

Development and evaluation of a rural diabetic training workshop for healthcare workers in Kilimanjaro based on findings of a needs assessment for diabetes and diabetic retinopathy screening

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ABSTRACT

Objective: The aim of the project was to create a comprehensive, ecological, theory and evidence-based screening program for diabetes and diabetic retinopathy to prevent avoidable blindness, using Intervention Mapping (IM).

Methods: The training workshop for Health Care Workers (HCW) in Kilimanjaro was based on findings of a needs assessment among HCW, showing mixed levels of knowledge regarding diabetes. The trainings highlighted that the rural HCW were not trained as diabetic specialists nor were they working in specialist diabetic clinics. They faced numerous obstacles in caring for People With Diabetes (PWD) due to varying levels of knowledge amongst colleagues, nurses, and clinical officers. When giving advice to PWD about how to avoid complications very few HCW were able to adopt a holistic approach to care promoting healthy living to prevent complications. The workshops were able to take comprehensive diabetes education to the rural HCF, reducing travelling time for HCW. Facilitators focused on changing both the attitudes and knowledge of HCW.

Results: The training workshops achieved the aim of training facilitators to educate HCW on diabetes care and self-management. The workshops met the expressed request of HCW for diabetes education and provided them with the resources they requested for self-study and reference in their clinical practice. The workshops empowered the facilitators who gained experience and confidence through the course of the three years. The commitment of the team to deliver the training in rural settings was acknowledged and appreciated by the recipients. The improvement in HCW diabetes knowledge was rewarding and satisfaction with the facilitators was high; training had informed the HCW clinical practice. Highly important was the engagement of HCW as stakeholders in the program, and continued support through annual HCW training workshop and stakeholder meetings.

Conclusion: The 'need assessment' of both PWD and HCW in Kilimanjaro Region, the dialogue with stakeholders, and the program's Working Committee, resulted in training workshops that are one strategy in the overall healthcare program in Kilimanjaro Region to plan, develop and implement a culturally relevant, evidence-based, theory-driven screening program for diabetic retinopathy to prevent avoidable blindness.

Key words: Evidence-based screening program, Diabetes, Diabetic retinopathy, Avoidable blindness, Intervention mapping

INTRODUCTION

The aim of the project was to create a comprehensive, ecological, theory and evidence-based screening program for diabetes and Diabetic Retinopathy (DR) to prevent avoidable blindness, using Intervention Mapping (IM)¹. We describe the planning, development, implementation and evaluation of the annual Healthcare Workers (HCW) training workshops. Rural HCW, working in Kilimanjaro Region were provided with an overview of holistic diabetes management and care, including eye health.

The need for this training came from a 'needs assessment' conducted in the Kilimanjaro Region, with People With Diabetes (PWD) and HCW². From the 'need assessment' the researchers had gained an understanding of the eye health behaviour of PWD, which revealed the dynamics between PWD and HCW and identified barriers to the uptake of eye screening services. The complexity of the power imbalance between the PWD and HCW was considered in its cultural and social context. The HCW training workshop was part of the IM-strategy: drawing upon local resources, being informed and supported

by the local community¹. Potential barriers, but also facilitators, were already known. The interaction between PWD and HCW became evident: poor knowledge of diabetes, conflicting advice, limited resources and poor retention of staff.

Local screening for diabetic retinopathy: The program had trialled and then introduced screening for Diabetic Retinopathy (DR) at the regional referral hospital, in a rural outreach program. The advantages being that the screening could be conducted by a trained technician and taken into the rural areas³ allowing for storage of the images for analysis, review, and epidemiological study⁴. Mydriasis (pupil dilation) for photography increases specificity and sensitivity of screening^{5,6}, additional benefit is the increased detection of other eye conditions⁷. Prevention of visual loss from DR in resource poor areas where access to care is often difficult, and socioeconomic factors add to the burden⁸. Throughout Africa, late presentation for screening and treatment is common⁹⁻¹¹.

