



INTERNATIONAL JOURNAL OF FOOD, NUTRITION AND PUBLIC HEALTH IJFNPH

ISSUE 12 | Nos.1/2 | 2020

IJFNPH is abstracted and indexed by:
ABI/Inform (ProQuest), Cabell's Directory of
Publishing Opportunities, UK National Institute
for Health and Care Excellence (NICE), British
Library, Crossref and most top universities
across the world.

تنشر بالتعاون مع المنظمة العالمية للتنمية المستدامة

Published in partnership with
the World Association for Sustainable
Development (WASD)

ISSN: 2042-5988 (Print); 2042-5996 (Online)

worldassociationSD
@WASD_news
WASD youtube



www.wasd.org.uk

International Journal of Food, Nutrition and Public Health

Evaluating the effectiveness of a tailored health educational toolkit to modulate type 2 diabetes mellitus and restrain its complications





Mary Etem Mbiatem

School of Life Sciences,
University of Westminster
115 New Cavendish Street
London W1W 6UW

Edmonton Mennonite Center for Newcomers
10170 112 Street, T5K 2L6, Edmonton, Canada
Email: etemary@yahoo.com



Ihab Tewfik

School of Life Sciences
University of Westminster
115 New Cavendish Street
London W1W 6UW, United Kingdom



type 2 diabetes mellitus



Abstract

Background

Type 2 diabetes (T2DM) is increasing in epidemic proportions. While diet and self-care are important in the management of T2DM, unfortunately, patients are often unsure of what constitutes an adequate healthy diet or effective self-care practices.

Purpose

This study aims to develop health education material to increase patients' knowledge of T2DM with respect to healthy eating and self-care practices, and enhance positive attitude changes towards their condition.

Methods

The study design included the administration of a health educational toolkit (in the form of a booklet), with the goal of raising participants' knowledge, and consequently, attitude and self-care practices regarding T2DM. Using a purposive sampling approach, this 6-week pilot intervention recruited 25 women and 26 males (mean age = 55.98 years; SD ± 11.019). Participants who attended the Diabetes Clinic at the Buea Regional Hospital, Cameroon, were interviewed to discover their knowledge and attitudes towards T2DM; the interviews were followed by anthropometric measurements and focus group discussions. Paired t-tests were used to assess patients' changes in knowledge, attitudes and self-care practices.

Findings

Results showed significant increases in participants' knowledge of T2DM post-intervention: 58.8% of subjects were able to identify at least four risk factors of T2DM, compared to only 7.8% prior to the intervention ($p=.0001$). Diabetes was defined as a problem of insulin deficiency by 61% of subjects as opposed to 8% prior to the study ($p=.0001$). Participants' knowledge of the signs and symptoms of hyperglycaemia and hypoglycaemia increased significantly ($p=0.0001$). Daily portions of vegetables increased from 47.1% to 58.8%, and a substantial number of subjects (33.3%) reported at least walking 2-4 times in a week for 30 minutes, post-intervention. However, there were no changes in the subjects' general physical activity levels.

Conclusions

The results confirmed our hypothesis that increased knowledge of T2DM leads to healthier dietary choices, improved self-care practices and attitudes towards the condition. Health education toolkits are relevant to empower people with diabetes to have more active roles in modulating their health condition.

Keywords

Health Education Toolkit; type 2 diabetes mellitus; healthy diet; self-care practices; pilot intervention; Cameroon.

Introduction

The World Health Organization (WHO) has announced that diabetes is increasing in epidemic proportions worldwide. The global prevalence of diabetes was estimated at 8.5% in 2014, affecting 422 million people in the 20-79 years age group (WHO, 2020). Global estimates of deaths attributable to diabetes reached 5 million in 2015 (Ogurtsova et al., 2017). The International Diabetes Federation (IDF) predicts that by 2045, an estimated 700 million people globally will have diabetes (Ogurtsova et al., 2017). These figures are alarming considering the social, financial, and healthcare costs of diabetes.

Research suggests that the diabetes epidemic is largely striking middle and low income countries, with four out of five people with diabetes likely to live in these countries (Dunachie and Chamnan, 2019). Ironically, until the 21st century, diabetes was basically unknown in Africa. According to research literature, Africa is undergoing an historical epidemiological transition in the burden of non-communicable diseases, particularly diabetes. A study by Levitt (2008) found diabetes in Africa to account for high cardiovascular and microvascular morbidity. Other studies (e.g., Aikins et al., 2010) have claimed that Africa is suffering from a multiple burden of disease; coupled with poverty, this greatly impacts the quality of life of people with diabetes.

The estimated number of people living with diabetes in Africa in 2010 was 12 million (IDF, 2013). An overwhelming rise in the prevalence in the near future is expected, with nearly 5.2% people with diabetes in Africa by year 2045 (IDF, 2019). This has been attributed to the rapid urbanisation and westernisation of lifestyle, ageing of the population, decreasing physical activity levels, and nutrition transition that has led to changing dietary patterns (Kengne et al., 2005; Imoisili and Sumner, 2009). Unfortunately, these surging trends of diabetes are not paralleled by resources and are therefore overwhelming to families, the health care systems, and the economy.

In Cameroon, the prevalence of diabetes in adults in urban areas is estimated at 6-8%, with as many as 80% of people living with diabetes currently undiagnosed in the population. Further, according to data from Cameroon in 2002, only about a quarter of people with known diabetes actually had adequate control of their blood glucose levels. The burden of diabetes in Cameroon is not only high but is also rising rapidly. Data in Cameroon adults based on three cross-sectional surveys over a ten-year period (1994-2004) showed an almost tenfold increase in to the prevalence of diabetes (WDF, n.d.).

