Situational analysis of infrastructure and human resources for diabetic retinopathy services in Tanzania

Mafwiri M[1], Mwakyusa N[2], Shilio B[2], Sanyiwa A[1], Lutale J[3], Dhalla K,[4] Makupa W[5]

[1]Department of Ophthalmology, Muhimbili University of Health and Allied Sciences, Tanzania
[2]Ministry of Health and Social Welfare, National Eye Care Program, Tanzania
[3]Department of Internal Medicine, Muhimbili University of Health and Allied Sciences, Tanzania
[4]Comprehensive Community Based Rehabilitation, Tanzania
[5]Kilimanjaro Christian Medical Centre, Tanzania

Corresponding author: Dr. M. Mafwiri. Email: mmafwiri@yahoo.com

ABSTRACT

Objective: Appropriate infrastructure and skilled personnel are essential for prevention of visual loss from diabetic retinopathy. The study was conducted to assess the situation of diabetic retinopathy services in Tanzania by describing the infrastructure and human resources in selected diabetes and eye clinics and to assess the knowledge of staff in relation to diabetic retinopathy for planning purposes.
Design*:* A descriptive, analytical cross sectional study.
Methods: Fifteen purposefully sampled hospitals were visited to assess the infrastructure, human resources and knowledge of staff about diabetes mellitus and diabetic retinopathy. Knowledge was assessed by interviewing 25 and 45 staff in diabetes and eye clinics respectively using a semi-structured questionnaire. Data were analyzed using SPSS version 17 software.
Results: Zonal hospitals had physicians and ophthalmologists while regional-referral hospitals had none. There were two retinal specialists. All zonal-referral, specialized and four regional-referral hospitals had dedicated space for diabetes services. Equipment for eye examination lacked while drugs and supplies were inadequate. All hospitals had dedicated space or eye services, with three retina clinics. Two hospitals had adequate equipment for diagnosis and treatment of diabetic retinopathy. Knowledge on when to screen for retinopathy was correct among 33% and 32% of staff in diabetes and eye clinics respectively, while that on yearly screening was correct among 44% and 34% diabetes and eye staff respectively. Clinical guidelines and protocols for the management of diabetes and diabetic retinopathy were lacking.
Conclusion: Human resources and infrastructure for the diagnosis and management of diabetic retinopathy is inadequate in Tanzania. Efforts to equip and train health personnel for comprehensive diabetes care are required.

Key words: Diabetes mellitus, Diabetic retinopathy, Infrastructure, Human resources, Knowledge

INTRODUCTION

The global increase in the magnitude of diabetes mellitus[1], late diagnosis of diabetes and poor access to care in the African population[2] contribute to the occurrence of complications including the sight threatening diabetic retinopathy[3]. Diabetic retinopathy impacts on families by reducing the economy of affected individuals, families and countries. It is the 6th leading cause of visual impairment globally and the commonest cause of blindness in the working age group in developed countries including USA and Europe[4]. In 2002, diabetic retinopathy, was estimated to contribute 5% of world blind (i.e. about 2 million)[2]. The proportion of blindness due to diabetic retinopathy is higher in developed compared to developing countries. A study in South Africa showed 8% of blindness and 11% of severe visual impairment among diabetic patients above 50 years of age in Cape Town[5]. In Tanzania there are estimated to be 1.7 million people aged 30 years and above with diabetes[6], and the available evidence suggests that approximately 10-12% will have sight threatening retinopathy[3] i.e. 170-204,000 people. These individuals need to be detected, and referred for confirmatory diagnosis and treatment, if required.

Early diabetic retinopathy and occasionally advanced stages of the disease can be asymptomatic. Prevention, early detection and treatment are therefore imperative to prevent vision loss from diabetic retinopathy. To ensure this, appropriate infrastructure and skilled personnel are necessary to provide health promotion messages to patients, and to diagnose, manage and following-up patients with diabetic retinopathy. However, in poor resource countries, implementation of these strategies is hampered by a number of barriers including inadequate human resources, infrastructure and poor referral networks[7].