Lack of specific knowledge of eye health: HCW's 'needs assessment' findings were triangulated with the PWD 'needs assessment' to reveal poor understanding of diabetes and self-management to avoid complications such as DR¹². Patient education, good glycaemic control and attending for DR screening in a timely manner are among the recommendations set out by the International Council of Ophthalmology¹². Of the HCW, 22/31 knew that PWD need an eye examination as diabetes affects the eye, causing cataract, DR, and blindness and 18/31 did not know how often PWD should be screened that in Kilimanjaro Region an annual dilated eye examination was recommended; 21/31 did not know how DR could be treated; 7/31, recommended surgical treatment; 3/31 recommended laser; 2/31, recommended Avastin injection and 1/31 recommended eye drops.

Limited healthcare provision: Tanzania has a predominantly rural population with 67.68% of its 57.31 million inhabitants living outside of the major cities¹³ and 3.2 physicians to every 100,000 people, primarily in the urban areas. In 2011, 49.1% were living in poverty on \$1.90 per day¹³. Rural healthcare needs are often met by non-physician clinicians with approximately per 10,000 people, 4.8 nurses and midwives; 0.5 medical officers and 0.4 assistant medical officers. Staff shortages (\pm 56%), and poor retention of staff, particularly in rural areas, result in overwhelming workloads causing poor continuity of care; compounded by inadequate infrastructure and poor management¹⁴. Staff report limited training opportunities, favouritism in allocation of training, lack of cover during training absences, poor and unsafe working conditions, skill mix inequalities, lack of resources and equipment¹⁴.

The role of traditional healers in Tanzania: Traditional healers register with the Tanzania Traditional Health Practitioners Association. It is not uncommon for PWD

living in rural communities to seek care from traditional healers¹⁵. With traditional health beliefs there is a cure for every illness¹⁶. The biomedical model defines diabetes as incurable; traditional healers define diabetes as temporary, believing diabetes originated with ancestors and they will eventually provide a cure. This promotes the passive attitude of some PWD to their condition and self-management. Within the traditional paradigm diabetes is understood as being caused by conflicts or misdemeanours of previous generations¹⁶. Traditional healers are often able to explain illness in a way that is both culturally relevant and understandable¹⁷; this explanation is valued even when the symptoms are not alleviated. While traditional healers will sometimes refer patients to biomedicine (44-74%) collaboration is difficult¹⁸.

The role of the Tanzanian Diabetic Association (TDA): The role of the TDA is potentially a powerful one supported by the International Diabetes Federation, with a good framework to support HCW and PWD¹⁹. The TDA initiated the development of diabetic clinics in regional hospitals in Tanzania and HCW-training, guidelines, and patient education. However, outside of regional hospitals, this has not translated into support for HCW caring for PWD attending other Healthcare Facilities (HCF), especially in rural areas^{2,19}. When the TDA was first established, only three HCF provided diabetic clinics, illustrating that care for PWD is extremely limited in rural areas.

At the time of the 'need assessment' in the Kilimanjaro, there were no known district diabetic clinics, the only specialist care available to PWD was provided at the Kilimanjaro Regional Hospital². The nurses in the hospital's specialist diabetic clinic explained that health information leaflets for PWD had to be purchased, remained on the shelf and were unavailable for the majority of PWD.

The need for diabetes education: Fundamental to diabetes education is the complex concept of health literacy²⁰, defined as "the degree to which people are able to access, understand, appraise and communicate information to engage with the demands of different health contexts in order to promote and maintain good health across the one's life-time"²¹.

Health literacy is required by PWD to use prescribed medications, to access clinic and hospital services, negotiate for provision of information and healthcare from HCW; gain knowledge, skills and competence to self-manage their lifelong condition of diabetes and prevent complications²⁰.

In this program, providing health education to PWD was identified as a key area where resources were limited². HCW must source scientific information from textbooks, journals, *et cetera*, which are both scarce and written in English. More information is now available via the internet. The majority of HCW speak English as a second

or third language². To provide clear health education the information taught must be well understood by the HCW in English and then translated back into Kiswahili^{2,21}.

Training programs for HCW: Training programs for HCW have been effectively implemented in low resource, and multi-cultural settings for a variety of health interventions: for lay HCW to implement breast and cervical pap smearing for low-income workers²²; diabetes prevention programs for community HCW in Thailand²³; diabetes training for community HCW²⁴; diabetes education for a Hispanic population using community HCW. These examples illustrate that trainings focus on changes in knowledge and attitude with little emphasis on evaluating skill and practice. Those are more difficult to evaluate due to time, staff and financial restraints²⁵.

