A health care worker needs assessment to develop rural diabetic training workshops for diabetes and diabetic retinopathy screening in Kilimanjaro

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ABSTRACT

Background: A needs assessment was undertaken in Tanzania to identify what problems People With Diabetes (PWD) and their Health Care Workers (HCW) were facing, as preparation for a theory- and evidence-based intervention. In Tanzania only 1 out of 99 people with diabetes achieve good glycaemic control and Diabetic Retinopathy (DR) is common and the leading cause of preventable adult blindness.
Objective: The focus of the program was on improving self-management.
Methods: Intervention mapping was used to plan, develop, implement and evaluate a theory- and evidence-based screening program for DR to prevent avoidable blindness.
Results: HCW demonstrated a poor knowledge of DR, treatment and the need for annual screening. Dietary knowledge of HCW was poor and PWD did not rate them as good communicators. HCW understood the rational for PWD to take regular exercise but failed to recommend socially acceptable means of achieving this. HCW recognised that mental health issues such as anxiety and depression were hindering self-management and prevention of related complications and identified poverty as a key factor for PWD failing to undertake treatment regimens and self-manage their diabetes. Costs and a lack of resources was preventing good diabetes control. HCW recognised the need for diabetes training and resources with which to educate PWD.
Conclusion: The study highlighted the need for primary prevention of diabetes, with basic training for primary care focused on practical, local, and indigenous health challenges.

Key words: Diabetes, Diabetic retinopathy, Screening, Intervention mapping, Self-management

INTRODUCTION

A 'needs assessment' was undertaken to identify what problems People With Diabetes (PWD) and their Health Care Workers (HCW) were facing. The health intervention program based on the Intervention Mapping (IM) protocol was adopted to plan, develop, implement, and evaluate a theory and evidence-based screening program for Diabetic Retinopathy (DR), to prevent avoidable blindness[1].

As a non-communicable disease, Diabetes Mellitus (DM) is a metabolic disorder causing hyperglycaemia and resulting in microvascular and macrovascular complications[2]. Sub-Saharan Africa (SSA) is projected to carry the largest burden of diabetes (34.2 million) by 2030. It is estimated by the International Diabetes Federation in 2021 that diabetes prevalence was 10.3%, and it is thought that two thirds of people with diabetes are undiagnosed[3].

Complications of diabetes: Living well and staying healthy with diabetes requires that PWD effectively self-manage their condition to achieve good glycaemic and blood pressure control thus limiting complications[2]. In Tanzania only 1 out of 99 people with type-2 diabetes achieve good glycaemic control[4]; home and hospital glucose monitoring are not routinely available, neither is costly insulin. Diabetic Retinopathy (DR) is the most common microvascular complication and the leading cause of preventable adult blindness[3,5]. Microvascular complications of poorly controlled diabetes are insidious, often only detectable by PWD when irreversible damage has already occurred[6].

Diabetic retinopathy and the need for screening: DR screening should be initiated at diagnosis and repeated annually even when the person remains asymptomatic to detect and successfully treat vision threatening diabetic retinopathy[7]. There is a paucity of data for the prevalence of DR in Tanzania. The program conducted a pilot study of 79 self-selecting PWD in Kilimanjaro and found 11.39% DR, 16.1% maculopathy and 2.9% proliferative retinopathy[8]. The program later conducted screening and found a prevalence of any DR at 27.9% in 3187 PWD[9].

Self-management of diabetes in Tanzania: The context of self-management for PWD in Tanzania is complex[8]. Combining co-morbidity with late diagnoses of diabetes, limited resources for diagnoses, management and