While education and dietary adjustment are important elements in the management of T2DM, some researchers (Aikins et al., 2010; Mbeh et al., 2010) reported that the absence



or inadequacy of diabetic educational materials, poor literacy rates, inaccessibility of electronic media, and cultural barriers in low income countries (LIC) leave people to do a great deal to take care of themselves; this is equally inappropriate. Therefore, making an instrument (toolkit) available that offers a one-to-one interface in diabetic training and education would appear a useful step in patient self-training and self-care in diabetes.

This study is the first of its kind in Cameroon and its primary goal is to empower people with diabetes to take more active roles in their health. The educational intervention is

supported by the Finnish Diabetes Prevention study that showed that T2DM (and its complications) can be easily prevented with lifestyle changes and behaviour modification (e.g., Finnish Diabetes Prevention study, US Diabetes Prevention Program). This study administered a health educational toolkit to test the level of knowledge of people with diabetes and assess the influence it may have on changes in attitude and diabetes self-care practices. It was envisaged that the toolkit would improve participants' knowledge, attitude and self-care practices towards diabetes, thereby helping them to manage the condition and prevent its complications.

Materials and Methods

A pilot sample consisting of 25 men and 26 women, aged 20-80 years [diagnosed with T2DM] was recruited from an urban area (Buea) in Cameroon, using a purposive sampling approach. Questionnaires and the booklet for the study were piloted on three participants (two men and one woman). The questionnaires and booklet were then distributed to everyone in the pilot sample, ie 51 participants. The study was conducted at the Buea Regional Hospital Annex, in the South West region of Cameroon, to ensure standard clinical procedures were used. The study

was conducted over six weeks, with subjects meeting every Tuesday during diabetic clinics. Information sheets were distributed and the study clearly explained to participants. Family members were encouraged to read the booklet to participants who could not read.

Data were collected using structured questionnaires and focus group discussions. Anthropometry measurements of subjects were recorded using standard clinical procedures:

- weight was measured to the nearest 0.1kg using an electronic scale;
- waist circumference was measured to the nearest 0.1cm using a non-stretch measuring tape, with participants wearing light indoor clothing;
- height was measured, with the subjects bare footed, using a rigid stadiometer;
- blood pressure [mmHg] was measured using an automated blood pressure machine;
- the subjects had their fasting blood glucose (capillary blood glucose measured after an 8-hour overnight fast) measured early in the morning before the support sessions and focus group discussions;
- no standard equipment was used to measure capillary glucose as some participants had their own blood glucose machines and did their test before coming to the clinic.

Participants' comprehension of the booklet was assessed during the focus group meetings organised in the hospital. This was done by asking open questions and stimulating open group discussions lasting 45-60 minutes; each group consisted of 10-15 participants. The goal was to give participants room to ask

questions and provide them with feedback. The post-assessment and evaluation was carried out at the end of the second week, using an interviewer administered questionnaire. The statistical test used was the paired t-test to assess changes in knowledge and self-care skills regarding diabetes.



Ethical considerations

A purposive sampling approach was used to recruit participants who were interested in participating in the study and met the criteria for participation. Participants were informed early on in the study of the nature of the research with respect to focus group discussions and issues around confidentiality. Confidentiality in the focus group discussions was based on an “honour system”.



Results

This section is divided over two consecutive sections: results of questionnaires, and feedback from the focus group discussions.

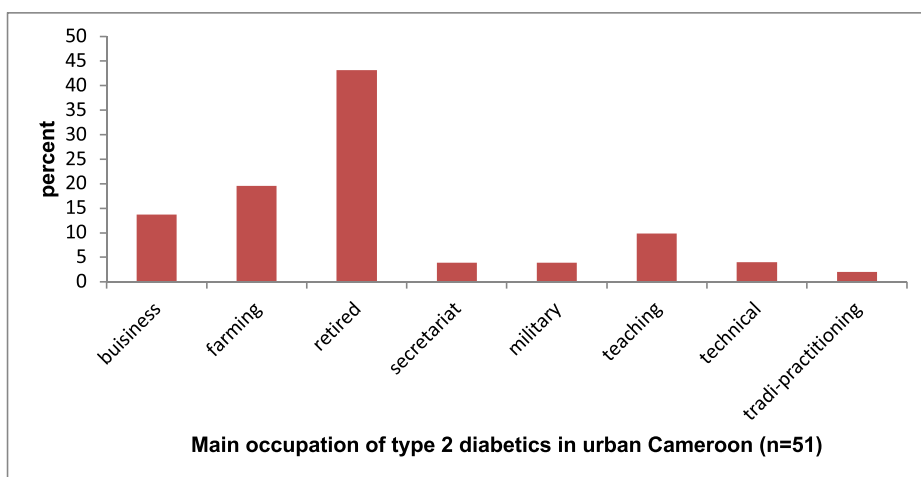


Figure 1: Main occupation of T2DM diabetics in Urban Cameroon (n=51)

Source: Devised by author from fieldwork data

A large proportion of subjects in the study was retired (43%); these subjects described themselves as leading a “sedentary” lifestyle. Of those leading an “active” lifestyle, farmers formed the largest proportion (19.6%).