The needs assessments of PWD and HCW showed poor knowledge and management of diabetes. It was clear from the assessment and from direct requests for training and resources from the HCW that the program should provide assistance¹.

MATERIALS AND METHODS

The curriculum programme production years 1 and 2

The approach: The trainings would be delivered in English. English is used for secondary and tertiary education in Tanzania. Medical textbooks and information available on the worldwide web are predominately in English.

The aims: Aims of the workshops were firstly, to deliver workshops on diabetes care and management to meet the expressed need for training by the HCW. Secondly, to build capacity in the facilitators who took on the role of teaching in the workshops so they would be equipped to train others. Objectives were to facilitate evidence-based learning aimed at behaviour change for PWD and to establish a link between rural HCW and the main hospitals to build referral services and increase awareness of diabetes management, care, treatment and rehabilitation services.

The time line: In year 1 the International Diabetic Federation (IDF) manual and HCW manual PowerPoint presentations were available to the facilitators²⁶.

Additional materials were provided by specialists and facilitators. A unified approach to the teaching methods ensured a standardised educational outcome to the training workshops.

The material was reviewed after each session and revised based on feedback and outcome evaluation from the participants. In the capacity building approach, each facilitator reviewed participants' feedback forms, and reflected on their experience from their delivery of the material and tasks set for the workshop participants.

The Teaching and Learning Module from the IDF provided a useful resource. The facilitators were teaching adult learners of varying educational backgrounds. Some of the HCW attending the workshops had not had any formal teaching for several years; some had a better comprehension of English than others. The aim was to deliver evidence-based messages about diabetes that all participants would understand, remember and be able to tailor and communicate effectively to their individual patients: an exciting but challenging task.

Training workshop facilitators: Educators from the referral hospital and university interested in diabetes were invited to act as facilitators, engaging other HCW and empowering them to motivate PWD to achieve self-management and an 'optimal' quality of life. Behavioural outcomes and performance objectives were developed for the facilitators to guide the objectives and content of the training workshops (Tables 1 and 2)¹. All facilitators held a degree in their area of expertise. The program aimed to teach 15 HCW at the selected HCF with 4-day training workshops.

The ratio of male/female HCW attending the training could be equal or even more males than females, i.e. 2:1. At one workshop there were 11 males and 6 females attending (male HCW tend to be given preference over female workers when education opportunities are offered because men remain in their positions and do not leave to have children).

The training workshops were held at HCF in areas that were treating the highest number of diabetic patients, rotating this training annually through different HCF. The program's working committee was aware of the high turnover of HCW in Kilimanjaro region.

Table 1: IM Step 2 - Facilitators' behavioural outcomes and performance objectives

| Behavioural outcomes | Main performance objectives |
|--|---|
| Facilitators provide evidence-based education on diabetes care and self-management to health care workers at HCF | Deliver evidence-based education on diabetes care and self-management. Ensure that teaching is culturally appropriate and relevant to the target population. Model communication skills that can be taught by health care workers to motivate people with diabetes to adopt efficacious self-management of diabetes. Ensure that health care workers are confident using goal planning for supporting people with diabetes in self-management and care. Raise awareness of primary prevention, e.g. diabetic retinopathy screening whilst asymptomatic. |

Table 2: Examples of change objectives for facilitators educating health care workers:

| Step 2 intervention mapping | | | | |
|--|---|--|---|--|
| Performance outcomes | Clinical knowledge | Communication skills | Self-efficacy | Outcome expectations |
| PO 1 - Communicate information to health care workers in Kilimanjaro Region about diabetes treatment and self-care | K 1 - State knowledge of diabetes treatment and self-care to be healthy living with diabetes | CMS 1 - Demonstrate how to effectively educate health care workers about treatment and self-care to be healthy living with diabetes | SE 1- Express confidence about training health care workers to counsel people with diabetes about diabetes treatment and self-care to be | OE 1 – Recognize that health care workers counselling will empower people with diabetes to better self-care of diabetes |
| PO 2 – Answer specific questions health care workers have regarding diabetes | K 2 – State specific knowledge about treatment and self-care of diabetes to prevent complications | CMS 2– Demonstrate how to provide health care workers with information about specific aspects of diabetes care targeted at prevention of complications, e.g. diabetic retinopathy screening, follow-up, and treatment options. Feel confident when answering questions to dispel the fears and anxiety of people with diabetes | SE 2 – Express confidence educating health care workers regarding difficult issues regarding the provision of diabetes treatment and self-care, e.g. for diabetic retinopathy | OE 3 – Describe belief about ability of health care workers to detect complications of diabetes, e.g. diabetic retinopathy. To make timely and appropriate referral for follow up and treatment as required. |

How the material was delivered (Step 5): Prior to the first workshop the program held a day's diabetic training day, at the referral hospital. The Training of Trainers aimed at developing the curriculum for a Diabetic Day at the referral hospital. HCW from the region were invited to participate. Facilitators did present some of their material to be evaluated by the participants.

Two key slogans were used, 'You can be healthy living with diabetes' and 'KISS-Keep it simple sasa': keep it simple 'now', which was applied to goal setting,

using action plans for all aspects of self-management²⁷⁻²⁹, SMART goals²⁷⁻³⁰, tailoring and framing^{31,32}.

In year 1, the training was divided into discrete sessions with an overview of material presented by power-point presentations followed by a group work session that allowed for a problem-based learning exercise. The sessions were interactive and aimed to build the communication skills and self-confidence of the HCW. Learning objectives were stated for each session. A summary and a take-home message concluded each session (Figure 1).

Figure 1: Outline of training workshop – year 1

1. An overview of diabetes: What is diabetes, diagnosis, treatment, targets for prevention and management of complications
2. Nutrition: Healthy diet, the food plate, meal planning, appropriate and locally available foods
3. Communication skills and self-management: Behaviour change by motivating self-care with action plans
4. Nursing advice: Practical advice on fasting during Ramadan, sick days and travelling, goal setting. Diabetes and pregnancy. Use of insulin
5. Exercise, foot care, diabetic neuropathy, and erectile dysfunction
6. Diabetic retinopathy and the need for annual eye screening
7. Data collection, referral of diabetic patients for specialist services

For year 2 the program presented feedback, outlined in the feedback from HCW who had participated in the year 1 training workshops, to a stakeholders meeting. The training material was updated³³ and combined with the previous material. The material was then based on a virtual healthcare team presentation of Patient X 34. This

would allow HCW to follow a virtual person from initial diagnoses with type 2 diabetes through all aspects of care with task-based activities interspersed through each training session. The participants were given a detailed outline of each session plus additional fact sheets.

Figure 2: Outline of training workshop –year 2

1. For year 2 the program presented feedback, outlined in the feedback from postal questionnaires sent to HCW who had participated in the year 1 training workshops to a stakeholders meeting.
2. The training material could be updated (34) and combined with the previous material. The material was then based on a virtual health care team presentation of Patient X (35). This would allow HCW to follow a virtual person from initial diagnoses with type 2 diabetes through all aspects of care with task-based activities interspersed through each training session.
3. The participants were given a detailed outline of each training session plus additional fact sheets.
4. Each training center would receive a HCW training manual for their library, textbooks on diabetes, and a diagnostic and treatment resources pack such as a set of scales, blood pressure machine, glucometer and slips for blood glucose measurement.
5. The program's Working Committee and stakeholders agreed to continue support to the HCW at the HCF with regular visits by the diabetologist to supervise their clinical care.

Each training centre would receive a HCW training manual for their library, textbooks on diabetes, and a diagnostic and treatment resources pack such as a set of scales, blood pressure machine, glucometer and slips for blood glucose measurement. The program's Working Committee and stakeholders agreed to continue support to the HCW at the HCF with regular visits by the diabetologist to supervise their clinical care.

RESULTS

Results of the training workshops evaluation

Postal questionnaire: In year 1 a postal questionnaire to self-evaluate how the HCW had applied learning from the training workshops to their clinical setting, showed mixed results; 43 replies were received (Table 3).