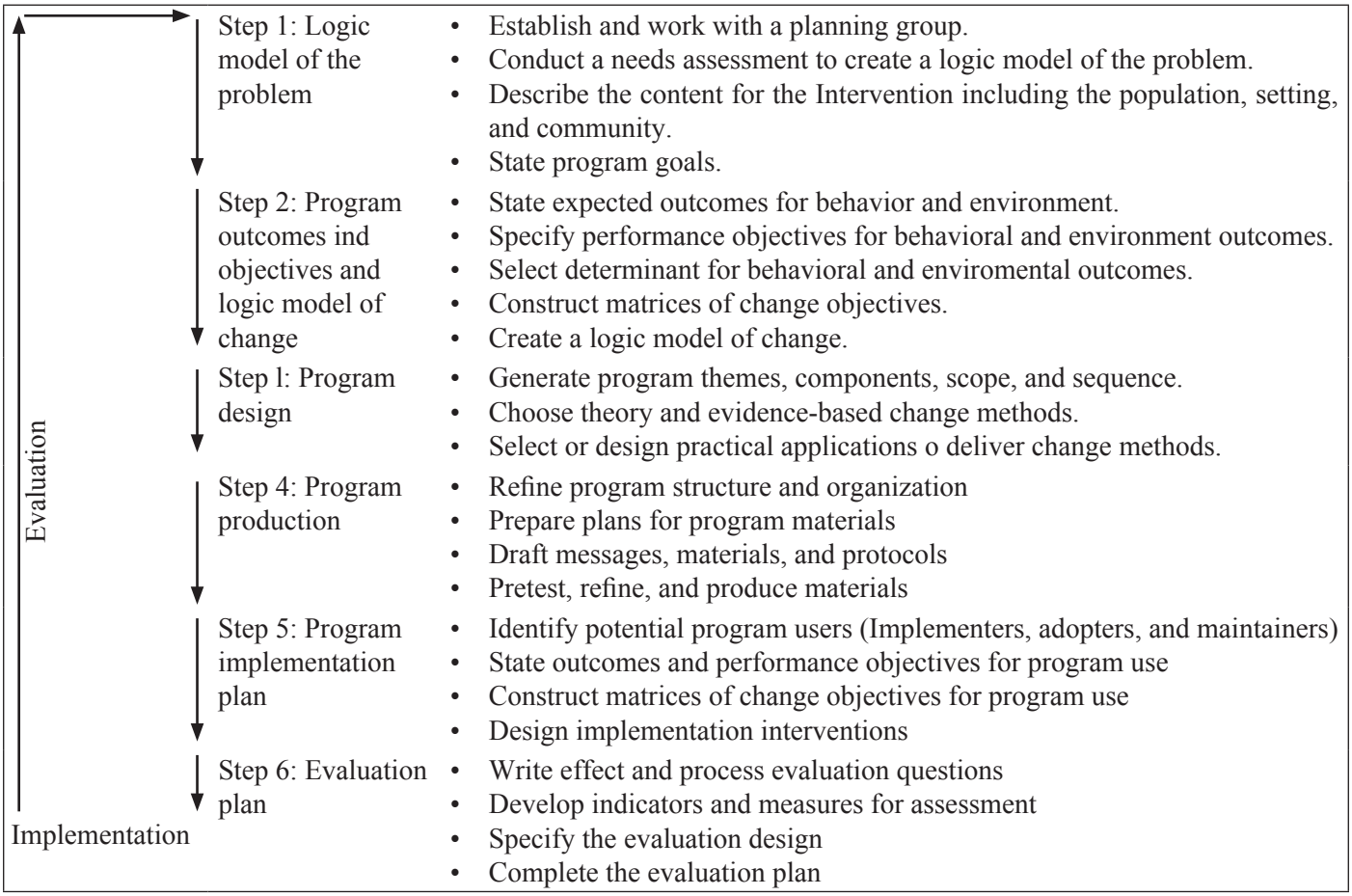
treatment of diabetes and DR leads to increased mortality and chronic complications amongst PWD[5,10]. In Tanzania 85.3% of the household budget is spent on food[11]. Studies on diet in the general population in Tanzania are limited but show that among PWD, 74-79% of daily calorific intake comes from carbohydrates[12]. Knowledge about healthy eating is particularly problematic due to economic restraints and cultural preferences for eating high carbohydrate food and meat, and vegetables cooked in fat. These findings were supported by the program's 'needs assessment' with PWD[8].

Physical activity and diabetes: The concept of physical activity as 'exercise' is considered unnecessary as many PWD and HCW work daily on their farms and their shambas (allotments) to grow subsistence food and coffee, collect water and firewood, and walk or cycle as a daily means of transport[8,13]. There is little leisure time for physical activity, although football/soccer is played in many communities[14]. There is little understanding among both PWD and HCW of the role that exercise plays in improving cardiac health, lowering blood pressure and blood glucose by improving the use of available insulin for glucose uptake during and after activity[15].

