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Developing comic strips promoting diabetic retinopathy screening in Kilimanjaro, Tanzania, using Intervention Mapping

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INTRODUCTION: Intervention Mapping is the protocol used by the Kilimanjaro Diabetic Programme to plan, develop, implement, and evaluate an evidence-based screening programme for diabetic retinopathy. Two comic strips were developed to deliver the message on the need for diabetic retinopathy screening.

OBJECTIVES: The first objective was to develop a culturally appropriate and accessible health message to promote diabetic retinopathy screening for the target audience. The second objective was to deliver a motivational message to promote acceptance of diabetic retinopathy screening irrespective of past eye health behaviour.

METHODS: A multi-method research design was used. Social cognitive theory provided the theoretical basis for the intervention, involving community participation to promote positive eye health behaviour.

RESULTS: For the Draughts Comic Strip, Flesch-Kincaid readability was 75.7% and comprehension was 87.04%, and for the Soap Opera Comic Strip Flesch-Kincaid readability was 75.6% and comprehension was 86.54%.

CONCLUSION: The development of the diabetic retinopathy comic strips was a positive health education strategy implemented during a clinical trial comparing methods of screening for diabetic retinopathy at the Kilimanjaro Christian Medical Centre Hospital. The level of comprehension of the comic strips by stakeholders indicated their understanding of the message. Patients enrolled in the clinical trial requested the comic strips. No discarded comic strips were found in the clinic during the clinical trial.

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INTRODUCTION

Diabetic retinopathy (DR), is the most common microvascular complication of DM [1]. Early diagnosis and treatment of DR is effective and efficient in preventing vision loss and blindness [1]. Early treatment, before severe vision loss has occurred can maintain visual acuity, however it often does not restore loss of vision. DR screening should be initiated at diagnosis of diabetes, and repeated even when the person remains asymptomatic so vision-threatening DR can be diagnosed and successfully treated [1].

Intervention Mapping (IM) was chosen as the protocol by the Kilimanjaro Diabetic Programme (KDP) [2–4] to develop a socio-ecological health programme focusing on the needs of people with diabetes (PWD), to formulate a sustainable screening programme for DR. This paper describes the steps of developing comic strips as a strategy in delivery an eye health intervention [5, 6]. IM is used to plan and develop theory- and evidence-based health promotion interventions iteratively and systematically. The six fundamental steps of the IM process are: 1. Conduct a needs assessment, 2. Define programme outcome and objectives using a Logic Model of Change, 3. Select theory-based intervention methods and practical applications, 4. Organise methods and applications into an intervention programme, 5. Plan for adoption, implementation, and sustainability of the programme, and 6. Generate effect

process and outcome evaluation plans. Each of the six steps is divided into specific tasks with attention to the cultural and environmental context relevant to the target population [5, 6].

The needs assessment of PWD and health care workers in the Kilimanjaro region of Northern Tanzania (Fig. 1, Precede-Proceed Model, Step 1,) formed part of the needs assessment to identify the behavioural and environmental determinants of PWD, health outcomes and quality of life [4, 7].

Behavioural outcomes and performance objectives were developed to address the questions of how best to promote, and maintain behavioural changes relevant to the KDP health intervention programme [6].

Through qualitative, quantitative assessment of PWD, health care workers [4], and dialogue with stakeholders and the KDP Working Committee, the behavioural and environmental determinants of behaviour preventing uptake of screening for DR were identified, including socioeconomic factors, health literacy, self-efficacy, normative beliefs, availability and accessibility to eye health services [4].