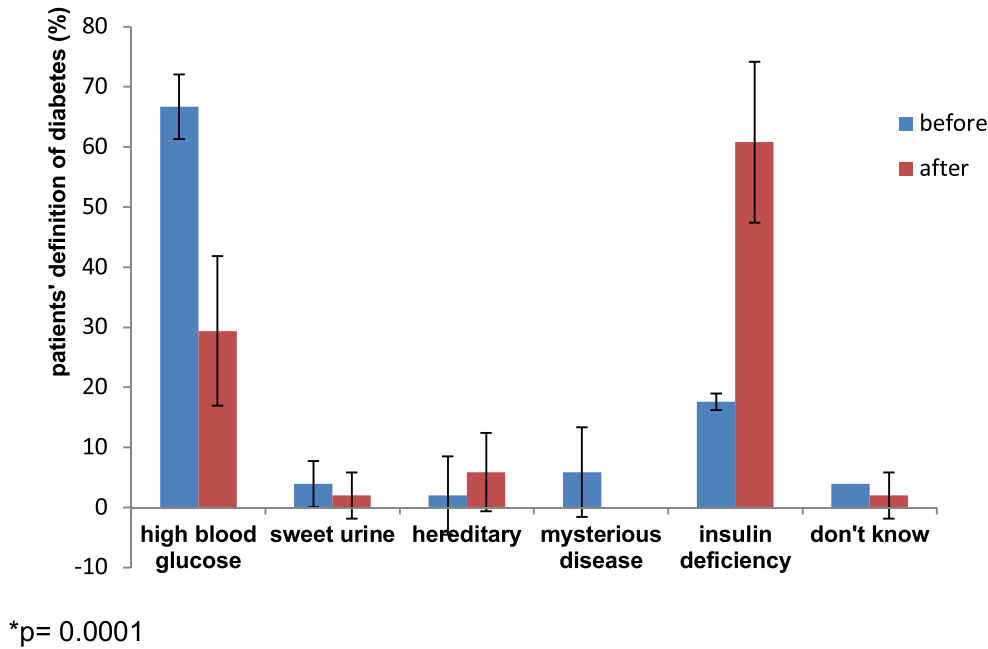


Figure 2: Definition of diabetes by subjects (n=51)

Source: Devised by author from fieldwork data

Prior to intervention, the majority of subjects (67%) defined diabetes as a “disease of high blood sugar caused by too much sugar in the diet”, while only 18% attributed it to a problem of insulin. However, a shift in understanding was noted post-intervention, with up to 61% of subjects attributing diabetes to a problem of insulin.

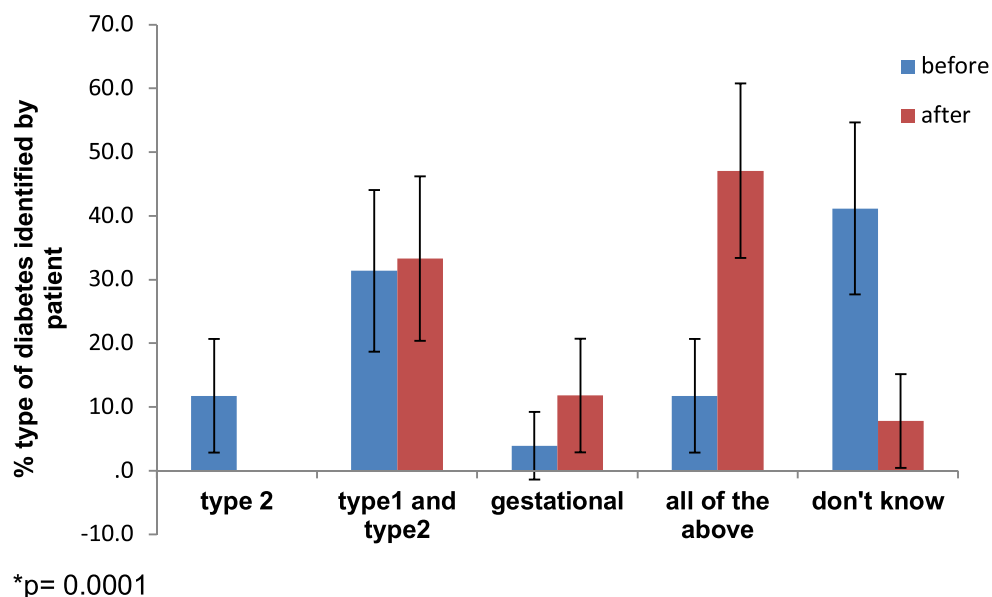


Figure 3: Types of diabetes identified by subjects (n=51)

Source: Devised by author from fieldwork data

Although a good number of subjects (31.4%) were able to list two types of diabetes (Type 1 or Type 2 diabetes), the majority (41.2%) did not have knowledge of the different types of diabetes.

