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Risk Factors Associated With Retinal Diseases In The Jos University Teaching Hospital, Jos, Plateau State.

Adejoh O M, Wade P D, Odugbo O P
Department of Ophthalmology, Jos University Teaching Hospital, Jos, Plateau State.

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I. INTRODUCTION

Retinal diseases are often associated with systemic diseases like hypertension and diabetes.[1] In addition, increasing age and artherosclerosis, race, smoking, a family history of the condition, high cholesterol, high fat intake and genetic factors have been implicated. Furthermore, good control of diabetes and hypertension significantly reduces the risk for retinal complications such as diabetic retinopathy.[33]

Systemic Hypertension

Systemic hypertension can be defined as a blood pressure of greater than or equals to 140/90mmHg. Reports have indicated that high diastolic blood pressure in young individuals and higher systolic blood pressures in older individuals can worsen retinopathy.[59] Tight control has been found to be beneficial to patients with type 2 diabetes who have maculopathy.[36]

Systemic hypertension has been reported to be a common risk factor for retinal diseases such as retinal vein occlusion, diabetic and hypertensive retinopathy.[59,60] This was upheld by the findings of the Nigerian National Blindness and Visual Impairment Survey in which diabetic retinopathy was found to be significantly associated with hypertension.[61] A retrospective study conducted in 2013 in south-western Nigeria recorded that systemic hypertension was the commonest systemic disease seen in 67 out of 100 (67%) patients with retinal vein occlusions.[62]

Diabetes mellitus

Diabetes mellitus is a metabolic disorder that is characterized by chronic, sustained hyperglycaemia with disturbances of carbohydrate, fat and protein metabolism resulting from defects in insulin secretion, or action, or both.[41] Diabetes mellitus can be classified based on aetiological types into insulin dependent (Type 1), non-insulin dependent (Type 2), Gestational (pregnancy induced) and miscellaneous types.[41] About 70-90% of the patients with diabetes mellitus present with typical Type 2 (Non-insulin dependent) diabetes mellitus while 25% present with Type 1 (insulin dependent) diabetes.[63]

The worldwide burden of diabetes in adults in the year 2002 was estimated to be around 171 million and it is predicted that there will be at least 366 million people in the world with type 2 diabetes mellitus by the year 2030.[64]

Type 2 diabetes mellitus is associated with many preventable risk and causative factors such as obesity, hypertension, dyslipidaemia, poor diet, physical inactivity, lack of regular exercise, increasing age and family history of diabetes.[65]

Diabetes mellitus is the commonest cause of retinal vascular diseases such as diabetic retinopathy and retinal vascular occlusions.[66] The most important risk factor for diabetic retinopathy is increased duration of diabetes mellitus. The incidence of diabetic retinopathy after 10 years was 50% and after 30 years 90%. This is supported by the fact that within 5 years of the onset of diabetes or before puberty, patients rarely developed diabetic retinopathy, however, about 5% of type 2 diabetic patients have diabetic retinopathy at diagnosis.[36]

The Diabetes Control and Complication Trial Research group (DCCT) reported that good glycaemic control substantially reduced the risk of development and progression of diabetic retinopathy (patients who had intensive blood glucose control showed a 76% reduction in the development of diabetic retinopathy, and a 54% reduction in the progression of diabetic retinopathy).[67]

Obesity

Obesity predisposes to systemic diseases like hypertension and type 2 diabetes mellitus which in turn cause retinal morbidity.[1] It was estimated in 2010 that overweight and obesity caused 3·4 million deaths, and 3·8% of disability-adjusted life-years (DALY) worldwide. As a result of the established health risks and this substantial increase in prevalence, obesity has become a major global health challenge.[68]

