance Standard with 85% considered achievable [7]. Screening attendance rates for diabetic retinopathy consistently below recommended levels have been observed internationally [8].

The reduced uptake of diabetic retinopathy eye screening is attributed to various barriers and enablers. Population eye screening among people with diabetes has been shown to be clinically effective but it is associated with suboptimal attendances with a wide range of demographic disparities [8]. Some reported reasons for low uptake of screening include long waiting periods, and limited health facilities offering the service [4]. The purpose of this study, therefore, was to assess uptake of screening for diabetic retinopathy and associated

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factors among adults aged 18-65 years with diabetes at Parirenyatwa Group of Hospitals.

II. METHODOLOGY

This was a cross sectional study conducted on a random sample of 83 participants aged 18-69 years. The study was conducted at Parirenyatwa Group of Hospitals in the Out Patients' Department (OPD). Approval for the study was granted by the Joint Research and Ethics Committee of the University of Zimbabwe College of Health Sciences and Parirenyatwa Group of Hospitals. All participants gave informed consent. An interviewer administered questionnaire was used to collect data. It had sections on demographic data, uptake of diabetic retinopathy screening and reasons for non-uptake of screening. All interviews were held in a private room and code numbers were used to identify participants and filled in questionnaires were kept in a lockable cupboard to which the researcher had sole access. Data was analysed using SPSS version 22 and STATA version. Descriptive statistics were used to analyse demographic data, screening rates and barriers to uptake of screening. The chi-square test was done to analyse demographic factors associated with uptake of screening. Logistic regression was done to determine predictors of uptake of screening services for diabetic retinopathy.

III. RESULTS

Table 1 presents socio demographic data. A greater proportion of participants who were not screened for diabetic retinopathy were females 16(59.3%) and gender was significantly associated with uptake of screening (p=0.029). The majority of the participants were married 55 (66.3%) and being married was associated with higher uptake of screening (p=0.037). About 51% of the participants were unemployed and the greater proportion of the participants were Christians 52(62.7%). Education level had no significant association with screening rates with only 17(20.5%) of the participants having no formal education. The majority of the participants 55(66.3%) lived in urban high density and type 2 diabetes was the most prevalent in both groups. A greater proportion of participants had lived with the diagnosis of diabetic retinopathy for 0 -2 years 37(44.6%) and there was a relatively fair distribution of participants by age in both screened and unscreened participants.

Barriers to uptake of diabetic retinopathy screening

Table 2 presents barriers to uptake of screening. Majority participants who had not been screened cited competing priorities 17(63.0%) and long waiting periods 16 (59.3%), as barriers. Misinformation, lack of motivation, attitudes and knowledge levels were significant barriers to uptake (p=0.024, p=0.048, p=0.011 and p=0.035 respectively).

TABLE 1: SOCIO-DEMOGRAPHIC CHARACTERISTICS (N=83)

