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Original Article

Alarming Prevalence and Associated Causes of Visual Disability among Patients with Type-2 Diabetes Mellitus: Management Challenges in a Country without Integration of Eye Health into Primary Health Care

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ABSTRACT

Background: The lack of integrated Eye Health into primary health care is the reason of the burden of type 2 diabetes mellitus (T2DM)-related visual disability (VD) comprising of blindness and visual impairment. The study sought to determine the prevalence of VD and its common causes in T2DM patients attending a primary health care facility. **Methods:** A cross-sectional study was carried out among adult T2DM outpatients at St Joseph Hospital that has a primary health care clinic for diabetics in Kinshasa, between 1st July and 30th September 2010. **Results:** 65 males (43%) and 85 females (57%) were recruited. The mean age of all patients was 55±13 years. Rates of blindness and visual impairment were 10.7% and 24.7%, respectively. The main causes of VD were: cataract (40%), Diabetic Retinopathy (DR = 38.6%), Glaucoma (17.3%), macular edema (14.7%), Retinal detachment (3.3%), optic nerve atrophy (3.3%), and age-related macular degeneration (0.7%). **Conclusion:** The magnitude of VD and its associated top causes appear alarming in a primary healthcare level. Observed rates are higher than those reported worldwide. Urgent integration of Eye Health into primary health care is needed in DR Congo to curb the problem.

Key words: *Visual disability, causes, primary care, Africa.*

RÉSUMÉ

Contexte : Le manque d'intégration de la santé oculaire dans les soins de santé primaires est la raison de taux élevés des cas de déficiences visuelles suite au diabète sucré de type 2 (DT2). Ces cas de déficiences visuelles (VD) comprennent la cécité et les autres handicaps visuels. Cette étude visait à déterminer la prévalence de VD et ses causes communes chez les patients atteints de DT2 qui fréquentent un établissement de soins de santé primaires à Kinshasa. **Méthodologie :** Une étude transversale a été réalisée chez les adultes atteints de DT2 se présentant en ambulatoire à l'hôpital St Joseph qui a une clinique de soins de santé primaires pour les diabétiques à Kinshasa. L'étude a eu lieu entre le 1er Juillet et le 30 Septembre 2010. **Résultats :** Dans cette étude, 65 hommes (43%) et 85 femmes (57%) ont été recrutés. L'âge moyen des patients était de 55 ± 13 ans. Les taux de la cécité et des autres déficiences visuelles étaient de 10,7% et 24,7%, respectivement. Les principales causes de VD étaient: la cataracte (40%), la rétinopathie diabétique (RD = 38,6%), Glaucome (17,3%), l'œdème maculaire (14,7%), décollement de la rétine (3,3%), atrophie du nerf optique (3,3%), et la dégénérescence maculaire liée à l'âge (0,7%). **Conclusion :** L'ampleur de VD et ses principales causes devient alarmante dans un niveau de soins de santé primaire. Les taux observés sont plus élevés que ceux rapportés dans le monde. L'intégration en urgence de la santé des yeux dans les soins de santé primaires est nécessaire en RD Congo pour lutter contre ce problème.

Mots-clés : *handicap visuel, les causes, les soins primaires, l'Afrique.*

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INTRODUCTION

The leading causes of visual disability (VD) including blindness and visual impairment commonly found among type 2 diabetes mellitus (T2DM) patients are preventable and might be easily managed according to 2020 Vision program (1). The responsibility for the care of people with diabetes has shifted away from hospitals to primary healthcare worldwide in the last 20 years (2, 3). The standard of primary healthcare can be as good as or better than hospital outpatient care in short term (4). For that, several guidelines and diabetes management programs have been developed to improve diabetes care in the community (5). This is to provide care that must be more accessible and affordable. In developing countries, Diabetes outpatients' clinics (DOCs) are commonly integrated into the Primary health care system. However, ocular primary cares are still not integrated into the DOCs. Thus, there is a lack of early screening for diabetes-related eye complications at the primary or secondary health care settings. In addition, medical doctors take care of people with diabetes without efficient coordination with eye practitioners even inside of the same referral hospital. In general, people with diabetes are followed-up by general practitioners at the primary healthcare settings. At this care level, general practitioners are "glucocentred" because the number of diabetic patients that they have to treat daily is increasing rapidly. Under this condition, diabetologists or general practitioners do not react to the presence of VD occurring in diabetic patients. There is a gap between what is known to be effective in diabetes care and what is currently provided (6).