Theoretical basis of self-regulation and health behaviour: Self-management of diabetes involves complex behaviours requiring planning to develop appropriate goal setting for diet, physical activity, blood glucose monitoring, foot care, regular clinic attendance and screening to prevent complications[16,17]. Moving away from knowledge, attitudes, and belief models of behaviour change[18], the emphasis has shifted to the perspective of self-management, emphasising self-empowerment and self-efficacy to allow PWD to manage their self-care, and prevent potential microvascular and macrovascular complications, such as, DR[16,19]. These strategies require effort, persistence, resources, and development of appropriate strategies[20].

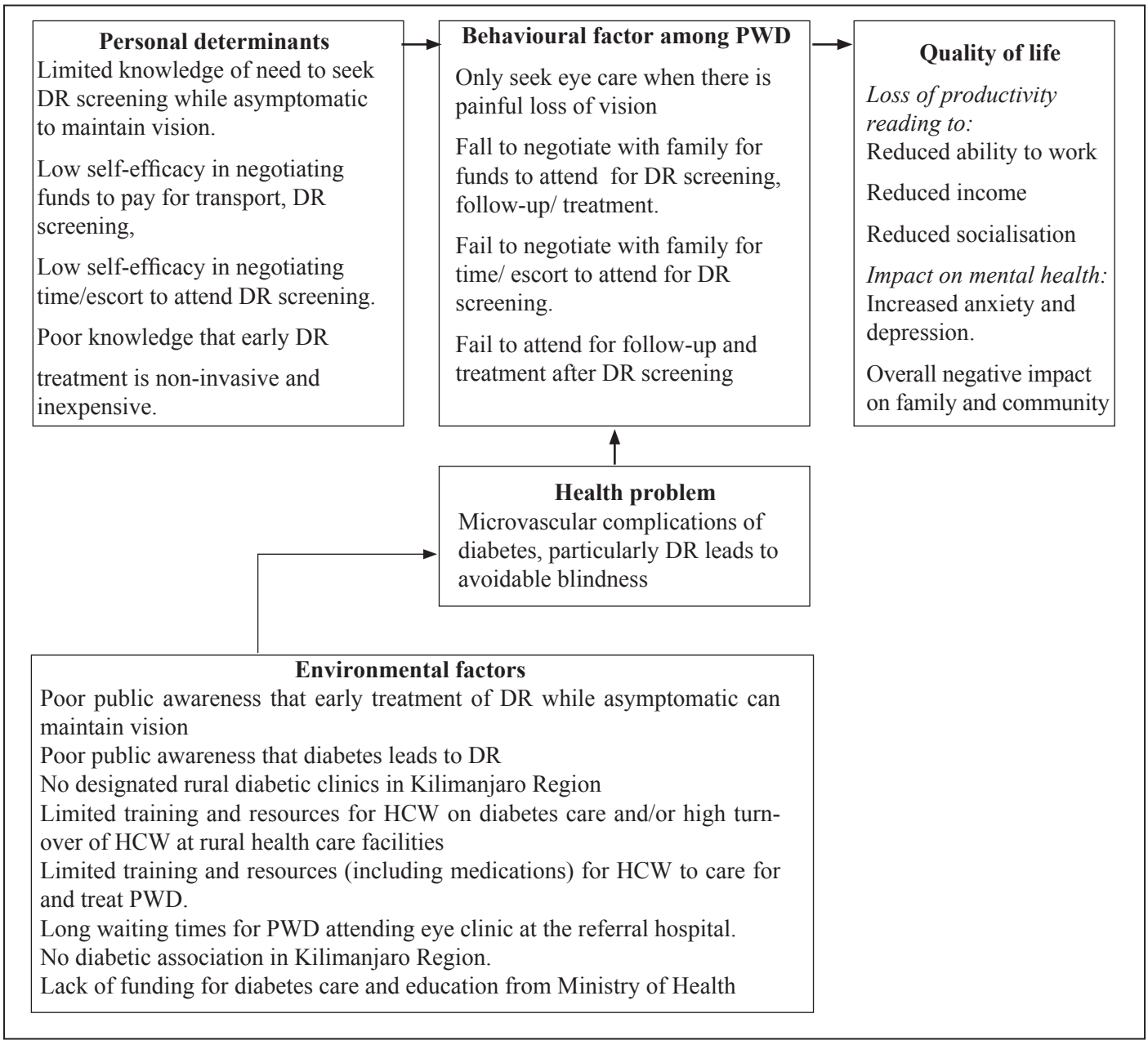
IM was used as the comprehensive, ecological, theoretical and evidence-based protocol for the development of the proposed health intervention (Figure 1)[1]. Through the 'needs assessment' the program aimed to gain an understanding of the eye health behaviour of PWD, identifying barriers to the uptake of eye screening services, leading to the development a comprehensive health promotion program that would draw upon local resources, being informed, and supported by the local community.