Variable (n=83)	Screening status		Totals (%)	Chi-square p-value
	No (%)	Yes (%)		
Gender				
Male	11(40.7)	37 (66.1)	48 (57.8)	
Female	16 (59.3)	19 (33.9)	35 (42.2)	0.029*
Total	27(100.0)	56 (100.0)	83 (100.0)	
Marital status				
Single	6 (22.2)	9 (16.1)	15 (18.1)	
Married	15 (55.6)	40 (71.4)	55 (66.3)	
Widowed	6 (22.2)	7 (12.5)	13 (15.7)	0.037*
Total	27 (100.0)	56 (100.0)	83	
Employment				
Formal	14 (51.9)	22 (39.3)	36 (43.4)	
Unemployed	11 (40.7)	31(55.4)	42 (50.6)	0.481
Informal	2 (7.4)	3 (5.4)	5 (6.0)	
Total	27 (100.0)	56 (100.0)	83 (100.0)	
Religion				
Christian	17 (63.0)	35 (62.5)	52 (62.7)	
Islam	5 (18.5)	12 (21.4)	17 (20.5)	
Traditional	3 (11.1)	2 (3.6)	5 (6.0)	0.255
Non-believer	1 (3.7)	7 (12.5)	8 (9.6)	
Other	1 (3.7)	0 (0.0)	1 (1.2)	
Total	27 (100.0)	56 (100.0)	83 (100.0)	
Education				
ZJC	5 (18.5)	11 (19.6)	16 (19.3)	
Ordinary level	7 (25.9)	17 (30.3)	24 (28.9)	
Advanced level	7 (25.9)	18 (32.1)	25 (30.1)	0.636
Tertiary	5 (18.5)	4 (7.1)	9 (10.8)	
Never went to school	3 (11.1)	6 (10.7)	9 (10.8)	
Total	27 (100.0)	56 (100.0)	83 (100.0)	
Income (RTGS)				
<500	14 (51.9)	28 (50.0)	42 (50.6)	0.291
500-1000	9 (33.3)	15 (26.8)	24 (28.9)	
>1000	4 (14.8)	13 (23.2)	17 (20.5)	
Total	27 (100.0)	56 (100.0)	83 (100.0)	
Residence				
Urban high density	18 (66.7)	37 (66.1)	55 (66.3)	0.957
Urban low density	9 (33.3)	19 (33.9)	28 (33.7)	
Total	27 (100.0)	56 (100.0)	83 (100.0)	
Diabetes type				
Type 1	2 (3.8)	3 (5.4)	5 (6.0)	0.114
Type 2	25 (96.2)	53 (94.6)	78 (94.0)	
Total	27 (100.0)	56 (100.0)	83 (100.0)	
Duration with diagnosis				
0-2 years	10 (37.0)	27 (48.2)	37 (44.6)	
2-4	5 (18.5)	9 (16.1)	14 (16.9)	
4- 6	7 (25.9)	11 (19.6)	18 (21.7)	0.667
6- 8	1 (3.7)	5 (8.9)	6 (7.2)	
8-10	2 (7.4)	3 (5.4)	5 (6.0)	
10-12	1 (3.7)	0 (0.0)	1 (1.2)	
12- 14	1 (3.7)	1 (1.9)	2 (2.4)	
Total	27 (100.0)	56 (100.0)	83 (100.0)	
Age(yrs)				
18 – 25	6 (22.2)	7 (12.5)	13 (15.7)	
25 - 35	8 (29.7)	16 (28.6)	24 (28.9)	
35 – 45	8 (29.7)	14 (25.0)	22 (26.5)	0.536
45 – 55	3 (11.1)	8 (14.3)	11 (13.3)	
55 – 65	2 (7.4)	11 (19.6)	13 (15.7)	
Total	27 (100.0)	56 (100.0)	83 (100.0)	

TABLE 2: BARRIERS TO UPTAKE OF DIABETIC RETINOPATHY SCREENING (N=83)

