



Research Article

# Idealism Versus Realism in Sustainable Global Research

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## Abstract

In sub-Saharan African countries, non-communicable diseases (NCDs) such as Type II diabetes are increasing in incidence and prevalence. Glycated hemoglobin (HbA1c) is a diagnostic tool for monitoring and managing patients with diabetes that is unavailable in many resource constrained environments. Following a qualitative study with key informants in rural northwestern Tanzania, point of care HbA1c machines were introduced to improve care of patients with diabetes. Education modules were developed for study participants in Shirati, Tanzania to improve disease management in this remote area that included locally available food choices, exercises to reduce blood glucose, and overall understanding of the disease process. A greater understanding of the cultural norms and mores as well as factors affecting supply of equipment are essential to improve care provided to this population. This paper contributes knowledge to the ongoing challenges of appropriate sustainable research to improve health in low resource areas.

**Keywords:** Diabetes Mellitus; Tanzania; Nutrition; Noncommunicable Diseases; Disease Management.

## Introduction

The economic impact of Non-Communicable Diseases (NCDs) across the continent of Africa is steadily growing. Currently, the top NCDs (cardiovascular disease (CVD), cancer, obesity, and diabetes) are increasingly affecting disability adjusted life years (DALYs) for the patients with these illnesses. While health funding, resource management, and drug manufacturing are turning their focus from communicable diseases to NCDs, the burden of managing these diseases falls on grass roots efforts to provide health education on prevention and management to slow their rising tide [1-4].

Diabetes Mellitus (DM), one of the top NCDs in Africa, is complexly interwoven with obesity and CVD [5]. Early identification and management of DM greatly reduces the devastating progression of the comorbid conditions associated with it, thus minimizing the loss of workforce due to long term illness and costs over time for the individual and healthcare systems. Difficulty in supply of medication and glucometers in rural areas limits the

ability of healthcare providers to provide “western medication” to manage the disease. Misperceptions about DM in Tanzania (TZ) also impedes uptake of DM treatment and even belief in the disease itself, particularly in rural areas [6,7]. Perceptions that DM has been a disease of the affluent also comprises one of the several barriers to DM self-management. Sawin and Knopp [8] reported misperceptions of DM management in Tanzania included witchcraft, white man food, and incurability like earlier findings by Nnko [9] and Kagaruki [10]. Turning toward prevention and health education has proved to be a most effective tool in managing this long-term disease process particularly in low resource areas [11].

With that in mind, a sustainable solution for DM management is to provide the necessary tools of available food, exercise, and symptom control. Challenges abound when conducting global research, with particularly unique issues in a Low to Middle Income Country (LMIC). The purpose of this study was to focus education directly on the care takers and food preparers with DM or DM in family members. In an ideal situation, a fully randomized mixed-method study would most scientifically indicate statistically significant findings. However, reality intrudes in unexpectedly expected ways.

## Research Design and Methods

The research, a qualitative interventional design conducted in Tanzania in a rural healthcare clinic setting, received IRB approval from James Madison University and the Medical Director at Shirati Hospital, the main site for the intervention. Using snowball recruitment, fifteen women aged 22-64 from the Shirati Hospital catchment area were invited to meetings on clinic grounds to participate in educational sessions on causes of diabetes, foods that are good for people with diabetes to eat from the local market, and how to increase activity to lower blood sugar. The women were included in the study if they had been diagnosed with diabetes or if a family member had been diagnosed with diabetes as the women would be the household member preparing the food. Three sessions were planned and presented by the researchers with the assistance of a local registered nurse and a community health worker (CHW). The women were interviewed at the end of the three sessions for feedback on the content of the educational sessions and methods for improving the content delivery. Details of the interviews were recorded in a journal by a research assistant.

Prior to the first educational session, each participant was tested using a point of care Hemoglobin A1C (HbA1c) machine provided by the researchers. The local registered nurses were educated on how to use the HbA1c machine to facilitate follow up testing. A 3-month, 6-month, 9-month and 12-month follow up were conducted by the local nurse or CHW who traveled to the participants' areas or at the hospital for testing. Data were collected and recorded for each participant.

### Content of Teaching Sessions

Teaching materials were prepared by the researchers prior to arriving in Tanzania. Photographs of local style foods were obtained and with the assistance of a translator fluent in Swahili,

the local language in Tanzania, a bingo game, (KULA), was created with each food and its name provided. Once in Tanzania, the assistance of a Tanzanian registered nutritionist at the clinic was enlisted to validate the photos of the foods, food preparation methods, and translations. At the beginning of the teaching sessions, the participants were asked to select foods on display before them that would be appropriate for someone with diabetes to eat. After reviewing their choices, the researchers provided education on the causes of diabetes with time for questions from the participants. The second session included discussion on why certain foods were better for diabetics and how food choices could affect the disease. In the third session, exercise was discussed and activities were demonstrated by the researcher and the research assistant. Exercise bands were provided to encourage resistance training and other forms of movement were discussed that would help in lowering elevated blood sugars.