Figure 1: Intervention mapping steps 1-6 and related tasks



The program's Working Committee identified the behavioural and environmental determinants of behaviours that needed to change if HCW could influence the health outcomes of PWD who attend the health care facilities in Kilimanjaro Region. The Logic Model of the Problem (Figure 2), which had been used to identify the causes of the health problems, was used to create the Logic Model of Change (Figure 3) to promote and improve the health of the PWD (IM-steps 1, 2 and 3).

Figure 2: Logic model of the problem at the referral hospital



The aim of this paper is to report the findings of the HCW 'needs assessment' (IM-step 1)[1], which were then triangulated with the findings of the 'needs assessment' of the PWD and used by the program's Working Committee to develop the strategies for the health intervention[1,8].

Figure 3: Logic model of change

Determinants	Behavioural outcomes	Health	Quality of life
Knowledge-understands need for DR screening while asymptomatic.	Travels to outreach clinic at the referral hospital for DR screening.	Maintain vision.	Maintain productivity and income.
Have a positive attitude towards DR screening.	Attends DR screening clinic and accepts DR screening.	Prevent avoidable blindness.	Maintain social interaction.
Believes there are more benefits than barriers to DR screening.	Receives notification of DR screening and attends follow-up assessment or treatment as appropriate.		Maintain good mental health.
Self-efficacy to negotiate escort and fees for transport and cost of treatment at clinic.	Commits to annual DR screening.		
Expects that DR screening will prevent vision loss.			
	Behavioural outcomes from the environmental agents/implementers		
	Provide information on DR screening and treatment.		
	Provide DR counselling to PWD.		
	Provide fast track service to PWD in eye clinic at the referral hospital.		
	Provide digital retinal screening at diabetic and eye clinics at the referral hospital.		
	Provide digital retinal screening at outreach clinics.		

MATERIALS AND METHODS

Needs assessment

Using convenience sampling, to achieve theme saturation, the researchers conducted a qualitative 'needs assessment' of HCW in Kilimanjaro region[21]. The development of the semi-structured questionnaire for the 'needs assessment' were informed by the results of a mixed methods PWD 'needs assessment' conducted by the researchers in order to triangulate the data findings[8].

Developing the semi-structured questionnaire: The programme's working committee formulated the needs assessment questionnaires with reference to diabetes and diabetic retinopathy literature reviews. An international colleague provided training on qualitative thematic analysis using the software Atlas-ti. After analysing the results of the pilot study, the questions were refined.

The qualitative process: Interviews were conducted in English and recorded. To ensure diversity and reduce sampling bias[21], the 35 question semi-structured interviews was conducted with HCW (n=31) at different HCF in the districts of Kilimanjaro region and included a mix of health care workers: 5 Medical Officers, 6 Assistant Medical Officers, 4 Clinical Officers, 14 Nurses, 1 District Eye Co-ordinator and 1 Physiotherapist. The average age was 47.6 years; 17 men, and 14 women. Two recordings could not be used for technical reasons. This data was compared to the qualitative and quantitative data, and an eye health questionnaire from the PWD 'need assessment' previously conducted in the same region[8,21,22].

Ethics approval: This was granted by Tumaini University Ethics committee, Clearance Certificate Number 241, Research Proposal Number 273.