An eye health study illustrating the concept of normative beliefs [8] revealed that within the target population in Kilimanjaro Region, people of 50 years and over, there is a perceived need for sight that is partially dependent on socially constructed expectations of work

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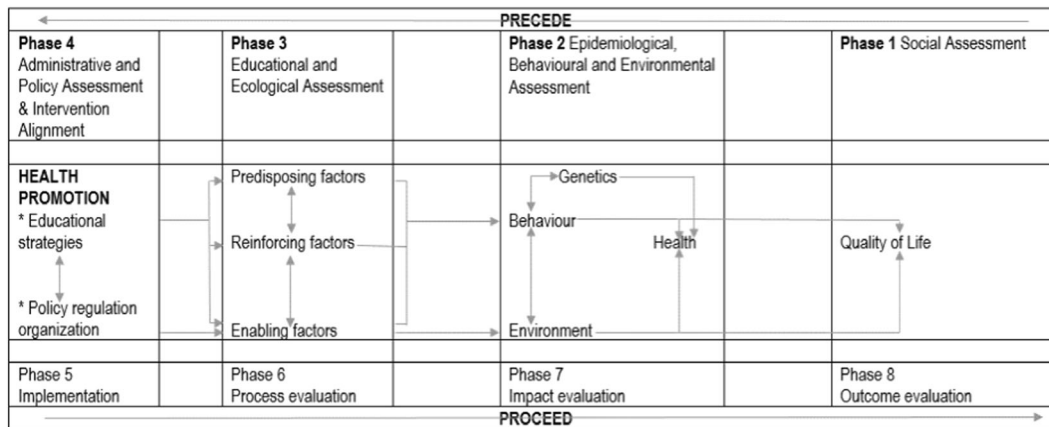


Fig. 1 Precede-proceed model for diabetic retinopathy screening [7].

and quality of life. These relate specifically to physical mobility, social interactions, and financial autonomy. There are complex relations between visual acuity, self-esteem, socially determined roles and expectations. Consequently women will continue to persevere with their daily routines despite greatly reduce visual acuity instead of expressing to their relatives their felt need for sight [8]: “Well, we don’t love ourselves, we usually ignore many things and we are tolerant somehow. Usually we do consider severe and painful cases. However, I am a widow, I’m not in pain and I have found no one to give me some money and to support me...” (#36).

Elderly PWD who have repeated medical expenses have to seek support from younger family members who have many needs (food, clothing, school fees, etc.) that may be solely met by the sale of their crops. Trying to negotiate the cost of medical expenses via complex and protracted social negotiations is sometimes too onerous for some elderly family members [8]. Consequently, people with severe visual impairment may be stigmatised and feel lonely and suffer from depression. Elderly individuals in Kilimanjaro Region may feel embarrassed or ashamed to ask for help. Waiting for treatment makes them more dependent on family members for their most basic needs, increasing their sense of worthlessness, compounding their social isolation [8].

Within Kilimanjaro region there is a tradition of oral communication versus written communication [9]. Relatively low levels of health literacy are a reflection of poor education [10]. The United Nations development programme report for 2014 showed that the mean number of years for education in Tanzania is 5.1 years. Poverty impacts negatively on health and education for those living in Tanzania, where life expectancy in 2015 is 61.5 years [10].

In Tanzania literacy levels vary regionally with high school teacher-to-student ratios of 1:30 to 1:60 per class. Kilimanjaro region has one of the highest levels of literacy in Tanzania, rated at 96% [10]. In spite of this, the KDP interviewed 26 people [4] and only 3 people had any secondary education, 10 people had between 4 and 8 years of primary education and 13 people gave no indication of receiving any education. The age range was from 34 to 83 years of age.

Education and literacy are key determinants of health that do not ensure health [11]. Health Literacy is a complex and dynamic construct, which first came into mainstream health education in the 1990s [12]. Health literacy can be defined as the degree to which people are able to access, to understand, appraise and communicate information to engage with the demands of different health contexts in order to promote and maintain good health across the life course [13]. Often there is confusion between literacy and health literacy. It is suggested that literacy refers to the basic skills needed to succeed in society while health literacy requires some additional skills to access, evaluate and integrate

health information from various contexts. In order to do this, knowledge of health-related vocabulary and the culture of the health system is required [14].