Table 3: HCWs self-evaluation about how they had applied learning from the workshops to their clinical setting

| | |
|--|--|
| What was the most interesting thing you learnt? | <i>'How HCW' behaviour and attitudes affect the management of diabetes'.</i> |
| How will you change your care of diabetic clients because of what you have learnt? | <i>'To tell the client facts about diabetes. To listen to their opinions and sharing of ideas'.</i> <i>'To teach them how to escape from complications.'</i> |
| Additional comments | <i>'We still need your help with our diabetic clinic and eye examinations.'</i> <i>'Please don't forget us, let you visit us for supervision, guidance and on job training and motivation.'</i> <i>'Need a recurrent seminar to improve the services.'</i> |

There were nine reports by HCW that weekly diabetic clinics had been started in HCF. Improvements in management and care of PWD were reported by 33/43 respondents, 12 specifically reported early detection and management of complications of diabetes. Education in all areas of self-management of diabetes was reported by 39 respondents; effective communication with patients and relatives by 8 respondents; training of co-workers and improved teamwork by 3 respondents. The HCW reported significant barriers in instigating change in their clinical practice as had been identified in the literature and in the researchers' 'needs assessment'^{2,35}.

As outlined in Table 3, in year 2 the trainings were evaluated with pre- and post- workshop training tests (59

HCW); Using a paired sample t-test the mean was 23.39 (95% CI 20.68-26.10), $t=17.26$, $df=58$, $std\ error=1.36$, $p\text{-value} < 0.001$. The knowledge questions related to medical diagnosis of diabetes (4), motivation of self-care (2), nutrition (3), physiotherapy (1), eye health (3), and self care (3).

Feedback from individual HCW was evaluated using a standardised evaluation form for healthcare students at the Kilimanjaro Region University (Figure 3). The level of satisfaction was measured on 15 criteria ranked 1 (poor) to 4 (excellent) with an overall rating of 87.5% and a separate overall satisfaction rating with the same ranking with an overall rating of 90% (Table 4).

Table 4: Outcome of HCW training workshops

| Knowledge of 6 aspects | No. | Mean | SD | SEM |
|--|-----|-------|-------|------|
| Pre-test | 59 | 49.08 | 11.13 | 1.45 |
| Post-test | 59 | 72.47 | 13.08 | 1.7 |
| Mean = 23.39. 95% confidence interval of this difference is (20.68, 26.10) | | | | |
| $t=17.2575$, $df=58$, $std\ error\ of\ difference = 1.355$, $p\ value\ is < 0.0001$ | | | | |
| Total criteria rating | 59 | 87.5 | 2.18 | |
| Total satisfaction rating | 59 | 90 | 2.35 | |

Figure 3: The evaluation form

| EVALUATION FORM | | HCF | | | |
|--|--|---------------------------|-------------------|---------------------------|----------------|
| Gender: M/F Age: _____ | | Year of Qualifying: _____ | | Professional Title: _____ | |
| INSTRUCTIONS: These forms are to help provide feedback for the organisers and facilitator/s. Please be honest when scoring each section of the assessment. The outcome of these evaluation forms will be kept confidential. Thank you for participating. Mobile number: _____ email address: _____ | | | | | |
| | | Poor- 1 | Satisfactory 2 | Good 3 | Excellent 4 |
| | General | √ | √√ | √√√ | √√√√ |
| 1) | Organisation: time management, teaching environment & resources | | | | |
| 2) | Attitude towards participants - respect and courtesy | | | | |
| 3) | Verbal skills: Audible, understandable, appropriate use of language and terminology | | | | |
| 4) | Use of explanations and examples: Understanding and cultural relevance | | | | |
| 5) | Use of questions: motivation and relevance | | | | |
| 6) | Interaction with participants: attitude and stimulation | | | | |
| 7) | Presentation of material: layout, font size, focus | | | | |
| 8) | Verbal descriptions and use of pictures etc | | | | |
| 9) | Content of lectures, comprehensive and relevant to clinical practice | | | | |
| 10) | Introduction: definitions and overview of topic | | | | |
| 11) | Key points of topics defined and explained | | | | |
| 12) | Explanations to questions raised by participants. | | | | |
| 13) | Relevance and application to your clinical care | | | | |
| 14) | Use of tasks for problem solving and group interaction | | | | |
| 15) | Development of critical thinking and challenge to engage in professional development | | | | |
| | Participant's overall satisfaction with overall teaching of the sessions | | | | |
| What was the most interesting fact you learnt today? How will you change your care of diabetic clients because of what you have learnt today? Comments: _____ | | | | | |