After the third session a trip to the local food market was planned to identify and purchase foods that would be appropriate for a person with diabetes to eat. The local registered nurse attended the trip to the food market and translated for the researchers to ensure the participants were able to understand which foods were best to purchase and why. Before going to the market, the original photographs used in the first session were again reviewed to assist in choosing the best local foods available.

At the final session, the participants were once again tested with the HbA1C machines and their results were compared with their initial test on day one. The participants were interviewed for feedback using probing questions and plans were made for them to follow up with the local nurses. Each of the sessions was approximately 45 minutes in length and took place over a ten-day period. Participants were paid for their participation in food products purchased at the local market.

## Results

Participant	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15
Age	64	44	47	32	35	32	42	40	40	32	30	45	22	34	40
HbgA1c T1	13	5.6	5.2	5	6.4	5.6	5.6	4.9	5.1	5.5	5.1	4.5	4.7	6.8	5.1
HBA1c T2	7.8	5.7	6	5.3	6.7	5.7	absent	5	5.6	5.8	5.7	5.4	4.9	6.7	5.5

**Table 1:** The table above shows the progression of HbA1c results for the 15 participants in the study.

Only two of the women at the initiation of the study had elevated HbA1c indicating diabetes or prediabetes per the American Diabetes Association (ADA) definition (noted in red). Notably P1 was an older female who thought her “sugar might be high” but had not sought treatment. Several of the women had normal to low HbA1c results. The subsequent HbA1c readings were taken by conversion of the FBS reading as use of the POC HbA1c machines was delayed due to issues with the POC HbA1c machines not arriving in country. New HbA1c machines were shipped to the site but were delayed in the Dar es Salam airport for weeks and when delivered, were not operable. Efforts were made to purchase HbA1c machines in country but none were available at the time.

This challenge was remedied by asking the women to come to the campus of the hospital to use the supplies available at the lab to record the HbA1c readings. FBS, which is the practiced method of monitoring glucose in this area, was done at the time during the teaching sessions as glucometers were provided by the researchers early in the study. Results of fasting blood sugars are listed in Table 2 which are converted from mmol/dl using the standard 1 mmol/liter =18mg/dl of blood glucose. The number is the concentrated mmol/l value with all values being rounded to the nearest whole number.

FBS	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15
T1	196	90	116	127	87	80	97	70	72	120	88	89	78	91	67
T2	183	90	88	63	122	81	85	94	86	117	90	81	142	108	72
T3	180	119	92	61	90	72	85	79	119	86	122	72	81	99	90
T4	abs	111	81	113	79	169	76	81	72	86	101	83	81	106	74
T5	abs	104	83	109	83	103	119	104	86	85	99	85	83	88	115
T6	abs	106	101	115	115	115	92	85	95	92	88	94	81	83	128
T7	108	93	119	119	94	94	abs	106	92	92	88	77	95	110	90

**Table 2:** Fasting blood sugars; \*abs= absent from class.

Of interest, participant one (P1) who had the highest HbA1c and FBS was absent for 3 sessions and upon her return her FBS was noticeable lower. The CHW followed up on this participant and found the woman had been sent to a larger city to receive care in the hospital. The participant stated she recognized the signs of her sugar being very high from the information in the teaching sessions provided through this study. The intermittent high FBS compared to the 3- and 6-month HbA1c align with the advantage of HbA1c in assessing progression of DM versus treating single readings of FBS.

### Focus Group Interviews

Focus groups conducted while the women attended the educational sessions were led by the Community Health Worker (CHW) or RN in country. Women in the groups noted that at times it was difficult to attend the session due to “family issues” after the sessions were moved to the local hospital area due to the POC machines being unusable. Further probing indicated two women did not have transportation, one was ill with malaria, and the third had a conflict with her husband. A motorcycle was sent to pick up the women without transportation so they were able to attend. The third woman was absent for the final session. The CHW was sent to follow up with her to ensure her safety

## Probing Questions for Focus Group interviews

### Women's Group

What is your understanding of diabetes for you or a family member?

What is the most helpful thing you have learned about diabetes?

The main thread that emerged from the discussion in the focus groups was the benefits of exercise. Of the 15 participants, more than half stated the exercise helped with body pains. In relation to the discussion around food preparation, all the women noted the double washing of rice, low sugar in tea and drinks, and use of garlic in prep was very beneficial. The women stated the foods were more acceptable in taste due to these additions. The use of colored grains versus white grains noted in the shopping session in the market was an improvement in taste and appeal of new foods. All the food suggestions were within the cost for the families. Most importantly, P1 greatly benefitted from the educational session as she was able to recognize when she was in danger from her elevated glucose and had her family transport her to a hospital.