Health intervention programmes for PWD need to consider the mental health of the target population [4]. Depression disturbs emotions, cognition, and behaviours [15] with a lifetime prevalence of approximately 11% in low-income countries [16]. Prevalence rates of depression worldwide, are estimated to be almost twice as high in people with type 2 diabetes compared with the general population [17], while prevalence rates of anxiety appears to be about 40% of the people with type 1 or type 2 diabetes [18]. If PWD experience anxiety and depression this has been found to worsens the prognosis of diabetes, increases non-compliance to medical treatment [19], decrease quality of life [20] and increase mortality [21].

The needs assessment conducted by the KDP amongst the target population of PWD in Kilimanjaro region identified high levels of anxiety and depression, expressed in terms of: *Suddenly being scared for no reason. Feelings of worthlessness* – page 8 [4]. In East Africa depression is often misdiagnosed as a psychosocial problem [22].

The Eye Health Questionnaire of 79 people living in Kilimanjaro region established that whilst 70.9% knew that diabetes damages the eyes, only 30.4% had previously undergone DR screening. When DR screening was offered to this small group 89.9% of them accepted DR screening [4].

The KDP programme was faced with the enormous challenge of motivating PWD to attend DR screening whilst they are asymptomatic. Given the barriers that PWD face in seeking health care for acute problems, the need for screening may seem to be irrelevant or inappropriate in the light of their other health needs. This challenge was addressed by developing culturally relevant comic strips which have been shown to be a good strategy in a low resource setting with low health literacy [23]. This strategy was informed by SCT [24]. The comic strips were developed using the concept of peer modelling framing the messages to influence the way in which information is processed by the reader and motivates the individual to change their behaviour. The majority of PWD in Kilimanjaro are of a low socioeconomic status with low levels of health literacy [4]. The aim was to maximise the clarity and understanding of the information while exposing PWD to risk information about their health so that they would act on it and alter their behaviour in a proactive way. SCT examines the effects of health communication on knowledge, beliefs and behaviour [25].

SCT is based on reciprocal determinism, i.e. no amount of observational learning results in behavioural change unless it is supported by the observer’s environment. This is a four-step process of watching and then modelling behaviour: (1) the observer must pay attention to the behaviour to be modelled, (2)