Family history/Race

Disease of the retina such as retinitis pigmentosa, hypertensive retinopathy and diabetes related retinal complications tend to cluster in families.[69] Certain races are thought to have a genetic predisposition to diseases, for example blacks and South Asians seem to have a genetic predisposition to diabetes mellitus.[1] On the other hand, AMD was formerly thought to be rare in blacks but the Baltimore Eye Study reported that the presence of drusens in both blacks and whites over the age of 40 years was common, though the more severe forms of AMD was more prevalent in whites.[70] This finding was also supported by the findings of Nwosu in Onitsha, south-eastern Nigeria where a hospital-based prospective study documented that AMD was the commonest retinal disease in that study population.[22]

Smoking

Cigarette Smoking has been implicated in the development of systemic diseases like hypertension and retinal lesions. It is a known risk factor for AMD and RVO.[71,72] Persons with diabetes who are current smokers are also at greater risk for the onset and progression of retinopathy.[73]

Pregnancy

Occlusion and damage of the retinal microvasculature can occur in pregnancy which is a hyperviscosity state, resulting in retinal vascular diseases. Rapid progression of diabetic retinopathy has been associated with pregnancy.[36] The risk of progression is related to the severity of diabetic retinopathy in the first trimester.[36] Similarly, hypertensive retinopathy and retinal venous occlusion (for example in eclamptic patients with malignant hypertension) could also occur.

II. MATERIALS AND METHODS

Study Design

This was a descriptive, cross-sectional, hospital-based study.

Study Population

The study population was all new adult patients seen in the Eye clinic in JUTH Jos over the duration of the study (six months).

Study Duration

This study was conducted from 30th June –31st December 2014.

Sampling Technique

Consecutive adult patients newly presenting to the eye clinic who were eligible were recruited for the study.

Sample Size Determination

Based on a prevalence rate of retinal diseases of 13%[3], a minimum sample size of 174 patients was calculated with a 95% confidence limit using Fisher's formula for sample size determination

Substitution gives:

$$n = \frac{(1.96)^2 (0.13) (1-0.13)}{(0.05)}$$

$n = 3.8416 \times 0.1131/0.0025$

$n = 0.43448496/0.0025$

$n = 173.79398$

Therefore, the minimum sample size estimated was 174 patients. After adding 10% for attrition, this figure was approximated to 190 in order to make allowance for non-respondents.

Inclusion Criteria

The study participants were selected based on the following criteria:

1. All new adult patients seen in the Eye clinic in JUTH Jos who consented to the study within the study period were recruited.

Exclusion Criteria

1. Adult patients with ocular pathology which obscured adequate view of the fundus even after adequate mydriasis.
2. Adult patients who did not consent to the study.
3. Patients less than 18years of age.

Ethical Considerations

Ethical approval of this study was obtained from the Health Research Ethical Committee of JUTH, before commencement of the study. Written informed consent was also sought for and obtained from each participant before enrolment into the study and they were assured of confidentiality. Subjects who were not literate had the study explained to them in the language they best understood through an interpreter before they consented. Participants were at liberty to withdraw from the study at any stage without consequences. Fundus photography was done for patients who required follow up and whose photographs the researcher desired to include in the study at no cost to the participants.

Study Definitions

1. For the purpose of this study, an adult will be defined as any individual aged 18 and above.
2. Visual acuity (VA): an angular measurement relating testing distance to the minimal object size resolvable at that distance. Graded using the Snellen's charts.
3. Definition of blindness and visual impairment.

The WHO categories of blindness and visual impairment were adopted for the study.[93]

- Blindness was defined as a presenting visual acuity of <3/60 in the better eye.
- Severe visual impairment was defined as a visual acuity of <6/60-3/60
- Visual impairment was defined as a visual acuity of <6/18-6/60
- No visual impairment was defined as a visual acuity of ≥6/18.

Study Materials

The following materials were used for the study:

Semi-structured, interviewer administered questionnaires (278) which required the socio-demographic information of the patients, assessment of clinical history, documentation of ocular examination findings and investigation results.

III. RESULTS

A total of 278 subjects who attended the Jos University Teaching Hospital eye clinic within the study period and fulfilled the inclusion criteria participated in the study. Ten (10) people declined to participate, giving a coverage of 96.5%.