In Democratic Republic of the Congo (DRC), data on VD among diabetic patients are available only from tertiary hospital reports (7) where an unexpected high frequency of blindness, visual impairment, and their causes were found. DOCs are integrated into the primary and secondary care centers and are established for the purpose of providing care to newly diagnosed diabetes patients in order to ensure regular follow-up and also be able to refer all cases presenting with ocular complications to tertiary hospitals. If this is the case, it is then expected that frequencies of VD are becoming less in comparison to those seen in tertiary hospitals. The objective of this study was to verify this hypothesis and to report on potential associations between VD and other important ophthalmic lesions in T2DM context.

MATERIALS AND METHODS

Study design and setting

The survey was a cross-sectional design carried out between known Central African diabetics consecutively admitted at Diabetes outpatients' clinic (DOC) of St Joseph Hospital of Kinshasa, between July and September 2010. After informed and verbal consent, adult patients (≥ 20 years) answered to an interview-administered structured and standardized questionnaires.

The available information obtained from the face to face interview included demographic data (sex, education level, age) and clinical data such as type of DM, DM duration, presence and duration of arterial hypertension, chronic diabetic complications such as diabetic retinopathy (DR), diabetic nephropathy, glaucoma, optic nerve atrophy, VD, stages of DR, infections, cataract, age-related macular degeneration (AMD), clinical significant macular oedema (CSME), and refractive errors.

Ophthalmologic examination

All participants in this study underwent a routine eye examination. Ophthalmologic evaluation included visual acuity, intraocular pressure measurement (mmHg), anterior segment biomicroscopy, and dilated funduscopic evaluation. Visual acuity was measured under similar lighting conditions by an ophthalmologist. Cataracts were diagnosed using a slit lamp (Haag Streit 900). Optic nerve and retinal examination was performed to describe any changes of the head of optic nerve. The vertical cup: disc ratio (CDR) and the presence of focal notching were recorded. CDR <0.6 was considered as physiological optic changes. CDR ≥ 0.6 was considered as optic atrophy or glaucomatous neuropathy and defined as follows: CDR=0.6-0.7 defined moderate optic nerve atrophy and CDR ≥ 0.8 defined as severe optic nerve atrophy. The retinal examination was detailed and performed at the best possible mydriasis, after dilating the pupils with tropicamide (1%) and phenylephrine (10%), by indirect ophthalmoscopy at the slit lamp (Haag-Streit 900, Switzerland) with 90 D lens.

Definitions

Aging was defined as patients with age ≥ 60 years and across the gradient of age groups (<45 years; 45-59 years, ≥60 years). Shorter DM duration was < 5 years and across DM duration groups (0-5 years, 6-10 years, 11-15 years, ≥ 16 years).

In this study, both the World Health Organization (WHO) definition of VD and the Revision of WHO classification (6, 7) were used. Thus, normal vision was defined as: VA 1.0 – 0.3 and VD included blindness (VA<6/60), mild and moderate visual impairment (low vision): VA<0.3 >6/60. For DR, the modified Airlie House classification as introduced by the Early Treatment Diabetic Retinopathy Study (ETDRS) (8) was used as follows: non proliferative (NPDR), proliferative (PDR) and maculopathy. Traditional criteria were used to define the other parameters of interest: arterial hypertension, DM type 1 and type 2 DM (T2DM), diabetic nephropathy, cataract, age, macular degeneration, refractive errors and glaucoma. Only type 2 diabetes patients were included in this study.