Variable	Screening status		Total	Chi-square p-value
	Not screened	screened		
Fear of laser				
No	22 (81.5)	52 (92.9)	74 (89.2)	
Yes	5 (19.5)	4 (7.1)	9 (10.8)	0.118
Total	27 (100.0)	56 (100.0)	83 (100.0)	
Guilty of glycaemic control				
No	18 (66.7)	41 (73.2)	59 (71.1)	
Yes	9 (33.3)	15 (26.8)	24 (28.9)	0.538
Total	27 (100.0)	56 (100.0)	83 (100.0)	
Waiting				
No	11 (40.7)	25 (44.6)	36 (43.4)	
Yes	16 (59.3)	31 (55.4)	47 (56.6)	0.737
Total	27 (100.0)	56 (100.0)	83 (100.0)	
Language				
No	27 (100.0)	56 (100.0)	83 (100.0)	
Yes	0 (0.0)	0 (0.0)	0 (0.0)	
Total	27 (100.0)	56 (100.0)	83 (100.0)	
Pain				
No	27 (100.0)	56 (100.0)	83 (100.0)	
Yes	0 (0.0)	0 (0.0)	0 (0.0)	
Total	27 (100.0)	56 (100.0)	83 (100.0)	
Forgetting				
No	17 (63.0)	41 (73.2)	58 (69.9)	
Yes	10 (37.0)	15 (26.8)	25 (30.1)	0.340
Total	27 (100.0)	56 (100.0)	83 (100.0)	
Competing priorities				
No	10 (37.0)	25 (44.6)	35 (42.2)	
Yes	17 (63.0)	31 (55.4)	48 (57.8)	0.511
Total	27 (100.0)	56 (100.0)	83 (100.0)	
Misinformation				
No	18 (66.7)	49 (87.5)	67 (80.7)	
Yes	9 (33.3)	7 (12.5)	16 (19.2)	0.024*
Total	27 (100.0)	56 (100.0)	83 (100.0)	
Anxiety				
No	21 (77.8)	42 (75.0)	63 (75.9)	
Yes	6 (22.2)	14 (25.0)	20 (24.1)	0.782
Total	27 (100.0)	56 (100.0)	83 (100.0)	
Motivation				
No	15 (55.6)	43 (76.8)	58 (69.9)	
Yes	12 (44.4)	13 (23.2)	25 (30.1)	0.048*
Total	27 (100.0)	56 (100.0)	83 (100.0)	
Knowledge				
No	14 (51.9)	42 (75.0)	56 (67.5)	
Yes	13 (48.1)	14 (25.0)	27 (32.5)	0.035*
Total	27 (100.0)	56 (100.0)	83 (100.0)	
Funds				
No	9 (33.3)	17 (30.4)	26 (31.3)	
Yes	18 (66.7)	39 (69.6)	57 (68.7)	0.784
Total	27 (100.0)	56 (100.0)	83 (100.0)	
Facilities				
No	11 (40.7)	23 (41.1)	34 (41.0)	
Yes	16 (59.3)	33 (58.9)	49 (59.0)	0.977
Total	27 (100.0)	56 (100.0)	83 (100.0)	
Attitude				
No	24 (88.9)	56 (100.0)	80 (96.4)	
Yes	3 (11.1)	0 (0.0)	3 (3.6)	0.011*
Total	27 (100.0)	56 (100.0)	83 (100.0)	

Predictors of uptake of screening for diabetic retinopathy

Table 3 presents predictors of uptake of retinopathy screening. An adjusted regression analysis was conducted controlling for gender, attitude, misinformation and knowledge to determine significant predictors of screening rates for diabetic retinopathy in Zimbabwe. Gender (OR=0.241, 95% CI [0.079 – 0.735].) and misinformation (OR=0.280, 95% CI [0.081 – 0.974].) were significant predictors of uptake of screening. Knowledge was a promising factor (OR=0.333, 95% CI [0.106– 1.048].).

TABLE 3: PREDICTORS OF SCREENING RATES FOR DIABETIC RETINOPATHY (N=83)

Screening rates and:	Adjusted Odds ratio (AOR)	Standard error	P value	95% Confidence Interval
Gender	0.241	0.137	0.012*	0.079 – 0.735
Misinformation	0.280	0.178	0.045*	0.081 – 0.974
Motivation	0.597	0.349	0.377	0.190 – 1.875
Knowledge	0.333	0.195	0.060	0.106– 1.048

IV. DISCUSSION

A. Demographic characteristics

This study was conducted on a sample of 83 participants whereas some studies have used bigger sample sizes ranging from 100 to tens of thousands.[9, 10]. However, findings from this study remain generalizable to the population under study because sample size was calculated using estimates derived from the same population [1]. Other studies have even used smaller samples [11].

Mean age of the participants was 39 years. Younger age[9, 12], together with longer diabetes duration, triglyceride and low density lipoprotein and glycosylated haemoglobin have been associated with diabetic retinopathy[13, 14]. Other risk factors are type 1 diabetes for over a decade[15], nephropathy[16], sedentary lifestyle[17], systemic arterial hypertension[18], obesity, pregnancy, cataract surgery, genetics and puberty[19]. This makes timely and regular screening for diabetic retinopathy very important in the management of diabetic patients. Majority (74%) participants had type II diabetes which might explain why almost a third of the participants fell within the 45-65 years' age group. Type II diabetes generally has an adult onset. Majority (44%) had been diagnosed with diabetes mellitus within 0-2 years. This poses a perfect opportunity to adopt a screening culture to prevent or delay diabetic retinopathy. Diabetic retinopathy is progressive in nature and the risk increases with advancing duration and age[15].