Despite these potential barriers, a programme for screening and treating diabetic retinopathy was established in the Kilimanjaro region in 2010 which is being run through the Department of Ophthalmology at Kilimanjaro Christian Medical Centre (KCMC).

The programme entails digital imaging of diabetic patients in diabetic clinics. Images are interpreted at KCMC and those needing further assessment and treatment are referred to KCMC. This programme is still ongoing and was not evaluated as part of this study.

The health care system in Tanzania: The population of Tanzania is 44.9 million and 5.6% of the population (i.e. about 2.4 million) are above the age of 60 years[8]. In Tanzania, health care is provided at four levels with referral pathways from dispensary through to tertiary centres. Dispensaries are facilities which cater for approximately 10,000 people and there are about 2,450 government dispensaries in Tanzania. Health centres provide primary and secondary services to a population of 50,000 and there are 409 public health centres in Tanzania. District hospitals serve a population of 300,000-500,000 and refer patients to regional referral hospitals. Through the public private partnership initiative in the country, there are some districts with faith-based hospitals that are of the same level as district hospitals serving the same catchment area. Regional referral hospitals provide secondary health services to 1.5-2.0 million. There are 17 regional referral hospitals and they refer to zonal referral hospitals. There are four zonal referral hospitals, one per zone, which serve a population of 6-13 million each. Muhimbili National Hospital (MNH), located in Dar es Salaam, the capital, is a zonal referral hospital for the Eastern zone and a national referral centre which receives referrals needing specialized care from all over the country. There are also few specialized tertiary level hospitals for specific conditions. Eye care services are available at the district (public and faith based), regional and zonal referral hospitals. Zonal hospitals are tertiary centres that are supposed to provide specialized care including diabetic retinopathy services.

The Tanzanian Ministry of Health and Social Welfare's National Eye Care Strategic Plan (2011-2016) highlights that there is inadequate information on eye services for patients with diabetes and diabetic retinopathy and a baseline situation analysis was recommended[9]. The National Eye Care Program office in collaboration with Muhimbili University of Health and Allied Sciences (MUHAS) planned the current study the purpose of which was to assess services for the care of diabetics and management of diabetic retinopathy in hospitals at different levels in the health system, focusing on infrastructure, human resources, awareness and practices and the challenges in delivering services.

MATERIALS AND METHODS

This was a descriptive cross sectional study, which was conducted from February to December 2012 in 15 hospitals across the country. The hospitals were selected so that each geographic zone was represented (Figure 1). The hospitals comprised of all four zonal government referral hospitals [MNH, Mbeya Referral Hospital; Bugando Medical Centre and Kilimanjaro Christian Medical Centre) and one specialist non-government eye hospital in Dar es Salaam (Comprehensive Community Based Rehabilitation in Tanzania (CCBRT)]. Six of the 17 regional referral hospitals were included (Kagera, Kigoma, Tanga, Dodoma, Morogoro and Mtwara) as well as four faith-based hospitals offering eye services (Mvumi, Dodoma region; Ndolage, Kagera region; Ndanda, Mtwara region and Kabanga, Kigoma region). The four zonal referral hospitals provide tertiary health care for the management of diabetes as well as eye care. The six regional referral hospitals offer secondary level health care while health care services at the four faith-based hospitals range from primary to secondary level services (Table 1).