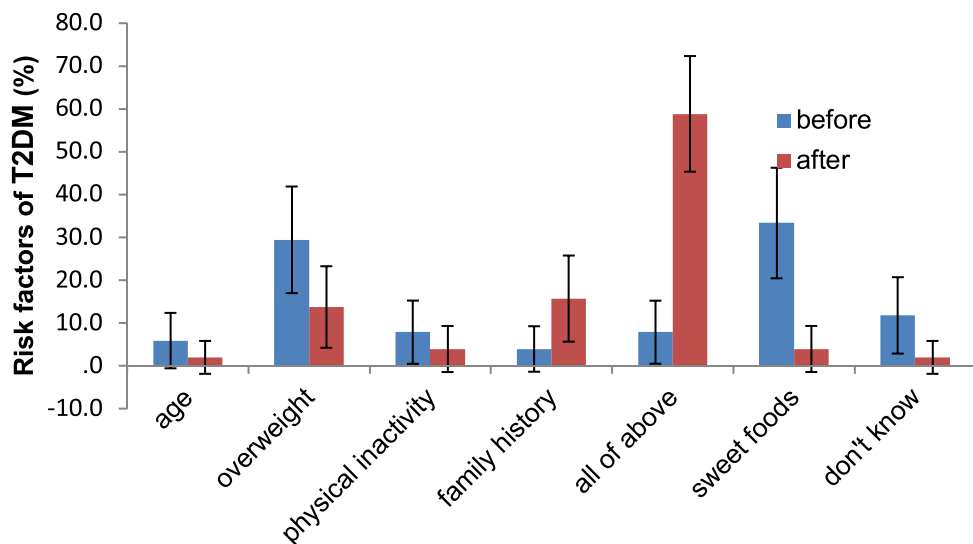
Table 1: Patient's awareness of diabetes type (n=51)

	Percentage (%)	
	Before	After
Type 1	3.9	2.0
Type 2	54.9	88.2
Don't know	43.1	7.8

p=0.0001

Source: Devised by author from fieldwork data

Although recruitment was based on subjects having a formal diagnosis of Type 2 diabetes, a shocking 43% of subjects reported not knowing their diabetes type prior to the study.

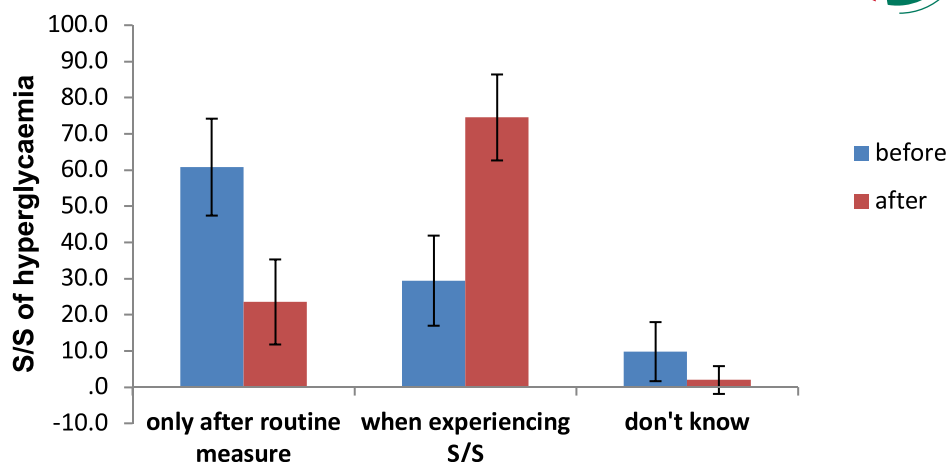


*p= 0.0001

Figure 4: Awareness regarding risk factors of type 2 diabetes (n=51)

Source: Photos Devised by author from fieldwork data

Prior to the study, only 7.8% of subjects were able to identify four risk factors of diabetes, with overweight (29.4%) and sweet foods (33.3%) listed as the most common risk factor by the majority of subjects.

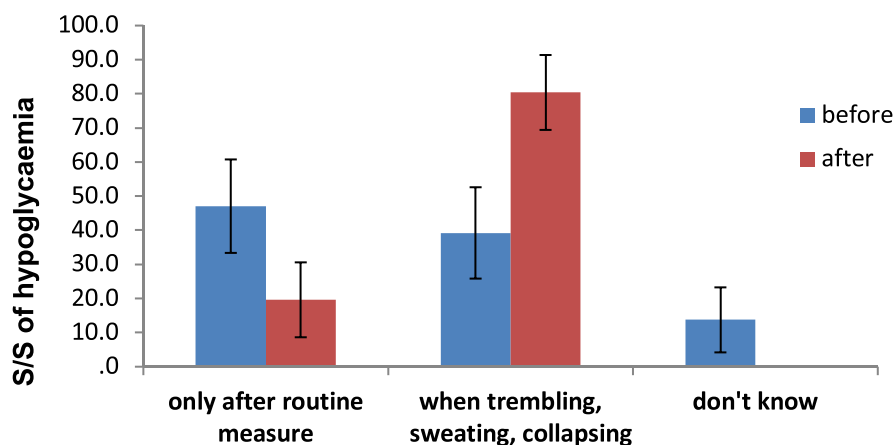


*p=0.0001

Figure 5: Change in knowledge regarding signs and symptoms of hyperglycaemia (n=51)

Source: Devised by author from fieldwork data

Prior to the study, few subjects (29.4%) could recognise symptoms of hyperglycaemia compared to 74.5% post-study.



*p=0.0001

Figure 6: Change in knowledge regarding signs and symptoms of hypoglycemia (n=51)

Source: Devised by author from fieldwork data

Initially most subjects (39.2%) were unable to recognise symptoms of hypoglycaemia; however, there was a shift post-intervention with up to 80.4% of subjects correctly identifying symptoms of hypoglycaemia. This change in knowledge is very crucial in diabetes management as symptoms of hypoglycaemia can often be confused with those of malaria, especially in Sub-Saharan African where malaria is a common illness.