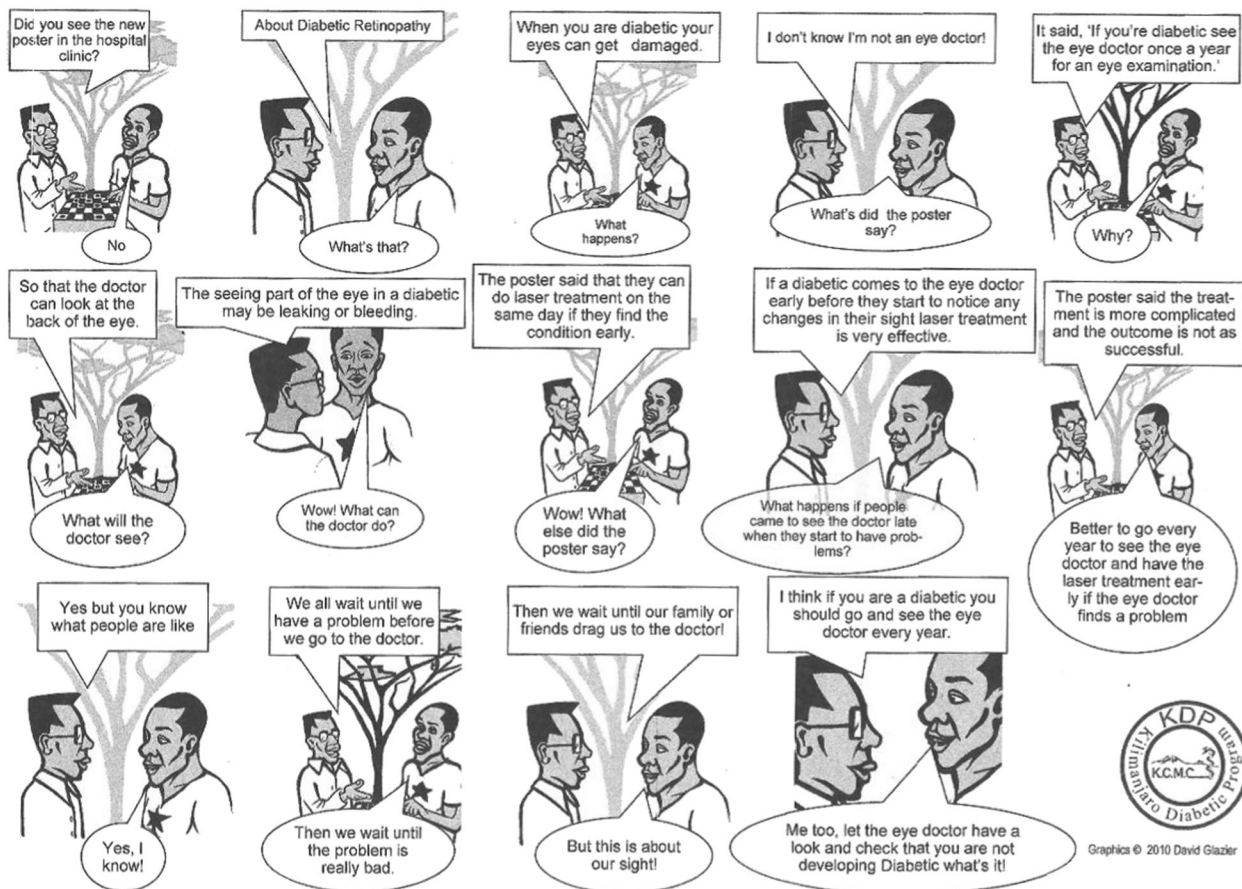


Fig. 2 Soap Opera Comic strip.

the behaviour to be modelled must be memorised. The ability to do this depends on the observer's ability to retain the details of the behaviour and their level of literacy, (3) modelling of the observed behaviour then guides future behaviour, (4) an incentive or reason (motivation) for the observer to model the model's behaviour depends on the outcome expectations (cost and benefit analysis) of the observed behaviour [26].

SCT describes the confidence that an individual has in their ability to learn and carry out a behaviour or in deciding to undertake a behaviour. For example after reading a comic strip about screening for DR, modelling the behaviour portrayed in the comic strip by undertaking screening for DR in either the diabetic or eye clinics [26].

Peer modelling is most effective in promoting observational learning of health behaviours when delivered through real stories about community members achieving behavioural change and narratives rather than through didactic or persuasive messages [27–29]. Modelling is especially effective when the observer perceives that the model is similar to them [30, 31].

The need for information about DR screening had been identified during the needs assessment, IM Step 1 [4]. The decision of what type of material would be developed for the intervention was taken from a questionnaire put to stakeholders attending a regular KDP stakeholders meeting, IM Step 3. Stakeholders included government representatives, endocrinologists, ophthalmologists, epidemiologists, social scientists, hospital directors, urban and rural health workers, and representatives of PWD.

METHOD

Stakeholders were asked what format information for DR screening should take. The majority chose a pictogram or comic strip with the information mostly in the form of pictures for patients who have difficulty

reading. This format was in preference to the alternatives which were discussed.

Members of the KDP working committee developed scenarios for two comic strips and received feedback from the group. Revisions of the artwork were made with respect of cultural and religion, IM Step 4 [5, 6, 32].

The process of developing the comic strips required further consideration of the cultural discourse in Kilimanjaro regarding health and illness. The 'Draughts' comic script used male role models and the 'soap opera' comic script used female role models (Figs. 2 and 3). The KDP comic strips provided role models that the PWD could identify with and model their eye health behaviour on (Table 1).

The level of comprehension and readability of the comic strips was tested by Flesch-Kincaid generated using MS Word. Readability refers to word and sentence length in the text, while comprehension refers to the how well the intended message is evaluated to be understood and how likely the intended action will be performed once the message has been read by the target audience [33]. The comic strips were drafted in English and then translated into Kiswahili by a first language speaker.