Figure 1: Map of Tanzania showing geographical distribution of study sites

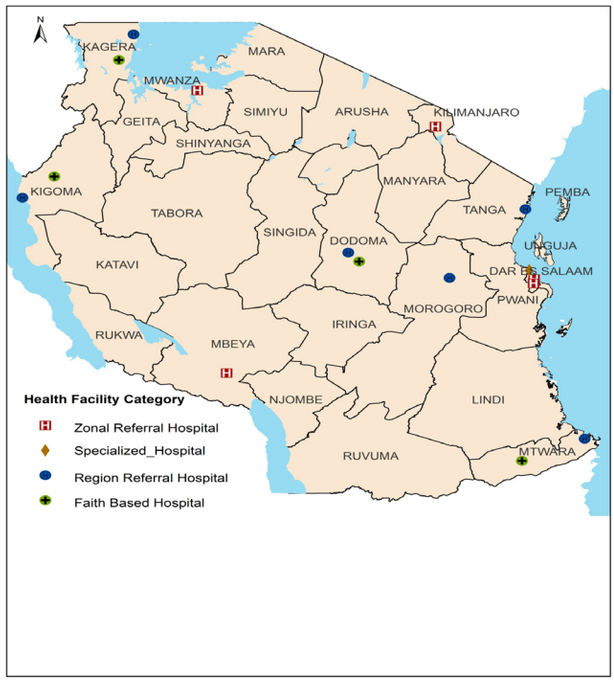

Table 1: Services provided by study hospitals

	Hospital type	Services provided		Geographical Location	Region
A	Zonal hospitals	Diabetes	Eye		
1	Muhimbili National Hospital (MNH)	Yes	Yes	National referral and university teaching hospital in the Eastern zone on shores of Indian Ocean. CP: 10 million of Dar es Salaam and neighboring regions	Dar es Salaam
2	Kilimanjaro Christian Medical Centre (KCMC)	Yes	Yes	Zonal referral centre and university teaching hospital in the North-Eastern zone near Mount Kilimanjaro. CP: 8 million	Kilimanjaro
3	Bugando Medical Centre	Yes	Yes	University teaching hospital and zonal referral centre for 6 regions in the lake and western zones. CP: 13 million. Mwanza the second largest city in Tanzania, about 1200 kilometers from both Dar es Salaam and Kilimanjaro.	Mwanza
4	Mbeya Referral Hospital	Yes	Yes	Zonal referral in the Southern highlands zone, close to lake Nyasa. About 1200 km from Dar es Salaam CP: 8 million	Mbeya
B	Specialized hospital				
1.	CCBRT	No	Yes	Non-governmental organization disability hospital, high volume ophthalmic tertiary centre in Dar es Salaam	Dar es Salaam
C	Regional referral hospitals				
1	Kagera	Yes	Yes	Lake zone on the Western shores of lake Victoria. CP: 2.5 million	Kagera
2	Bombo	Yes	Yes	North-Eastern zone- bordering Kenya. CP: 2 million	Tanga
3	Kigoma	Yes	Yes	Western zone. On shores of Lake Tanganyika. CP: 2.2 million	Kigoma
4	Dodoma	Yes	Yes	Central zone. CP: 2.2 million	Dodoma
5	Morogoro	Yes	Yes	Eastern zone -200 km from Dar es Salaam. CP: 2.2 million	Morogoro
6	Mtwara	Yes	Yes	Southern zone. On the shores of the Indian ocean. CP: 1.3 million	Mtwara
D	Faith based hospitals in districts				
1	Ndolage	No	Yes	Lake zone. Muleba district. CP 500 population	Kagera
2	Kabanga	No	Yes	Western zone. Kasulu district. CP500 population	Kigoma
3	Mvumi	No	Yes	Central zone. Chamwino district. CP 500 population	Dodoma
4	Ndanda	No	Yes	Southern zone. Masasi district. CP 500 population	Lindi

CP = catchment population

Data collection in diabetic clinics: Data on services for people with diabetes were collected from the 10 hospitals with diabetic clinics (all four zonal and six regional hospitals).