RESULTS

Finding of the needs assessment of health care workers (Step 2).
Examples of participants' answers are presented in Table 1.

Table 1: Findings of needs assessment of health care workers – Examples

Knowledge of diabetes diagnosis
Question: "Can you give me a definition of diabetes?"
Reply: *"Diabetes is a chronic disease which affects the pancreas, and when it is affected the production of increased sugar or sometimes it can lower the sugar. The causes of diabetic are not actually known, but a few people have been affected because of taking things like alcohol and toxic drugs. There are 2 types of diabetes, one affects children and the other affects adults."* (KTS)
Complications
Question: What information do you give to diabetic patients about complications of diabetes?
Reply: *"They should continue with drugs because they can get blindness, they can faint and even go into a coma."* (MSM)
Specific knowledge of eye health
Question: "Can you tell me what diabetic retinopathy is?"
Reply: *"Damage of the nerves so that the patient cannot see properly."* (MSM)
Question: "Do you know how it can be treated?"
"I know that when you get complication of diabetes you can't reverse (it)." (JL)
Mental health
Question: "Do you think any of your patients are feeling anxious or depressed?
Reply: *"Yes, they are very anxious because they know there is no cure of diabetes, and they are given so many rules they become unhappy; they are worried. Some are depressed."* (KCA)
Question: "Is there anything else that makes them feel anxious and depressed?
Reply: *"The family. They are now not able to be productive and the income becomes low."* (KCA)
Reply: *"Some are anxious because this is a chronic disease … They get depressed because of taking the drugs always, sometimes they are depressed because they want to go for check-up but don't have the money to travel."* (UAM*)*
Communication and following advice
Question: "How well do you think your patients follow instructions that you give them about their treatment?"
Reply: *"I know that they follow if they come regularly to clinic and if the blood sugar is controlled then I'm sure that they are following the instructions."* (UEM)
Limited resources due to poverty affect both PWD and HCW
Question: "So, they have some problems following their treatment?"
Reply: *"Yes because some of them involve expenses. Sometimes in our centre here we run short of drugs or insulin, or short of sticks so we tell them to go buy but we are not sure if they do that. Another problem is lack of knowledge so it is important for the health workers to be knowledgeable so that they may speak the same language. That is one of the challenges, the health workers also need to be knowledgeable pertaining to diabetes."* (UEM)
Question: "What problems do the diabetics face in following the treatment plan that is prescribed for them?"
Reply: *"There is a lot of problem, especially in our area, if the patient came to the hospital most of the time we have no reagent, so it is difficult for us to detect if it is hyperglycaemia or hypoglycaemia, sometimes we refer the patient, sometimes the patient delay to get a treatment. Most of the time there is a shortage of drugs."* (KCA)
Question: "So, you cannot do diagnosis at the moment, you can't treat, you must refer?"
Reply: *"Most of them we refer because if you can't check their blood sugar, you have no reagent. It is better to refer the patient to where they can get proper treatment."* (KCA)
Nutrition
Question: "What information do you give diabetic patients about their diet?"
Reply: *"It depends, some have hypoglycaemia and others have hyperglycaemia, so I teach them the diet according to the condition. In general, I tell them ripe bananas increase blood sugar, to eat small amount of 'ugali' and increase vegetables. We give them this information so that they can control that disease."* (ugali=cornmeal; KCA)
Physical activity
Question: "Do you tell them anything else about exercise?"
Reply: *"Yes, most people here work, most people here get exercise in their work."* (USS)
Reply: *"It's important, I tell them to do exercise so that they won't be obese."* (UEM)
Reply: *"We tell them to exercise, in order to burn sugar and to improve circulation in the body."* (MJL)

Knowledge of diabetes diagnosis: HCW classified diabetes as being controlled by the pancreas and a lack of insulin (7 out of 31), as an increase in blood sugar (16 out of 31), a lack of insulin (5 out of 31) and by signs and symptoms (5 out of 31).

Complications: Informing PWD about hyperglycaemia and hypoglycaemia was mentioned by 10 out of 31 HCW, microvascular (20 of 31) and macrovascular complications were almost equally mentioned (17 out of 31). The most mentioned microvascular complications to inform PWD of were cataract and blindness (11 out of 31), and the most important macrovascular complication to inform PWD of were wounds, diabetic foot, and gangrene (15 out of 31).