### **Limitations**

Conducting research globally presents potential limitations in communication and intention. Language barriers and lack of understanding of local customs and mores present as the reality versus idealism in the research process. The researchers had a long-standing relationship with administrators and healthcare providers at Shirati Hospital prior to conducting this research which assisted in the IRB process and introduction to the community. Efforts were made to identify cultural norms related to food preparation in the home, types of food available for preparation, and access to refrigeration or storage of foods with the consultation of a Tanzanian nutritionist. A local RN and CHW who were previously trained in research, born, and raised in the community, and who are well known to the participants, were included on the research team to ensure trust was developed for the study and to provide follow-up appointments.

Even with these measures, cultural factors impacted the “ideal” research process. A focus group had originally been planned for the men of the households of the women participants. No male was interested in participating in the study at that time and were unable to be recruited for a focus group. Also, domestic

issues alluded to by one participant as the “argument” with her husband, raised additional issues surrounding a woman’s ability to complete the study. The one participant who did not attend the final meeting was contacted by the CHW and her well-being was assured.

Equipment for the follow-up appointments proved to be a limitation. The HbA1c machines utilized in the study were provided by the researchers when they arrived in Tanzania at the start of the study. These machines require storage at a specific temperature to be accurate and to function properly. The local nurses identified issues with the HbA1c machines during the 3-month follow-up visits. Along with proper functioning, access to replacement machines provided to be difficult. A local supplier of the machines could not be identified. A shipment of replacement machines from the researchers was delayed in delivery by several weeks which left the machines uncooled for an extended time leaving their functionality in question. Cost for supplying POC HbA1c machines must be compared to the easier availability of BS glucometers in a LMIC. Since this is the case, a change in the method of the study was necessary. The data collection was moved to the fasting blood glucose at the follow up meetings with findings noted in the above chart.

Other ethnic practices complicated the educational process for DM. Men are more likely to present themselves for medical treatment and receive preferential treatment while women are occupied in the households taking care of the family, food prep, and management of crops (personal communication, Dr. Bwire Chirangi and Dorothy Kiware RN, Shirati Hospital, Tanzania). Additionally, when food is prepared in the household, the eldest male eats first, followed by other males in the household. If food is acceptable, and in enough supply, the women and the children are allowed to eat the remaining food. If the food is not acceptable it will be tossed out prior to other members eating (personal communication, Dr. Bwire Chirangi and Dorothy Kiware, RN, Shirati Hospital, Tanzania). Therefore, lower HbA1c and FBS readings could represent a food compromise in the household.

## Discussion

Sustainability of research initiatives in resource deficient areas remains a challenge. Equipment readily available and easily accessed in the Western World is often extremely difficult to obtain in rural low- and middle-income countries. However, the benefit of using results of HbA1c testing to determine how well a person with diabetes is managing their illness is supported in the medical literature. It also prevents frequent visits to the hospital clinic interfering with the women's work at home and childcare. Even with sufficient planning and preparation by the research team, events transpired to prevent the equipment from being available.

For the future, creative ways to provide POC HbA1c machines needs to be pursued. Even grant funding would not be a long-term solution but would provide a more stable data point in testing the impact of diabetes education. Expanding the study to include men and other members of the household would also increase the impact factor of the interventions. Lastly, more training for the CHW and RN and continued input from the local trained nutritionist would bridge barriers between family dynamics and food preparation.

Additional measures need to be implemented to expand the data to include the men in an arm of the study. It would be judicious to have the men and women in separate arms due to the cultural implications mentioned earlier. However, the males of the household would provide significant insight into the transition from foods that increase the risk of DM to ones that moderate or even stall the progression of DM in this population.

The complexity of international research can never be fully calculated. Even with Tanzanian health workers involved in the planning and execution of the study, human factors impede the purity of the research. The use of previously gathered qualitative data did provide some awareness of beliefs to address during the teaching [8]. However, the ethos surrounding any health issue is an organic process that requires fluidity and practicality in field research to develop methodology that is true to its origin in the research process while adaptive to the predictability of human unpredictability.

## Conclusion

When existing in the line between idealism and realism in research, a balance needs to be achieved with adaptation and a commitment to scientific rigor and reliability. Many adaptations

were necessary in this study to continue to provide education for the women and provide sustainable alternatives for better DM management in a rural, low resource area in Tanzania. Although the results cannot be compared to other research or make definite relations between the intervention and the DM management of the individuals or family members, the seed of empowering the women to make better choices for themselves and their households has been initiated.

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