In the diabetic clinics the following information was collected by observation using a standard data recording form: number of clinic rooms, equipment for measuring blood glucose and glucose strips, and equipment for eye examination including torch, visual acuity chart and ophthalmoscope. Staff working in diabetic clinics were grouped into clinicians (i.e. Medical Specialists, Medical Officers or Assistant Medical Officers) and nurses. One clinician and one (in regional hospitals) or two nurses (in zonal hospitals) were randomly selected and were interviewed using structured questionnaires to collect information on socio-demographic variables, professional qualifications, the nature of service being delivered including measurements of blood pressure, estimation of blood glucose, physical examination and whether there were standardized management protocols. Staff were also asked about the challenges they encounter

in delivering services and whether they had had any Continuing Medical Education (CME). Questions were asked to assess the knowledge of staff in relation to the complications of diabetes, with further questioning in relation to the causes and risk factors for visual loss amongst diabetics. Staff were asked when newly diagnosed diabetics should be screened for retinopathy and the frequency of subsequent examination. They were asked about the management options for diabetic retinopathy and whether they have any collaborative relationship with staff in the eye clinic. Staff in-charge of the diabetic clinics were asked about the number of staff available for conducting clinics for diabetes and the number of registered patients. A sample of patients from all 10 diabetic clinics was interviewed and results will be presented in a separate paper.

Data collection in eye clinics: Data on eye services were collected from all 15 hospitals, using a different standard collection form to observe and record clinic space and the availability of functioning equipment. The latter was based on the minimum recommended requirements at different levels of care as stipulated in the 2011-2016 National Eye Care Strategic plan[9]. Interviews were also conducted with selected eye clinic staff, including Ophthalmologists, Assistant Medical Officers in Ophthalmology (AMOO), nurses and optometrists. Depending on their availability, one ophthalmologist or AMOO, one optometrist, and one nurse were selected from regional and faith based hospitals. Two nurses (instead of one) were selected from zonal and the specialized hospitals. Structured questionnaires were used to gather information on socio-demographic variables, professional qualifications and participation in CME; service delivery including availability of protocols for management of diabetic retinopathy; relationship with diabetes clinic in the same hospital and challenges encountered in delivering services. Interviews with eye clinic staff also assessed their knowledge about diabetic retinopathy (as above). In faith based hospitals interviews were only conducted with eye clinic staff as there were no dedicated diabetes clinics.

Data on the availability of equipment, space, staff and protocols were summarized using "traffic lights" (Figure 2) where green denotes that World Health Organization (WHO)[10] National Ministry of Health recommendations for that level of service delivery were met or exceeded; orange denotes below recommendations but some available; and red denotes none of the recommendations were met.

Figure 2: Diabetic retinopathy in traffic lights for diabetes clinics eye care

	Number of hospitals	Dedicated clinics	Adequately trained staff	Adequate equipment for diagnosis of DR	Adequate equipment for treatment of DR	Treatment protocols	Educational materials for patients
Specialized	1						
Zonal	2						
Zonal	2						
Regional	6						
Faith based	4						

Diabetes care

	Number of hospitals	Dedicated clinics	Adequately trained staff	Adequate equipment to manage diabetes and its complications	Treatment protocols	Educational materials for patients
Specialized	1	Not applicable				
Zonal	4					
Regional	4					
Regional	2					
Faith based	4	Not applicable				

Data analysis: All data were collected and analyzed using Statistical Package for Social Sciences (SPSS) version 17. Frequency tables were used to describe quantitative data

RESULTS

Health care facilities and services for diabetes care: A total of 25 staff (five medical officers, six AMOOs, 14 nurses) who routinely work in the diabetic clinics were interviewed. They had a mean age of 45.5 years and 20% were male.

Infrastructure and workload: All four zonal and four of the six regional referral hospitals had dedicated physical space for diabetes clinics. However, in most clinics the space was not adequate for the number of patients attending the clinics leading to overcrowding in the consultation rooms and waiting areas. The four faith-based hospitals did not run dedicated clinics for diabetics and services were provided within the general medical clinics.

The number of diabetic patients attending the hospitals varied, with zonal referral hospitals having more registered patients than regional hospitals. The average number of registered patients per diabetic clinic in zonal hospitals was 4,063 with an average attendance of 55 (range 35 to 70) patients per clinic day (Table 2).