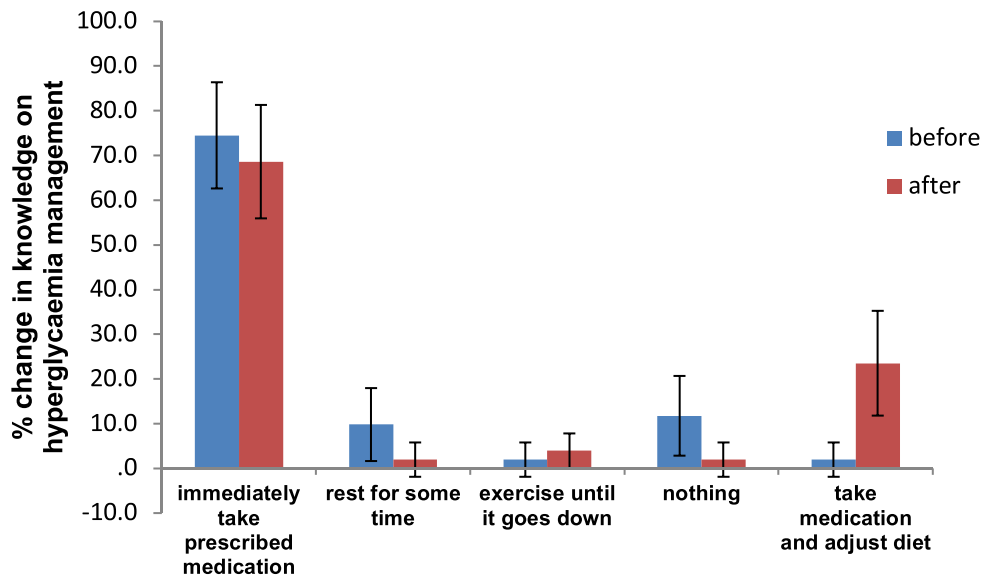
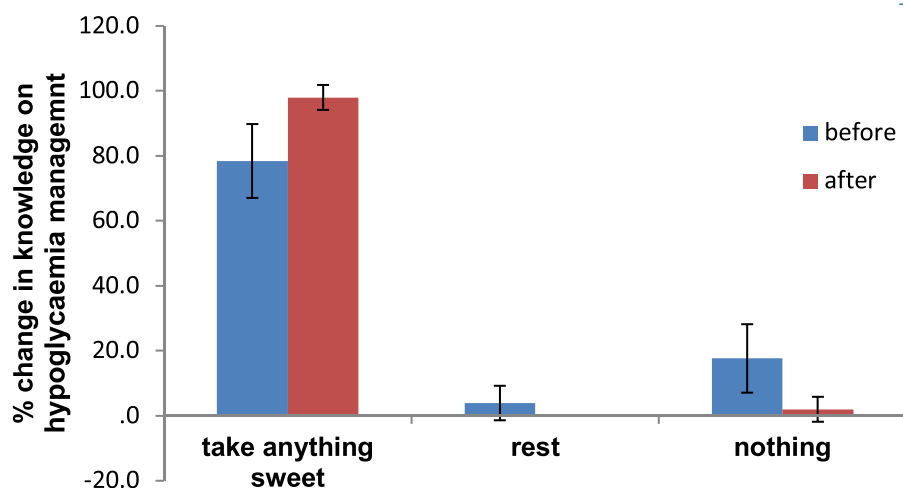


Figure 7: Change in knowledge regarding management of hyperglycaemia (n=51)

Source: DeVised by author from fieldwork data

In terms of the management of hyperglycaemia, subjects relied mostly on medications both pre- (74.5%) and post-intervention (68.6%).

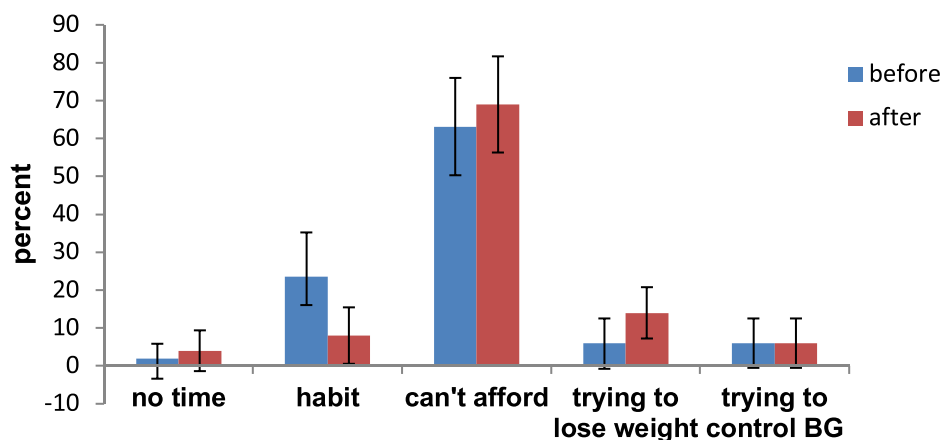


*p= 0.002

Figure 8: Change in knowledge regarding management of hypoglycaemia (n=51)

Source: Devised by author from fieldwork data

The majority of subjects had a similar understanding of hypoglycaemia management both pre- and post-study, although a slight increase in understanding was noted post-study.



p=0.524

Figure 9: Rationale for dietary pattern by diabetics (n=51)

Source: Devised by author from fieldwork data

Most subjects attributed their choice of dietary type to lack of means (63% and 69% pre- and post-study respectively); they reported not being able to afford healthy meals. This highlights the importance of socio-economic factors in diabetes management.