Specific knowledge of eye health: The majority of HCW knew that PWD need an eye examination because diabetes affects the eye, causing cataract, DR, and blindness (22 out of 31). The majority of HCW (18 out of 31) did not know that PWD should have an annual dilated eye examination. The majority of HCW, (21 out of 31) did not know how DR could be treated, (7 out of 31), recommended surgical treatment, (3 out of 31) recommended laser treatment, 2 out of 31, recommended Avastin injection and 1 out of 31 recommended eye drops.

Mental health: HCW (26 out of 31) identified mental health as a significant problem for PWD. HCW suggested that the majority (19 out of 31) of PWD were depressed about managing lifestyle changes of living with diabetes, specifically taking daily medication, adjusting diet, restricting alcohol consumption and not being able to work. HCW suggested that many (18 out of 31) PWD were anxious at initial diagnosis of diabetes, and with self-management of diabetes and associated complications.

Communication and following advice: HCW were asked to rate themselves as communicators on a scale of 1-10. The average self-rating score was 8.56 indicating high levels of self-efficacy as communicators. The majority of HCW (15 out of 31) felt that PWD followed the instructions given regarding their treatment regimens and to self-manage their diabetes if they remembered and understand the instructions they are given, this is reflected by their attendance at the clinic and their blood sugar levels.

Others (9 out of 31) felt that some PWD were hindered by poverty and local traditions regarding diet and beliefs in the use of traditional herbs. Other problems with following advice of self-management of diabetes included ignoring recommendations altogether out of despair.

HCW identified key reasons PWD failed to follow their treatment regimens and self-manage their diabetes as: poverty (27 out of 31), being unable to pay for transport to health care facilities for check-ups and care (7 out of 31), being unable to pay for medication and food (20 out of 31), shortage of medication and not taking mediation when feeling unwell (7 out of 31), diet being unsuitable, unpalatable and unavailable (9 out of 31), lack of education and understanding of diabetes (16 out of 31). The need to follow up PWD in the community was recognised by (9 out of 31) of HCW.

When asked what the specific barriers PWD faced in accessing treatment, the HCW identified similar reasons; cost and lack of medication and testing agents for blood sugar (26 out of 31), transport to health care facilities for check-ups and care (8 out of 31), staff knowledge of diabetes treatment and self-management (10 out of 31).

Limited resources due to poverty affect both PWD and HCW: When asked what resources were available to educate and provide treatment for PWD the HCW stated that 12 out of 31 had medication available for PWD, 11 out of 31 had testing for blood glucose, 15 out of 31 were able to provide education for PWD (the chosen method of education was one-on-one discussion as written or printed material was extremely limited), 5 out of 31 had some medical equipment (weighing scale, blood pressure machine). The researchers' 'need assessment' of PWD supported these findings[2]. When HCW were asked what additional resources would assist with educating PWD, 18 out of 31 requested additional staff in the rural clinics, training and 12 out of 31 requested leaflets and pamphlets.

Nutrition: The most mentioned dietary change recommended was to reduce carbohydrates or sugar (23 out of 31) followed by a need to increase fruit, vegetable, and roughage (58%) and protein (11 out 31). There were less frequent recommendations to reduce portion sizes (3 out of 31) or to eat a balanced diet (4 out of 31).

Physical activity: HCW reported that they instructed their clients to take regular exercise by either walking or jogging. The rationales for exercise were as follows; exercise is good, reduces weight or prevents obesity (15 out of 31) exercise helps reduce blood sugar and blood pressure (11 out 31) and it improves circulation and helps prevent complications (5 out 31).

DISCUSSION

The HCW 'needs assessment' findings were triangulated with those from the researchers' people with diabetes 'needs assessment' report of poor understanding of diabetes and self-management to avoid complications such as DR which stemmed from a poor diabetes knowledge base[8]. This information is considered important as outlined in the DR screening guidelines recommended by the International Council of Ophthalmology[7]. The clinical knowledge of diabetes of the majority of the HCW was poor and this was reflected in the varied and often conflicting information given to PWD[23].