RISK FACTORS ASSOCIATED WITH RETINAL DISEASE

Identified risk factors associated with retinal disease were age (< 40 years and ≥ 40 years), Poor health seeking behaviour, prior diagnosis with retinal disease in one or both eyes, hypertension, diabetes mellitus (DM), retinal LASER photocoagulation, history of previous surgery, history of long term medication and duration of DM (< 10 years and ≥ 10years). Further logistic regression of the factors revealed the following as significant predictive factors of retinal disease: poor health seeking behaviour, with 0.494 chance of increased risk of retinal disease (Odds = 0.494, CI = 0.288-0.847, p = 0.010); history of diagnosed retinal disease, with a 0.023 chance of increased risk of retinal disease (Odds = 0.023, CI = 0.003-0.180, p = 0.0005); diagnosed hypertension, with a 0.439 chances of increased risk of retinal disease (Odds = 0.439, CI = 0.242-0.794, p = 0.007); diagnosed diabetes, with a 0.269 chances of increased risk of retinal disease (Odds = 0.269, CI = 0.136-0.533, p = 0.005); history of previous eye surgery increases the risk of retinal disease 0.450 times (Odds = 0.450, CI = 0.214-0.948, p = 0.036); history of long term medication increases the risk of retinal disease 0.236 times (Odds = 0.236, CI = 0.053-0.417, p = 0.0005) and duration of diabetes mellitus >10 years which increases the risk of retinal disease 0.222 times (Odds = 0.222, CI = 0.053-0.932, p = 0.040). However, age and history of retinal LASER photocoagulation were not significant predictors of retinal disease. (Table 19)

Table 19: Logistic Regression of Risk / predictive Factors of Retinal Disease

Risk Factor	Odds ratio (OR)	95% Confidence Interval (CI)		p-value
		Lower	Upper	
Age (years)	0.577	0.316	1.054	0.074
Poor health seeking behaviour	0.494	0.288	0.847	0.010
Diagnosed with retinal disease	0.023	0.003	0.180	0.0005
Diagnosed hypertension	0.439	0.242	0.794	0.007
Diagnosed diabetes	0.269	0.136	0.533	0.005
Had retinal LASER photocoagulation	0.000	0.000	0.000	0.999
History of previous eye surgery	0.450	0.214	0.948	0.036
History of long-term medication	0.236	0.133	0.417	0.0005
Duration of Diabetes Mellitus	0.222	0.053	0.932	0.040

IV. DISCUSSION

Risk Factors for Retinal Disease

Age and retinal diseases

There was an increasing trend of retinal diseases with advancing age in this study, with a notable peak in the 60-69 year age bracket. Also, 48.7% of patients with retinal diseases were aged 50-69 years while 75.7% were aged 40 and above. This association of increasing age with increased occurrence of retinal diseases was found to be statistically significant. An increase in retinal diseases with age was also noted in similar studies carried out in Ibadan, Onitsha, Nigeria and Pakistan.[22,30,57]

Gender and retinal diseases

Though not found to be statistically significant, retinal diseases were detected more in the female gender in this study population. The finding of female preponderance of retinal diseases in the respondents is however in contrast to that of Onakpoya et al in the South west GPZ of Nigeria where a higher prevalence of retinal disease in males was detected.[3] As earlier noted, more females with retinal diseases were found to be obese in this study which was found to be statistically significant. This could possibly account for this contrast since obese patients are more likely to develop retinal vascular diseases.[38]

Place of domicile and retinal disease

In this study, more patients (70.5%) were domiciled in the urban areas than rural areas (29.5%). However from the 2006 census figures, the reverse is the case as 45% are known to reside in urban areas while 55% reside in rural areas of Plateau state and 70% live in rural communities in Nigeria while 30% live in urban communities.[90] This further buttresses the point that there has been a shift towards urbanization which is partly responsible for the increase in prevalence of retinal diseases even in our environment.