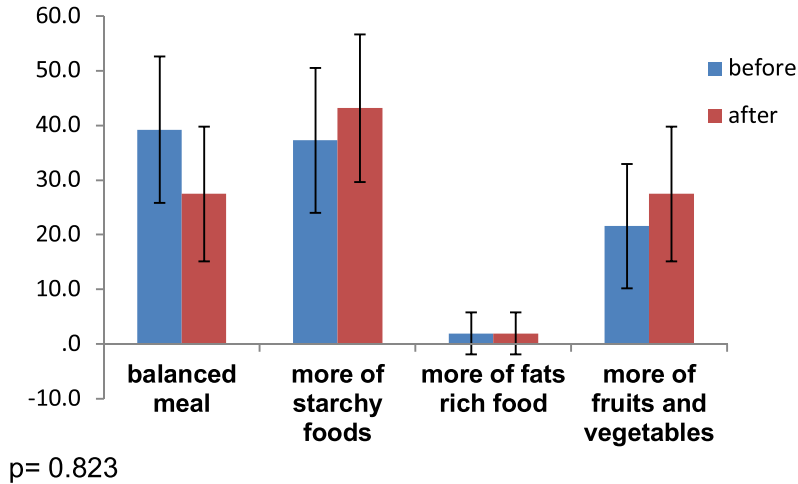


Figure 10: Typical lunch plate of type 2 diabetics (n=51)

Source: Devised by author from fieldwork data

Participant's typical meals of subjects consisted mostly of carbohydrate rich foods (37.3%) while vegetables and fruit made up 27.5% of dietary intake. Post-study, while the amount of vegetables and fruit consumed increased, fewer subjects maintained a balanced diet while the amount of carbohydrate consumption increased.

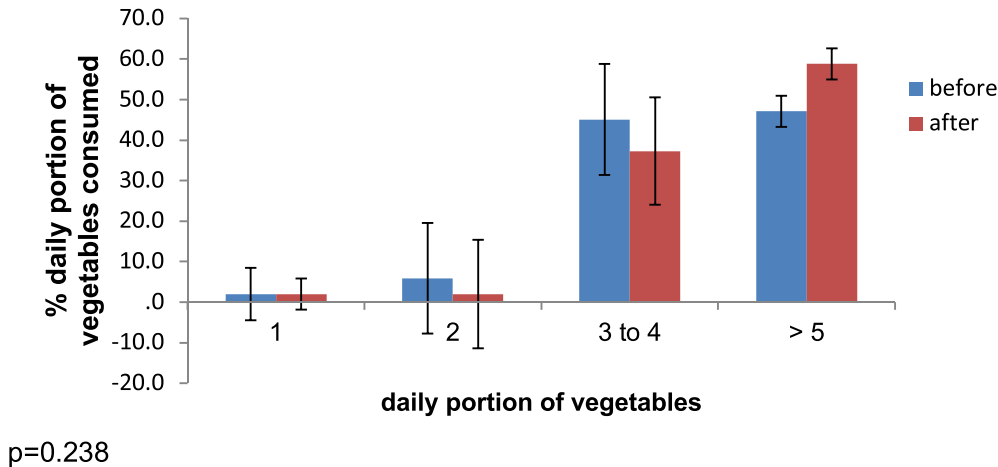
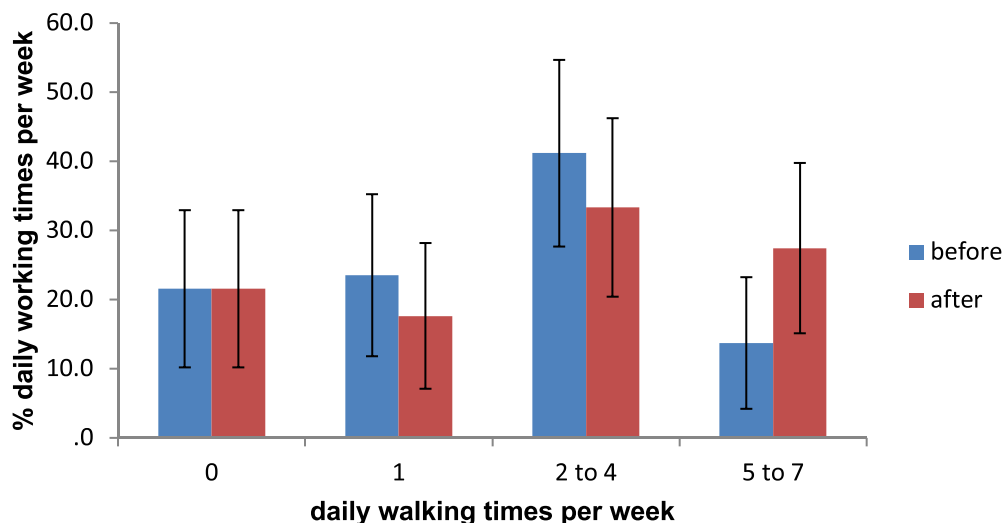


Figure 11: Daily portion of vegetables consumed by type 2 diabetics (n=51)

Source: Devised by author from fieldwork data



Pre-intervention, 47.1% of subjects consumed more than 5 portions of vegetables a day and this further increased post-study.

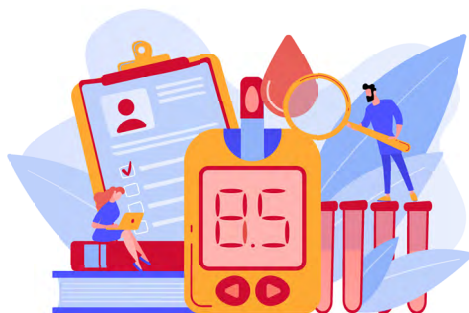


$p=0.086$

Figure 12: Thirty minutes daily walking times for type 2 diabetics (n=51).