HCW demonstrated a poor knowledge of DR, how it could be treated and the need for annual DR screening, resulting in poor uptake of DR screening, treatment. and attendance for follow-up[24,25]. Dietary knowledge was poor with HCW failing to advise PWD to eat a balanced

diet and reduce portion sizes[8]. HCW rated themselves as good communicators but feedback from the PWD 'need assessment' did not support this view[8].

HCW understood the rational for PWD to take regular exercise but failed to recommend socially acceptable means of achieving this[8]. HCW recognised that mental health issues such as anxiety and depression were hindering self-management and prevention of related complications[8]. HCW identified poverty as a key factor for PWD failing to undertake treatment regimens and self-manage their diabetes[8]. In addition to cost, a lack of resources was identified as preventing good diabetes control. HCW recognised the need for diabetes training and resources with which to educate PWD.

One of the outcomes of the HCW 'need assessment' was the training of six facilitators from the university, who participated in the development and delivery of a three-year rural holistic health care training program for HCW in Kilimanjaro Region, as one of the IM strategies. One of the four days of the training focused on eye health and DR screening. This strategy is detailed elsewhere. The health program incorporated various theoretical methods that support each other including Social Cognitive Theory, encompassing self-efficacy and modelling[26]; Goal Setting Theory[27] with SMART goals (specific, measurable, attainable, relevant, and timely[28]) message framing on health behaviour[29,30], and the Persuasive Communication Model[31].

Strengths and weakness of the study

The study was able to triangulate the findings of the 'needs assessment' with PWD[8] with those of the HCW. The strength of the study was that it gave the health care workers an opportunity to talk about their lack of resources in the management and care of PWD. It gave the researchers the opportunity to identify the need for comprehensive education of health care workers in diabetes and specifically diabetic retinopathy in Kilimanjaro Region. This led to the development of the educational programme that would then run in the region over the next three years for these health care workers. It was supported by the diabetologist from regional hospital visiting the clinics and the provision of textbooks and equipment for the clinics.

This was a small study (n=31) of the HCW target population. For the findings to be of greater value it should be replicated and expanded to include more HCW. The study was limited to a semi-structured questionnaire and did not include focus groups and written feedback. There was an opportunity to expand this information after the training workshops were conducted.

The study was conducted in English by the primary investigator. This limited the understanding of the semi-structured questionnaire and feedback received from some of the HCW.

This study identified the need to provide education for HCW at rural Health Care Facilities in Kilimanjaro Region. In real terms, the issues surrounding poverty, and lack of resources, and policy regarding the conditions of training or retention of HCW in Kilimanjaro could not be addressed.

The way forward

The program's study highlighted the need for primary prevention of diabetes, with basic training for primary care focused on practical, local, and indigenous health challenges[32]. HCW should be locally recruited and trained close to their geographical origins and eventual place of service[33]. To develop primary prevention of diabetes there is a need to improve both education and salaries, these are policy issues[33]. As was identified by the HCW 'needs assessment', the need for community and village workers is of great importance in the effort to ensure primary and secondary prevention of chronic disease such as diabetes and prevent avoidable blindness from DR[33].

Self-management skills are important in optimising diabetes care[34-36]. In the Tanzanian context, there appears to be little opportunity to educate either HCW or PWD in diabetes self-management. While the program's training workshops provided HCW with tools to assist PWD to engage in self-management, the way forward is with more client-centred care as is suggested by self-regulating theory[37,38]. This moves people from regulating their health because of controlled regulation (following a prescribed health regimen of diet, exercise, and medication because it has been directed by health care providers and/or the social environment), to being committed to autonomous, self-determined health behaviour[39].

Future research

African institutions need to be empowered to do research that will encourage the development of best practices to address the needs of people in their regions[23,40,] The use of ecological frameworks that ensure an evidence-based theory derived approach to health interventions are recommended[1].

Declaration

Authors' consent: All authors have agreed with the submission of this paper.

Competing interests: All authors have no competing interest.

Authors' contribution: CH developed the needs assessment questionnaires and conducted the interviews. JM assisted in the data management. CH and AB analysed the findings. JM contributed to the implementation. GK helped supervise the project. CH took the lead in writing the manuscript. All authors discussed the results and contributed to the final manuscript.

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