Table 2: Number of diabetic patients registered and attended at the zonal and regional referral hospitals

Hospital type	Registered patients	Diabetic clinics per week	Patients attendance per clinic day	Patients attending per week
Zonal referral				
Muhimbili	4500	2	70	140
KCMC	1500	2	60	120
Mbeya	2000	1	35	35
Bugando	8252	1	60	60
Total	16252		225	355
Average per hospital	4063		55	88
Regional referral				
Morogoro	206	2	40	80
Kigoma	2000	3	30	90
Mtwara	2561	2	20	40
Bombo	84	2	15	30
Kagera	118	2	15	30
Dodoma	620	1	50	50
Total	5589		170	320
Average per hospital	931		28	53

Staff working in diabetes clinics: The four zonal hospitals had one to three medical specialists who provided specialized care for diabetic patients (Table 3). There was no cadre of AMO in zonal referral hospitals. Only two regional hospitals had a medical specialist working in the diabetic clinic. In the regional hospitals the diabetic service were provided by general Medical Officers and AMOs. Zonal and three of the regional hospitals had one or two nurses who had been trained in the management of diabetes. Other nursing staff had not undergone formal training in diabetes care, but rather had short on job training.

Table 3: Cadres of staff in the 10 diabetic clinics during the study period

Staff cadres	Hospital type		
	Zonal referral hospital (n=4)	Regional referral hospital (n=6)	Total
Medical specialists	8	2	10
Medical officers	15	6	21
Assistant medical officers	0	10	10
Specialist nurses	10	8	16
General nurses	9	9	16

Fourteen (56%) of the staff interviewed had undergone formal training in the management of diabetes which ranged from one to three months. Most had attended a three month short course at MUHAS in Dar es Salaam. Two thirds of these staff had been trained more than five years ago.

Equipment: Only two zonal diabetes clinics had visual acuity charts and one of the regional diabetic clinics had an ophthalmoscope. There were no torches for eye examination.

Service delivery: The majority (23/25, 92%) of diabetic clinic staff reported that they routinely measure blood pressure and examine the feet of diabetics on each clinic day. All staff reported that the blood glucose of all patients was measured each clinic day. Only two diabetes clinic staff responded that protocols for the management of diabetes mellitus were available but they could not be presented for verification. At the MNH diabetic clinic there was a protocol for management of diabetic keto-acidosis.

Eye examination was not routine except when patients complained of poor vision. One Medical Officer reported performing fundoscopy in patients complaining of visual loss. The reasons given by doctors for not doing routine fundoscopy were being overworked, lack of facilities and skills (four doctors) and having an eye clinic in the same hospital where patients could be referred (three doctors).

Health care facilities and services for eye care: Forty five staffs were interviewed in the 15 eye clinics: three (6.6%) ophthalmologists, 12 (26.6%) AMOOs, 13 (29%) Optometrists, 12 (27%) ophthalmic nurses and five (11%) general nurses who routinely work in eye clinics. The mean age was 47.3 years and 27 (60%) were male.

Infrastructure and workload: All 15 hospitals visited had dedicated physical space for eye services. Zonal referral hospitals providing tertiary level care had 6-10 rooms for eye care while regional referral hospitals had the lowest number of rooms (Table 4).

Table 4: Number of rooms for the eye clinics by hospital level

Hospital level	Average number of rooms (range)	Number of retina clinics
Zonal and specialized hospitals (tertiary level)	6.0 (4-10)	2
Regional referral hospitals (secondary level)	2.6 (1-6)	0
Faith-based hospitals	3.7 (3-5)	0

Dedicated retina clinics were only established in one zonal referral hospital (KCMC) and one specialized hospital (CCBRT). The retina clinic at MNH started to offer medical retina services during the study period. Retina clinics were held once or twice a week with an average attendance of 35 patients with diabetic retinopathy. In 2011, the retina clinic at KCMC registered 1,669 patients and performed 574 focal and pan retinal photocoagulation laser therapy sessions. The remaining two zonal hospitals (Mbeya and Bugando) and all regional and faith based hospitals did not have retina clinics.