Poor health seeking behaviour and retinal diseases

This was found to be a predictive factor for the development of retinal disease in this study population and this finding emphasizes the need for health education and increased awareness in the community.

Hypertension and retinal diseases

Hypertension was found to be a predictive factor for retinal disease. This is in keeping with results of studies where hypertension was found to be associated with retinal diseases such as retinal venous occlusions.[60]

However, duration of hypertension was not found to be statistically significant in this study. This might be because of the difficulty in determining the exact time patients became hypertensive as the history of hypertension was self reported by the participants.

Type 2 Diabetes mellitus and retinal diseases

A history of diabetes and diagnosis of diabetes mellitus of greater than 10 years duration was found to be predictive for the development of retinal disease in this study population. Type 2 diabetes mellitus was found to be responsible for all cases of diabetic retinopathy in this study population. This highlights the need to focus on screening services for patients with type 2 diabetes mellitus attending the eye clinic in JUTH. It also points to the benefits of establishing routine screening exercises in other outpatient departments in secondary health centres of the North central GPZ and JUTH especially in the medical and general outpatient and departments. Possible referral routes from physicians in secondary health centres in the North central GPZ need to also be established.

In this study population, we discovered that over 60% of the patients who presented with diabetic retinopathy had diabetic macular oedema. Furthermore, about 80% of persons with diabetic retinopathy had either diabetic macular oedema, proliferative diabetic retinopathy or a combination of these. This shows that the burden of persons with imminent potential visual loss, poor visual function / prognosis from diabetic retinopathy alone in JUTH eye clinic attendees is high and requires swift attention. Special studies of the retina such as FFA and ICG are very important in the diagnosis of retinal diseases, however similar to what was found by Onakpoya et al in Ife and Eze et al in Enugu, these facilities are deficient in our centre.[3,23] The ability to exclusively differentiate early between diabetic macular oedema and ischaemia (which aids in the decision for LASER photocoagulation in diabetic macular oedema) and prevent worsening of retinal ischaemia is therefore lacking.

Even though most cases were not referred, a lot is still left to be desired in the area of diagnosis and treatment of retinal diseases in JUTH. Quite a number of facilities and instruments are needed for better evaluation/diagnosis and management of retinal diseases such as vitrectomy and OCT machines. This is similar to what was found in studies in third world settings and retrospective studies elsewhere in Southeastern and Southwestern Nigeria where facilities for specific diagnosis and appropriate management of vitreo-retinal diseases were deficient and their need pointed out.[3,22,23]

V. CONCLUSIONS

Factors significantly associated with retinal diseases in this study were hypertension, diabetes mellitus, duration of DM of ≥10 years, a prior history of diagnosis with retinal disease, previous eye surgery and long-term use of medication.

There was a significantly higher incidence of retinal diseases among patients with a history of hypertension and type 2 diabetes mellitus in the eye clinic of JUTH compared to normotensive patients.

Retinal diseases are relatively common in Ophthalmic outpatients in JUTH Jos. Risk factors such as poor health seeking behavior, hypertension, diabetes mellitus, duration of DM > 10years, previous ocular surgery were significantly associated with retinal disease in this study. There is therefore a need to conduct a large-scale study of these disorders to better define their etiologic characteristics.

Health education, provision of modern facilities and highly skilled manpower can help reverse the increasing trend of retinal diseases in developing countries like ours. Information should be made available to the public highlighting the incidence, pattern and predisposing risk factors of retinal diseases, which have been found to be an important cause of blindness in the adults in this study. The results need also be made available to the public so that individuals understand the importance of going for screening exercises to detect retinal diseases and presenting early for speedy intervention if having visual symptoms.The appropriate authorities need to be made aware of these findings so when planning services for this population, they will be mindful of this fact for proper resource allocation. Cataract is currently the focus for most blindness prevention programmes but this study has revealed the importance of also paying attention to retinal diseases. This should be further emphasized and possibly included in blindness prevention programmes in Plateau state and other parts of Nigeria.

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