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Primary open angle glaucoma (POAG) was diagnosed in participants under glaucomatous treatment (drugs or filtering surgery). In participants without known glaucoma, POAG was diagnosed on the basis of structural and functional evidence (high IOP and CDR abnormalities). POAG was defined by a CDR ≥ 0.6 or a neuroretinal rim width reduced to <0.1 CDR between 11:00 and 13:00 or between 17:00 and 19:00; POAG was defined by VA <3/60 and IOP ≥ 21 mmHg or VA <3/60 and the eye showed evidence of glaucoma-filtering surgery if it was not possible to examine the optic disc (9). The study protocol was approved by the local Ethics Committee and was conducted according to the principles of Helsinki Declaration.

Statistical Analysis:

Frequency (n) and proportions (%) distributions were used to summarize categorical variables whilst means ± standard deviations were used for continuous variables. The contingency table, the proportions and Odds ratio (OR) with 95% confidence intervals (95% CI) were used to assess the univariate association between VD and its major causes. A *P*- value <0.05 was considered significant. Data analysis was carried out using the Statistical Package for Social Sciences (SPSS) for Windows Version 13 (SPSS Inc, Chicago, IL, USA).

RESULTS

Out of 150 participants, 65 (43%) were males and 85 (57%) were females. The mean age was 55 ± 13 years (range 21-83 years): 13.3% aged less than 45 years, 46% aged 40-59 years and 41% aged ≥ 60 years. The mean average of Fasting plasma glucose (FPG) was 186±81 mg/dL. More than 75% of participants had no glycaemic control: fasting glucose ≥ 126mg/dL and HbA1c ≥ 10%. The mean DM duration was 9±8 years and the median duration for DM was 5 years. 68% (n=102) had low socioeconomic status (SES). Bilateral rates of blindness and visual impairment were 10.7% and 24.7%, respectively (**Table 1**).

Table 1 Prevalence and types of visual disability among Type 2 diabetics in the primary health care level

Visual acuity category	Right eye n (%)	Left eye n (%)	Bilateral n (%)
Blindness	26 (17.3)	20 (13.8)	16 (10.7)
Visual impairment	36 (24.0)	46 (30.7)	37 (24.7)
Normal vision	88 (58.7)	84 (56.0)	97 (64.7)

The main causes of VD were cataract (40%), DR (38.6%), Glaucoma (17.3%), clinical significant macular oedema (14.7%), retinal detachment (3.3%), optic nerve atrophy (3.3%), and AMD (0.7%) (**Table 2**). Among these T2DM patients with cataract, 68.8% of them were blind; 68.8% of patients with DR were blind, 31.2% with glaucoma were blind, and 50% with optic nerve atrophy had blindness (**Table 3**). One hundred and twenty patients (80%) reported a previous eye check before this study and 28% had a history of cataract extraction. In this study, only 11.5% of T2DM patients with Glaucoma were known glaucomatous and under treatment prior to the screening. At the time of our screening, 50% (13/26) of T2DM patients had glaucomatous optic neuropathy with a Cup disc ratio (CDR) >0.6; 30.8% of patients with POAG had a severe optic nerve atrophy. Occurrence of VD was significantly associated with the presence of cataract (*P* < 0.0001), DR (*P* = 0.022) and optic nerve atrophy (*P* < 0.0001). There was no statistical and significant difference on the risk of visual disability between controlled and uncontrolled T2DM patients (*P* = 0.062).

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Table 2 Leading causes of visual disability among Type2 diabetics in the primary health care level

Causes of Visual acuity	n (%)
Cataract	60 (40.0)
Diabetic Retinopathy (DR)	58 (38.6)
Open Angle Glaucoma (OAG)	26 (17.3)
Macular edema	22 (14.7)
Retinal detachment	5 (3.3)
Optic nerve atrophy	5 (3.3)
Age-related Macular degeneration (AMD)	1 (0.7)

Table 3 Association between causes of visual disability and visual acuity categories among T2DM patients at DOCs