Source: Devised by author from fieldwork data

Exercise levels increased in terms of number of days walked per week, while daily walking times were found to be inconsistent among participants.



Self-reports of Subjects

During the focus groups, subjects were encouraged to share their perception of diabetes and self-care habits. Below are anonymous statements from some participants.

When asked about their dietary patterns, the majority of participants responded:

"I eat what I see or what my wife presents to me".

A female participant shared:

"I have to eat the same food as my household since we can't afford to prepare two separate meals for the household".

When asked about examples of local foods that constitute their diet, the following responses revealed that most diabetics based their meal on a specific staple:

"I am afraid to eat any food other than unripe plantains and vegetables because I do not want my sugar level to increase. I eat unripe plantains at least five times in a week and alternate it with vegetables and sauces".

During the focus group discussions, we identified an important gap in subjects' understanding of what constitutes a healthy diet. This is illustrated in the following quote given by almost all subjects:

"...they say people with diabetes should not eat just anything... what therefore do you recommend us to eat, based on the common food staples in our locality?"



The following misconception regarding fruit consumption was shared by a good number of participants:

"I do not eat fruits because they are too sweet; I don't even want to take the risk".

Post-study, when asked about any new learning and how they could use this learning in taking care of their health, the following responses were obtained:

"I think I have been dealing with this condition the wrong way; now I know I do not need to limit variety in what I eat".

"Now I know I do not have to buy expensive foods, I can eat all the vegetables I have in my farm so long as I watch my portion and limit the amount of oil when preparing my meals".

"It's very reassuring to know that this is something I can manage very well if I stick to a healthy lifestyle and my medications; it's not as scary as before".



Discussion

The six-week health educational intervention produced some important changes in participants' knowledge, attitude and self-care practices. Diabetes was defined as a problem of insulin deficiency by 61% of participants, as opposed to 8% prior to the study. This shift in knowledge is important in diabetes care and management as earlier studies (e.g., Skelly et al., 2006) reported that diabetes is often perceived as a disease of sugar, resulting in diabetics dramatically cutting down on their sugar intake; this may pose a serious risk, especially in managing hypoglycaemia. At the end of the study, 88.2% (as opposed to 54.9%) of participants correctly identified their type of diabetes, and up to 47.1% were able to identify other types of diabetes. This change in knowledge enabled effective monitoring and managing of the condition. Subjects showed an increased knowledge in identifying and managing the signs and symptoms of both hyperglycaemia and hypoglycaemia. Also, 23.5% (n=51) of participants thought that medication and healthy diet were important components in diabetes management, compared to 2% (n=51) of subjects prior to the study.

While vegetables formed a large portion of participants' daily fruit and vegetable portions, it is important to recognise the method of food preparation. Kiawa et al. (2006) noted that much of Cameroonian cultural foods were based on palm oil, red meat and corn flour products, resulting in high consumption of saturated fats that will further complicate



insulin resistance and further predispose people to cardiovascular diseases. Although daily walking increased in terms of number of days walked per week, duration of time walked was found to be inconsistent among participants.



During the focus group discussions, the majority of subjects were unsure of what constituted a healthy diet and portion size. Cameroon currently has no food guidelines based on the local foods available in the region. Also, the lack of a law governing food labelling makes it difficult to measure meal portion sizes. Another misconception identified in the focus group discussions is that the majority of diabetics reported basing their meals on particular low glycaemic index carbohydrates (particularly plantains). Failing to recognise that non-carbohydrate food sources can raise blood sugar in certain pathophysiologic circumstances when carbohydrates are in short supply to the body can pose significant risk in diabetes management (Powell et al., 2007).

Of the 51 participants, 48 were on diabetes medication. There was an important misconception on the pharmacological management of type 2 diabetes. This is supported by findings from Mann et al. (2009) in a study conducted on low income minority

groups in New York, where three in four of the participants believed that medication was needed even when blood glucose levels were normal. Dependence on medication for control of blood glucose in type 2 diabetes increases risks of hypoglycaemia and makes lifestyle changes difficult or underestimated.



Conclusions

The study produced substantial increases in knowledge, attitude and self-care practices of diabetics among people living with type 2 diabetes in Cameroon. A tailored health education diabetes toolkit is important in diabetes monitoring and care; it efficiently empowered people with diabetes to be more actively involved in their health, especially in diabetes-resource poor countries. The health education toolkit was designed to be

user-friendly, and it is our hope that it can be sustained as a long-term resource for people with diabetes. However, huge efforts still need to be made in creating better support systems that empower people with diabetes to lead healthier lifestyles. An area for future research would be to develop a diet plan with selected guidelines (using the common food staples in Cameroon) that diabetic patients can follow to better modulate their health.

Limitations of Study and Future Recommendations

The study has several limitations. First, the short timeframe for the intervention did not allow the researcher to follow up subjects to assess for long-term changes. Second, the small sample size and age group recruited did not allow for the study results to be generalised. Third, participants were made aware of the goal of the study at the onset; this may have biased the results obtained. Fourth, the recorded change in attitude and behaviour may not be an adequate reflection

of long-term attitude and behaviour practices given the time limitations of the study. Finally, the research team was not able to control for literacy levels (although family members were encouraged to read for participants who could not read), economic status, and methods of meal preparation. However, studies of this nature can inform large-scale educational intervention programmes that empower people with diabetes to take care of their own health.