RESULTS

Comprehension and readability

of the comic strips was evaluated by stakeholders attending a regular KDP stakeholders meeting (Tables 2 and 3). On the Draughts Comic Strip Flesch readability was 75.7 and comprehension 87.04% ($n = 27$) and on the Soap Opera Comic Strip Flesch readability was 75.6 and comprehension was 86.54% ($n = 26$). The higher the score the easier this makes the material to read.

Impact

The use of the comic strips was piloted at Kilimanjaro Christian Medical Centre Hospital during a clinical trial for DR screening, IM Step 5. During the clinical trial, the participants were observed

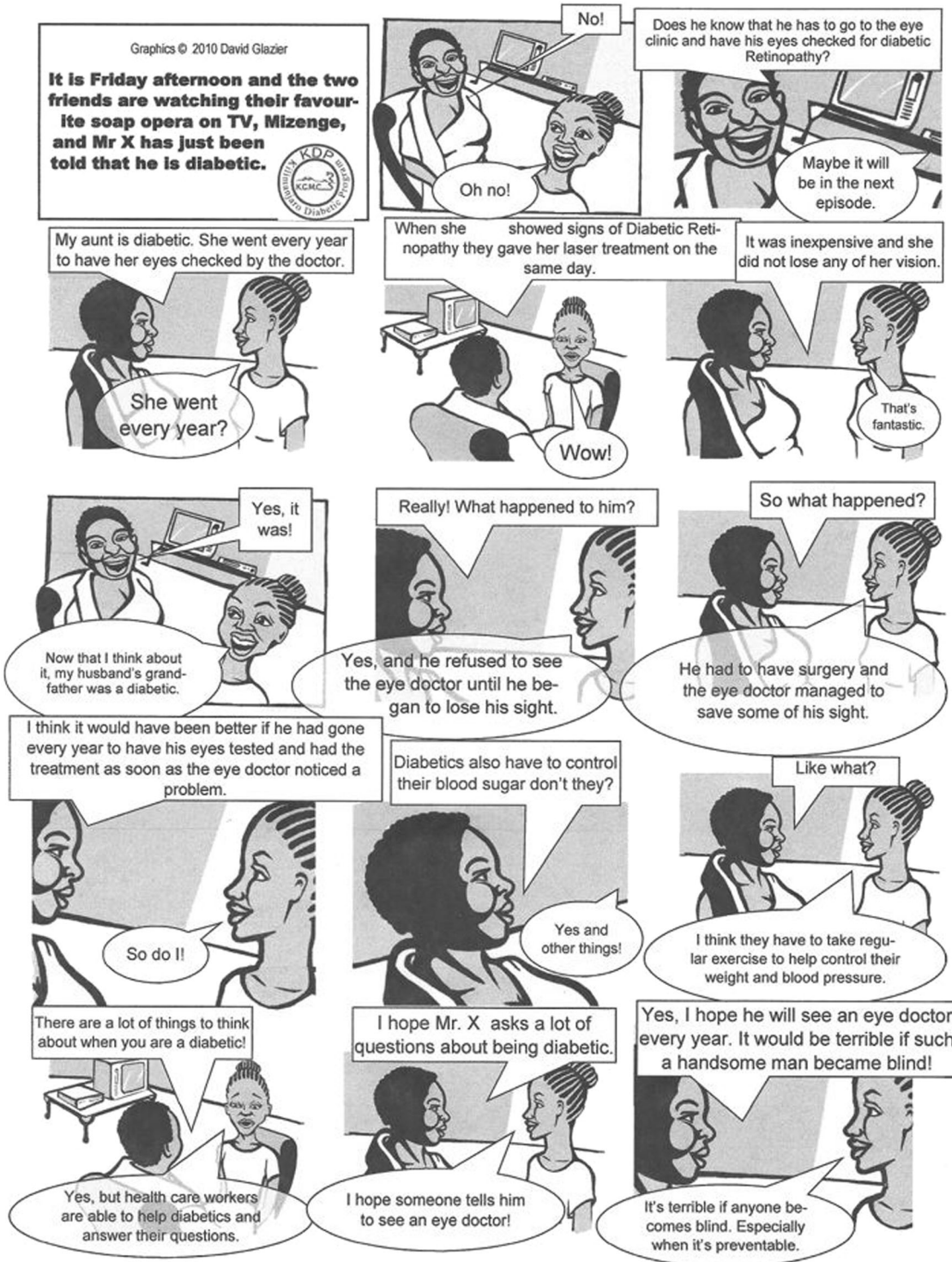


Fig. 3 Draughts Comic strip.

reading the comic strips and no discarded strips were found in the clinics or walkways.

DISCUSSION

The comic strips were developed to promote DR screening for PWD. Levels of readability of the scripts were in the range of a 6th grade student and on the Flesch grade scale this is considered easy to read. The aim of placing the text within comics was to

make the information accessible, interesting, relatable, to promote dialogue and motivate uptake of DR screening.

IM provided the KDP with a strong protocol to assess the barriers facing PWD preventing the uptake of screening for DR. Using the IM steps and tasks ensured attention was paid to the socioecological, cultural, and environmental context of PWD prior to proceeding with the planning of the health care intervention. The systematic and iterative nature of IM was fundamental in the collaboration of Working Committee of the KDP with stakeholders

Table 1. Method, parameter and application example.

Method	Definition	Parameters	Example
Modelling Social Cognitive Theory; Theories of Learning [35–37]	Providing appropriate models being reinforced for the desired action	Attention, remembrance, self-efficacy and skills, reinforcement of model; identification with model; coping model instead of mastery model	The comic strips provide male and female models from the target population dealing with the issues facing uptake of screening for diabetic retinopathy and the benefits of early screening and treatment.

Table 2. Feedback on KDP 'Drafts' Information Leaflet.

Please complete the following questions to give us feedback on the patient information leaflet (comic strip) which will be given to people with diabetes who attend for diabetic retinopathy screening in Kilimanjaro.

Tick one box below the option which you think is the correct answer for each question. ☑

1. What is the new poster in the clinic about?

Hypertension	Malaria	Childhood immunisations	Diabetic Retinopathy
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2. What did the poster say people diabetes with should do?