	Visual acuity categories		
Causes of VD	Blindness n (%)	Visual impairment n (%)	Normal vision n (%)
Cataract	11 (68.8)	29 (78.3)	20 (20.6)
Diabetic Retinopathy (DR)	11 (68.8)	21 (56.8)	23 (23.4)
Open Angle Glaucoma (OAG)	5 (31.2)	9 (24.3)	12 (12.3)
Macular edema Retinal detachment	5 (31.2)	-	-
Optic nerve atrophy	8 (50.0)	-	1 (1.03)
Age-related macular degeneration	-	-	1 (2.7)

DISCUSSION

The high frequency of VD found in this study can be attributed firstly to the absence of primary eye health integrated into the DOCs into primary health care level, and secondary to the lack of appropriate co-operation between diabetologists and ophthalmologists in our country. The results of this study showed the prevalence of VD and its top causes among T2DM patients in a primary level to be similar with those of tertiary level of health care in the same setting (7). This demonstrated that diabetic patients do not have accessible and affordable eye care at the primary care level. The gluco-centered surveillance of diabetic patients at the DOCs is not focused at regularly screening patients for eye complications as recommended by the existing guidelines.

Those circumstances constitute one of the possible reasons of this alarming burden of VD occurrence and its associated causes. The only difference resided in terms of the rank and the referral of the VD causes. As observed in this study, while DR is the leading cause of VD in tertiary level (7), cataract become the leading of VD in primary healthcare setting. The excess of 85% of DR cases referred to the tertiary hospital (7) may be justified by their severity.

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There are reasons that blindness or visual impairment remains long time undiagnosed and untreated even when it reaches the stage of severity.

In developing countries, primary health care system can be cost-effective at decreasing the prevalence of diabetic blindness (5). This is possible by integrating primary eye health into the DOCs into primary Health care settings. The objective should be a systematic screening of chronic ocular complications of T2DM focusing on diagnosis of major and preventable causes of VD.

Prevention of diabetic VD depends on the co-operation between the general practitioner who manages T2DM and the ophthalmologist who will intervene once the eye disease has reached a sight threatening stage (10). Diabetes care needs a systematic approach, involvement of a coordinated team, and dedicated healthcare professionals working in an environment with patient-centered high-quality care as a priority (11, 12). High-quality care can be provided by collaborative and multidisciplinary teams (13, 14).

The loss of vision in patients with DR occurs however in the absence of symptoms. With the adequate medical vigilance, the ophthalmologist may begin treatment before eyesight has been seriously affected (15).

Developing countries are facing demographic and nutrition transitions with aging and lifestyle changes characterized by low intake of fruits and vegetables rich in antioxidants, vitamin and other micronutrients, respectively. That is why aside micronutrients' deficiency young African diabetics develop oxidative stress which accelerates progression of eye complications to severity even after a short time of DM duration (7, 16-18).

Ethnic and environmental differences in T2DM control and DR prevalence are well established in the literature (19-21). Indeed, African T2DM patients are known to be at high risk of high prevalence of DR than their counterpart Indians (22) after short diabetes duration (23). This justifies the need of preventive diabetes care at primary care level in Africa (24).

Combined professional interventions targeting tight control of glycemia, early diagnosis of causes of VD as well as their efficient treatment may decrease in the number of T2DM patients with untreated diabetes-related eye complications at the primary care level (25). The integration of primary eye care into DOCs interventions may improve the quality of care provided to diabetics and should effectively reduce the prevalence of visual disability among these Central African T2DM patients already seen at the primary care settings.

CONCLUSION

Due to the absence of primary eye health integrated into the teams of diabetes care providers at the primary healthcare settings, the prevalence of blindness and visual impairment is increasing at a level similar to the tertiary hospitals. These findings at primary health system confirm alarming prevalence of visual disability, diabetic retinopathy, cataracts, and glaucoma previously reported from the tertiary healthcare level within the same province.

There is a need for multidisciplinary programmes with integrated Eye primary care, early detection and treatment of important causes of this visual disability, education of diabetic patients, private and public commitment. The present study supports recommendations to improve quality of care provided at primary settings by promoting combined professional interventions with multidisciplinary and coordinated teams. Clinicians can actually even educate diabetic patients for adherence to annual eye screening.

Competing Interest:

Authors declare that they have no competing interest.

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