Eye clinic staff responded that they attended 1-2 patients with diabetic eye disease per clinic day. One member of staff at a zonal referral hospital reported that the eye clinic had a protocol for management of diabetic retinopathy. However, it was not available for verification. The remaining 14 (93.7%) eye clinics had no protocols for managing diabetic retinopathy.

Staff working in eye clinics: Only two of the 21 practicing ophthalmologists (10%) in the study area had undergone specialist training in medical retina, one in a zonal hospital and the other in the specialist eye hospital (Table 5). In MNH one ophthalmologist was oriented in retinal diseases but had not undergone fellowship training. The other two zonal referral hospitals had one ophthalmologist who had not been trained in medical

retina. All six regional hospitals and the four faith based hospitals at the time lacked ophthalmologists and were staffed by one or more AMOO. Optometrists were available in all 15 hospitals. Ophthalmic Nursing Officers (ONOs) were also available in most hospitals.

Table 5: Cadres of eye health staffs in the 15 eye clinics during the study period

Staff cadres	Number of hospitals				
	4 zonal hospital	1 specialized eye hospital	6 regional hospital	4 faith based hospitals	Total
Retina specialists	1	1	0	0	2
General ophthalmologist	15	4	0	0	19
AMO in Ophthalmology	0	4	6	4	14
Ophthalmic nurse	10	1	8	3	16
Optometrist	14	4	6	4	28

AMO = Assistant Medical Officer.

General Nurses oriented in ophthalmology were available but not included in this table.

Only ten (20%) eye clinic staff had had any form of training in management of diabetic retinopathy which ranged from one day to six weeks.

Equipment: All the zonal referral and specialized eye hospitals had all the basic equipment needed for the diagnosis of diabetes retinopathy according to WHO Standards[10] (Table 6) but the regional referral hospitals were inadequately equipped. Some regional referral hospitals lacked basic equipment such as direct ophthalmoscopes and retinal lenses for indirect ophthalmoscopy. All three retina clinics had lasers while two clinics had equipment for vitreo-retinal surgery.

Table 6: Equipment for delivering services for diabetic retinopathy in eye clinics

Equipment type	Hospital type		
	Zonal and specialized (n=5)	Regional referral (n=6)	Faith based (n=4)
Visual acuity chart	5-8 each	2-3 each	2-5 each
Torch	2-5 each	1-2 each	1-2 each
Direct Ophthalmoscope	1-6 each	0-1each	1 -2 each
Indirect Ophthalmoscope	1-6 each	0	1
Retinoscope	3 each	0	3
Retinal lenses	3-8 each	0	3
Laser equipment	3 in total	0	0
B-Scan	2 in total	0	0
Optical Coherence Tomography	2 in total	0	0
Vitreo-retinal surgery equipment sets	2 in total	0	0

Knowledge of diabetes clinic staff about diabetes and diabetic retinopathy: Knowledge about eye conditions affecting diabetics was good as 80% mentioned diabetic retinopathy, 56% cataract and 20% glaucoma. Staff also had some knowledge about other organs which can be affected in diabetes: feet - 56%, heart - 36% and the nervous system - 4%. However, knowledge of risk factors for diabetic retinopathy was less good with 72% mentioning long duration of diabetes, 36% poor diabetic control and 12% hypertension. Only a third of staff correctly knew that patients with Type 2 diabetes should be screened at diagnosis and that Type 1 diabetics should be screened 5 or more years after diagnosis. Less than half (44%) knew that diabetic patients should be screened every year, 52% did not know the frequency of screening and the remainder thought that screening should take place only when patients complained of visual loss. Only 32% knew that diabetic retinopathy can be treated by laser, others reporting that good control of risk factors was a treatment for diabetic retinopathy.