Not ever see an eye doctor	See an eye doctor at every clinic visit	See an eye doctor every 3 months	See an eye doctor once a year
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3. Why would the doctor do this?

To check their feet	To check their blood sugar	To check their blood pressure	To look at the back of the eye
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4. What do the doctors see when they look at the back of the eye?

The seeing part of the eye may leak or bleed	The lens of the eye is cloudy	The front of the eye is cloudy	The gel inside of the eye leaks
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5. If there is a problem in the eye what can the doctor do?

No treatment	Eye drops	Laser treatment	Eye Surgery
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6. Why should people come early, before they see any changes in their sight, for treatment?

Laser treatment is effective in saving sight	Laser treatment is not available	No treatment is available	They can have sight saving treatment but it is more complicated and the outcome is less effective
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

7. What happens to people with diabetes if they wait and come to see the eye doctor when they start to have problems?

Laser treatment is effective in saving sight	Laser treatment is not available	No treatment is available	They can have sight saving treatment but it is more complicated and the outcome is less effective
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

8. What do the friends agree is the best time for people to go to see the eye doctor?

Refuse to see the Eye Doctor	Visit the Eye Doctor at every clinic visit	Visit the Eye Doctor every 3 month	Should visit the Eye Doctor every year
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

9. What behaviour do the friends discuss about going to see the doctor?

People wait until they have bad problems and then need to be encouraged by friends to go to the doctor.	People go without any delay to see the doctor if they are unwell.	People go every 3 months to see the doctor even if they are not unwell.	People go every year to see the doctor for a medical check up.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

10. What do the friends think about people with diabetes going to see an eye doctor?

Refuse to see the Eye Doctor	Visit the Eye Doctor at every clinic visit	Visit the Eye Doctor every 3 month	Should visit the Eye Doctor every year
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Refuse to see the Eye Doctor	Visit the Eye Doctor at every clinic visit	Visit the Eye Doctor every 3 month	Should visit the Eye Doctor every year
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

PWD and health care workers, and in the evaluation of the health intervention programme.