DISCUSSION

The ‘needs assessment’ of HCW showed mixed levels of knowledge regarding diabetes. There was some knowledge of microvascular and macrovascular complications of diabetes, the need for PWD to avoid uncontrolled blood sugar levels through self-management of a healthy lifestyle of diet, exercise, and self-care. The trainings highlighted that the rural HCW were not trained

as diabetic specialists nor were they working in specialist diabetic clinics. They faced numerous obstacles in caring for PWD due to varying levels of knowledge amongst colleagues, nurses, and clinical officers.

Earlier studies^{36,37} showed that microvascular complications, such as DR can be reduced with improved glycaemic and blood pressure control, but only if monitoring and medications are consistently available³⁷. Similarly, all other diabetes services must be integrated

and be consistently available, such as DR-detection and management of complications³⁷. Whilst the program's training aimed to provide the rural HCW with a better understanding of diabetes management, especially of eye health, and to provide some basic resources; often blood sugar levels could not be monitored and medications were unavailable.

Complications: When giving advice to PWD about how to avoid microvascular and macrovascular complications (secondary prevention) very few HCW were able to adopt a holistic approach to care promoting healthy living to prevent complications². HCW found that PWD present late to HCF with established complications of diabetes and there were few opportunities or resources to educate PWD on prevention of complications of diabetes. This supports the findings of the KDP 'needs assessment'². The focus of HCW was generally on managing secondary and tertiary prevention of complications of diabetes due to late presentation at the HCF².

Evaluating the training workshops: The workshops were able to take comprehensive diabetes education to the rural HCF, reducing travelling time for HCW. Facilitators focused on changing both the attitudes and knowledge of HCW. This evaluation is supported by findings in both the outcomes of the pre and post-tests of the workshops (Table 3) and the feedback in the postal questionnaires. The facilitators were committed to the training and some of the HCW who attended the training had been interviewed during the initial 'need assessment' in Kilimanjaro Region.

Study limitations

The KDP was unable to undertake tests after completion of the workshops nor was it possible to monitor the clinical application of learning by HCW in the clinical setting. Future trainings should add these objectives to training programs.

CONCLUSIONS

The training workshops achieved the aim of training facilitators to educate HCW on diabetes care and self-management. The workshops met the expressed request of HCW for diabetes education and provided them with the resources they requested for self-study and reference in their clinical practice. The workshops empowered the facilitators who gained experience and confidence through the course of the three years. The commitment of the team to deliver the training in rural settings was acknowledged and appreciated by the recipients.

The improvement in HCW diabetes knowledge was and satisfaction with the facilitators was high. There was positive feedback on how training had informed the HCW clinical practice. The use of task-based learning in

years 2 and 3 of the training workshops gave the HCW the opportunity to model the skills taught and reinforce knowledge and understanding before applying this in the clinical setting. The engagement of HCW as stakeholders in the program, and continued support through annual HCW training workshop and stakeholder meetings was an important aspect of the intervention.

The training workshops were one strategy used in the overall program healthcare intervention in Kilimanjaro to plan, develop and implement a culturally relevant, evidence-based, theory-driven screening program for DR to prevent avoidable blindness. The 'need assessment' of both PWD and HCW in Kilimanjaro, the dialogue with stakeholders, and the program's Working Committee led to the development and delivery of comprehensive education on diabetes management and care to HCW in the Kilimanjaro Region and strengthened the network between rural and urban HCW².

The way forward

To reduce microvascular (e.g. DR) and macrovascular complications of diabetes there need to be behavioural and environmental changes on numerous levels. The environmental factors that prevent self-management and restrict management and care of diabetes to secondary and tertiary prevention require organisational and policy changes, and provision of scarce resources to effect tangible change that will impact on the health of PWD and improve their quality of life.

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