Knowledge of eye clinic staff about diabetes and diabetic retinopathy: Knowledge of the eye complications of diabetes was higher among staff interviewed in the eye clinics as 93% knew about diabetic retinopathy, 52% knew about cataract and 20% knew about glaucoma. When asked which ocular structures were likely to be affected, 95% said the retina, 37% said the lens,15% said the cornea and 13% the uvea. Knowledge of risk factors for diabetic retinopathy was less good with less than half (47%) mentioning good glycaemic control and only 9% control of hypertension. Thirty two percent of eye clinic staff knew that Type 2 diabetic patients should be screened at diagnosis while Type 1 diabetes patients should be screened at least 5 years after diagnosis. However, only a third (34%) knew that screening should be undertaken on an annual basis and 55% did not know. The remainder said patients should only be examined when they complained of visual loss. The majority of staff (80%) knew that diabetes retinopathy could be treated by laser. Staff in zonal referral

hospitals with retina clinics had better knowledge than staff in regional and faith based hospitals.

Collaborative care by physicians and eye care providers: Apart from ongoing research between physicians and eye care providers in two zonal referral hospitals, the only other relationship was cross referral, when both services were provided in the same hospital. However, there was no mechanism to track whether referred patients attended the referral and they usually received no feedback. Joint meetings and training were not mentioned.

Challenges encountered by physicians and eye clinic staff: Almost three quarters of staff in clinics for diabetics reported insufficient consumables (i.e. glucometers, gluco-strips and multi-sticks for monitoring blood glucose) and medicines as the main challenges they faced. According to the Ministry of Health directives, diabetic services should be provided without cost to the patient as the government is expected to cover all costs. However, despite this provision, medication was sometimes not available in hospital pharmacies, or was in short supply meaning that patients were given less than three month's supply. A quarter of patients have to resort to private pharmacies where the cost of medication is high (e.g. 10$ for a vial of insulin). Other challenges included inadequate clinic space and lack of trained staff.

The main challenge reported by eye clinic staff was an inadequate number of staff with the knowledge and skills necessary to manage diabetic retinopathy (64%). Staff also lacked opportunities for training. Other challenges were lack of equipment (20%), and inadequate medicines and supplies (7%). Three (7%) staff reported no challenge. Staff also reported that patients often attended with advanced diabetic retinopathy leading to extensive laser treatment and poor outcomes.

DISCUSSION

The main findings of this study were that dedicated clinics for diabetes were established in all zonal referral and in most regional hospitals. Dedicated clinics for retina diseases were not established in most of the zonal referral hospitals. There was lack of staff with relevant knowledge, skills and equipment to deliver high quality services for diabetics and diabetic retinopathy at every level in the health system. Only two eye departments (one non-governmental owned) were able to provide the full range of diagnostic and surgical services for diabetic retinopathy, with another providing laser but not vitreo-retinal surgery. There was a lack of relevant clinical guidelines and protocols for the management of diabetes and diabetic retinopathy. Many of the diabetes clinics were overcrowded but despite this blood glucose testing, blood pressure and foot examination were routine. Staff reported many challenges in their ability to provide services for diabetics, including lack of medication, and for diabetic retinopathy where the main challenge was lack of skilled personnel. The health system in Tanzania will need to be strengthened at every level to meet the increasing challenge of non-communicable diseases, including diabetes and its complications, as stipulated in WHO following the political declaration of the High- level Meeting of The General Assembly on Non-communicable Diseases[11].

Diabetes care: All four zonal referral hospitals in Tanzania had dedicated spaces for diabetes care but clinics were overcrowded. These clinics had facilities for blood glucose and blood pressure monitoring either in the clinic or at the central chemical laboratory. The reported shortage of supplies including glucometers, glucose strips and drugs in diabetic clinics in some regional referral hospitals are factors that can lead to poor control and an increased incidence of diabetic retinopathy as there is strong evidence that improved control of blood glucose and hypertension reduce the risk of micro-vascular complications[12]. According to the Ministry of Health directives, diabetic services in Tanzania are offered without cost to the patient and the government pays for all costs of diabetes care. Zonal and regional diabetic clinics lacked basic equipment for eye examination which has also been reported in Nigeria[12]. The low level of knowledge about diabetic retinopathy combined with failure to assess visual acuity and perform fundoscopy meant that diabetic retinopathy was not being detected early, and patients were only occasionally examined or referred to eye care providers if they reported visual loss. Most regional and faith based hospitals lacked specialists in internal medicine to offer specialized diabetes care and services were provided by general medical officers, AMOs and general nurses which compromises overall care of patients[13]. This finding is similar to a study in Kenya[14]. Lack of knowledge among staff at every level about the risk factors for diabetic retinopathy meant that patients were not counseled about the potential risk to their sight due to poor control of blood glucose and hypertension.