Strengths of the study

The comic strips were planned and developed with participation from stakeholders and were culturally relevant. They modelled eye health behaviour for both male and female PWD to seek DR screening whilst still asymptomatic. Providing PWD with the comic strips was an important part of the KDP motivational strategy to engage participants in understanding the need to take part in screening for DR. Knowledge, in and of itself does not change behaviour [34], yet it is a starting point

to motivate an individual to begin to consider behaviour change.

Weaknesses of the study

The level of readability of the comic strips could have been higher. Comprehension tests of the comic strips were not undertaken with the target group of PWD due to limited time and resources; the comprehension testing was undertaken with the stakeholders, who included PWD and originally decided what form the information leaflets should take. An attempt was made to follow up PWD who had taken part in the KCMC clinical trial to evaluate how well they remembered the comic strips, IM Step 6. Due to irregular

attendance at the diabetic clinic it was not possible to track sufficient numbers of participants to present for analysis. Of the handful of participants who were followed up some months after the clinical trial only two remembered reading the comic strips.

Recommendations for future researchers

Researchers need to find a way to increase health literacy to improve health outcomes, by tailoring and providing culturally appropriate health education at all levels of society. People should be empowered to participate in all caring and management decisions and make their own health decisions [12]. IM provides a strong protocol for undertaking health intervention programmes that engage stakeholders, the target population, and are theory and evidence based.

Recommendations for policy makers

It is the responsibility of policy makers to incorporate the notion and paradigm of health literacy into their research agendas and their objectives for population health [12].

CONCLUSION

The findings suggest that the use of comic strips that model culturally relevant eye health behaviour is a valuable educational strategy in motivating PWD to adopt DR screening. However, without follow-up interviews this conclusion cannot be supported. Research needs to be conducted to understand why people accept screening when it is available.

The challenge to programme planners is to change eye health behaviour to motivate PWD to attend for DR screening whilst they are asymptomatic and then to attend for further assessment and treatment if a need to do so is detected. Given the complex decision-making process in families regarding illness and the therapeutic experience of PWD in Kilimanjaro this is indeed a challenging task. Given the fact that only 40.2% of referred patients attended their referral appointment at the KCMC eye clinic for further assessment or treatment after they had been screened, further work needs to be done [2]. PWD require support, education, motivation, and empowerment to attend for follow-up and treatment when a problem is detected by screening programmes to prevent avoidable blindness. In this current pandemic this seems an enormous task.

Summary

What was known before

- Literacy refers to the basic skills needed to succeed in society while health literacy requires some additional skills to access, evaluate and integrate health information from various contexts. Knowledge of health-related vocabulary and the culture of the health system is required to do this.
- Combining simple text with pictograms makes health information accessible to low literacy health users.
- Peer modelling is effective in promoting observational learning of health behaviours when delivered through real stories about community members achieving behavioural change and narratives rather than through didactic or persuasive messages. Modelling is especially effective when the observer perceives that the model is like them.

What did this study add

- This study showed the process of combining peer modelling with health information in an accessible format in collaboration with community stakeholders.
- The comic strips were both culturally and gender relevant to the target population.

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AUTHOR CONTRIBUTIONS

CH: Primary investigator, researcher and writer of the paper. AH: Lead clinician at KCMC Hospital and editor of the paper. JM: Project manager and translator. PC: Research supervisor and editor. GK: Research supervisor and editor.

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COMPETING INTERESTS

The authors declare no competing interests.

ETHICAL APPROVAL

Ethical approval was granted by Kilimanjaro Christian Medical Centre Ethics Committee.

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