Males comprised almost two thirds (57,8%) of the sample and male gender was significantly associated with uptake of screening (44,6% vs 22.9%, p> 0.029). A study conducted in England reported similar results[9] In this study this could be due to the ability of men to pay for screening services. Being married was also associated with higher uptake of diabetic retinopathy screening. This still underscores the importance of spousal support financially, socially and psychologically. Financial barriers though not significant predictors of uptake in this study, were cited by 68.7% participants. More than half (50.6%) participants earned less than RTGS $500. This poses a serious financial constraint on people with diabetes mellitus in a hyperinflationary environment like Zimbabwe. Lower uptake in females could be due to competing demands as women generally tend to have more responsibilities than their male counterparts in the African culture. Uptake of diabetic retinopathy screening has been reported to be low in populations of low socioeconomic status[9].

B. Uptake of screening

Diabetic retinopathy screening, though not a complete eye test[20], is a key element in diabetes care for early detection of diabetic retinopathy because the disease does not cause any noticeable symptoms in its early stages[21]. Results from this

study showed an uptake of diabetic retinopathy screening of 53%. This is below the acceptable 70% and the optimal 80% recommended by the National Screening Committee[9] Consistently low rates of uptake of screening have been reported in studies conducted in Africa and other developing countries[4, 14, 22, 23]. with higher rates ranging from 70-91.9% having been reported in developed countries[9, 10, 21] with settings like England recording rates of uptake from 55% to 95%[24].

C. Barriers to screening

Some barriers to the uptake of diabetic retinopathy screening include guilt of poor diabetic control, poor access to location of screening and lack of interest taken by the practice in diabetes care[9]. The major barrier to the uptake of diabetic retinopathy screening reported in this study was lack of funds as reported by 68.7% participants. Lack of finances as the major barrier to diabetic retinopathy screening[25, 26]. Diabetic retinopathy screening is not a free health service in Zimbabwe. It costs United States Dollars $100 at Parirenyatwa Group of Hospitals and majority patients cannot afford it especially with the prevailing inflation in the country. More than half (59%) participants cited lack of nearby facilities for screening and this explains the 61.4% that cited transport problems. Transport and access to screening do determine uptake of diabetic retinopathy screening[24] Parirenyatwa Group of Hospitals is a referral hospital located more than 10km away from major residential high density areas. In this study misinformation, lack of motivation, negative attitudes towards screening and lack of knowledge were associated with low uptake of screening. On logistic regression, gender (OR=0.241, 95% CI [0.079 – 0.735]) and misinformation (OR=0.280, 95% CI [0.081 – 0.974]) were significant predictors of uptake of screening. Communication with screening services, contacting patients, integration of screening and other care, focus on newly diagnosed individuals and perception of non-attenders are very essential in promoting uptake of screening[24]. In Zimbabwe, diabetic patients have to wait for six months or more before they can have their retinal screening due to limited public health facilities[4]. Non-attendance to vision, having competing priorities, anxiety, disengagement with diabetes care, misinformation, forgetfulness to go for screening , lack of coordination and collaboration in care and discomfort from eye drops are barriers to diabetic retinopathy screening[10].

V. Conclusion

Uptake of diabetic retinopathy screening was low. Gender and misinformation were significant predictors of uptake of screening. Individualised and structured health education in people with diabetes mellitus in view of the self-care required and the risk of both micro and macrovascular complications. However, this study had its own limitations. This was a hospital based study and participants could have given socially desirable responses that did not reflect true practice. Self-reports for data collection could have overestimated uptake and introduced recall bias. It is recommended that the study be replicated on a larger scale to improve generalisability.

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