Eye care: The zonal referral and specialized eye hospitals had adequate space and the minimum recommended equipment for diabetic retinopathy services and three had dedicated retinal clinics. Similarly the six regional hospitals had dedicated space for eye care services although they had inadequate equipment for the diagnosis and treatment of diabetic retinopathy. More dedicated retina clinics are required to improve access following the World Diabetic Foundation Guidelines for screening and management of diabetic retinopathy which state that all patients with diabetic retinopathy should be seen at a dedicated retinal clinic with appropriately trained staff[15]. The number of eye health personnel with skills and equipment to identify and manage was also inadequate in all regional referral

and faith based hospitals. The lack of proper training of health professionals has also been cited as a cause of poor compliance with treatment and serious diabetic complications including diabetic retinopathy[16]. As would be expected, staff in the eye clinics had better knowledge about the ocular complications of diabetes, including diabetic retinopathy, but as among staff in the diabetes clinics, most were not aware of the need for regular retinal examinations on an annual basis. This means that patients are not being counseled about the need for eye examination.

Limitations of the study: Failure to ask about the health management information systems and to observe practices by both diabetic and eye clinic staff limited the findings of this study. Enquiring about the health information management system would have provided important information on how patients are tracked at all levels of care; while observing practices would have confirmed what was reported by staff.

CONCLUSIONS AND RECOMMENDATIONS

In conclusion, diabetes eye services in Tanzania are inadequate in terms of infrastructure and human resources. There is a need to make the management of diabetes a priority to ensure that care for diabetes and diabetic retinopathy is provided at the different levels of care in the health system.

There is an imperative need to strengthen all zonal hospital diabetic clinics by upgrading the infrastructure for care of diabetes and retinopathy including expanding the physical space, provision of equipment for eye examination, diagnosis and treatment of diabetic retinopathy and improving the availability of drugs and supplies. To increases access and improve care, equipment for provision of a full range of diabetic retinopathy services need be availed at all zonal referral hospitals. Regional referral hospitals also need to have equipment for screening and where possible for treatment of diabetic retinopathy. Integration of detection of diabetic retinopathy within the diabetes clinics needs be explored to ensure diabetes patients are regularly screened for diabetic retinopathy in time.

Efforts are required to generate skilled medical and retina specialists by encouraging young doctors to train as ophthalmologists and medical specialists and to source for scholarships for their training. Increasing the number of ophthalmologists will create a bigger pool from which some would sub-specialize as retinal specialists. Training of existing eye clinic staff is necessary to improve early detection and referral of patients with diabetic retinopathy is another priority. Joint diabetes and eye clinic meetings and CME sessions need to be established as they are important for updating knowledge and skills among practicing health personnel. The collaboration between the eye and diabetes clinics and other clinics is also important in view of the interactions between diabetes and other communicable diseases in Africa whose management require an integrated and complimentary approach to service delivery[2].

National guidelines for comprehensive management of diabetes and for diabetic retinopathy need to be developed and disseminated to health care providers. Efforts should be made to develop and use clinical protocols in all diabetes and eye clinics as well as increasing awareness among health care providers on multidisciplinary approach to management of patients with diabetes.

In order to empower patients to improve control of their diabetes, a health education communication strategy needs to be developed for diabetes and diabetic retinopathy. Several different approaches are possible, with evidence suggesting that one to one counseling is more effective than group health education sessions[17].

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