References

- Aikins, A.D., Unwin, N., Agyemang, C., Allotey, P., Campbell, C. and Arhinful, D. (2010):** Tackling Africa's chronic disease burden: from the local to the global. *Globalization and Health*, Vol. 6, No. 1, pp.1-7. doi.org/10.1186/1744-8603-6-5.
- Dunachie, S. and Chamnan, P. (2019):** The double burden of diabetes and global infection in low and middle-income countries. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, Vol. 113, No. 2, pp.56-64. DOI: 10.1093/trstmh/try124.
- Imoisili, O.E. and Sumner, A.E. (2009):** Preventing Diabetes and Atherosclerosis in Sub-Saharan Africa: Should the Metabolic Syndrome Have a Role? *Current cardiovascular risk reports*, Vol. 3, No. 3, pp.161-167.
- International Diabetes Federation (IDF) (2013):** *IDF Diabetes atlas*, 6th edn. Brussels, Belgium: International Diabetes Federation.
- International Diabetes Federation [IDF] (2019):** *IDF Diabetes atlas*, 9th edn. Available at: <https://diabetesatlas.org/en/sections/demographic-and-geographic-outline.html>.
- Kengne, A.P., Amoah, A.G. and Mbanya, J.C. (2005):** Cardiovascular complications of diabetes mellitus in sub-Saharan Africa. *Circulation*, Vol. 112, No. 23, pp.3592-601. DOI: 10.1161/CIRCULATIONAHA.105.544312.
- Kiawi, E., Edwards, R., Shu, J., Unwin, N., Kamadjeu, R. and Mbanya, J.C. (2006):** Knowledge, attitudes, and behaviour relating to diabetes and its main risk factors among urban residents in Cameroon: a qualitative survey. *Ethnicity and Disease*, Vol. 16, No. 2, pp.503-509.
- Levitt, N.S. (2008):** Diabetes in Africa: epidemiology, management and healthcare Challenges. *Heart*, Vol. 94, No. 11, pp.1376-1382. DOI: 10.1136/hrt.2008.147306.
- Mann, D.M., Ponienman, D., Leventhal, H. and Halm, E.A. (2009):** Predictors of adherence to diabetes medications: the role of disease and medication beliefs. *Journal of Behavioural Medicine*, Vol. 32, No. 3, pp.278-284. DOI: 10.1007/s10865-009-9202-y.
- Mbeh, G.N., Edwards, R., Ngufor, G., Assah, F., Fezeu, L. and Mbanya, J.C. (2010):** Traditional healers and diabetes: results from a pilot project to train traditional healers. To provide health education and appropriate health care practices for diabetes patients in Cameroon. *Global Health Promotion*, Vol. 17, No. 2, pp.17-26. DOI: 10.1177/1757975910363925.
- Ogurtsova, K., da Rocha Fernandes, J.D., Huang, Y., Linnenkamp, U., Guariguata, L., Cho, N.H. Cavan, D., Shaw, J.E. and Makaroff, L.E. (2017):** IDF Diabetes Atlas: Global estimates for the prevalence of diabetes for 2015 and 2040. *Diabetes Research and Clinical Practice*, Vol. 128, pp.40-50. Available at: <https://doi.org/10.1016/j.diabres.2017.03.024>.
- Powell, C.K., Hill, E.G. and Clancy, D.E. (2007):** The relationship between health literacy and diabetes knowledge and readiness to take health actions. *The Diabetes Educator*, Vol. 33, No. 1, pp.144-151. DOI: 10.1177/014572106297452.
- Skelly, A.H., Dougherty, M., Gesler, W.M., Soward, A.C. Burns, D. and Arcury, T.A. (2006):** African American beliefs about diabetes. *Western Journal of Nursing*

Research, Vol. 28, No. 1, pp.9-29. DOI: 10.1177/0193945905280298.

World Diabetes Foundation (n.d.): Cameroon National Diabetes and Hypertension Programme, WDF16-1429. Available at: <http://www.worlddiabetesfoundation.org/projects/cameroon-wdf16-1429>.

World Health Organization (WHO) (2020): *Diabetes*. Available at: <https://www.who.int/news-room/fact-sheets/detail/diabetes>.

Biography

Mary Etem Mbiatem is a Registered Provisional Psychologist with the College of Alberta Psychologists, and a member of the Psychologists' Association of Alberta, Canada. She has a Master's degree in Counselling Psychology (MA) from Yorkville University, Canada. Mary is also an alumnus of the University of Westminster, England, where she obtained a Master of Public Health (MPH) in 2010. Mary is presently involved with providing psychological services to immigrant and refugee populations with complex trauma histories. Prior to joining the mental health field, she worked as a clinical nurse, nurse instructor and then as a research assistant in diabetes and non-communicable diseases research. Mary maintains an interest in childhood and adult trauma, psychosocial adaptation, hope/resilience and health care utilisation of immigrant populations.

Dr Ihab Tewfik is a Registered Nutritionist (Public Health) who has expertise in planning, implementing and evaluating sustainable nutrition intervention programmes at the population level. He has developed an independent academic research career that underpins the pivotal role of nutrition science in modulating complications of global chronic diseases through tailored functional recipes (TFRs). These innovative TFRs are optimised using locally produced food ingredients that are formulated into meals to nourish vulnerable populations and ascertain their optimum health. In addition to his PhD from London South Bank University, Ihab holds Master of Public Health (MPH) and Doctorate of Public Health (DrPH) from Nutrition Department, University of Alexandria. Ihab was promoted to Associate Professor before he left University of Alexandria to join the University of Westminster London in 2000.