



RESEARCH ARTICLE

REVISED Self-management and its associated factors among people living with diabetes in Blantyre, Malawi: a cross-sectional study [version 2; peer review: 1 approved, 2 approved with reservations]

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Abstract

Background: Self-management is key to the control of glycaemia and prevention of complications in people with diabetes. Many people with diabetes in Malawi have poorly controlled glucose and they experience diabetes-related complications. This study aimed to assess diabetes self-management behaviours and to identify factors associated with it among people with diabetes at Queen Elizabeth Central Hospital, Blantyre, Malawi.

Methods: This cross-sectional study recruited 510 adults attending a diabetes clinic at a teaching referral hospital in southern Malawi. The social cognitive theory was applied to identify factors associated with following all recommended self-management behaviours. Data on participants' demographics, clinical history, diabetes knowledge, self-efficacy, outcome expectations, social support, environmental barriers and diabetes self-management were collected. Univariate and multivariate logistic regression analyses were conducted to identify factors associated with following all self-management behaviours.

Results: The mean age of participants was 53.6 (SD 13.3) years. The majority (82%) were females. Self-reported medication adherence within the last seven days was 88.6%; 77% reported being physically active for at least 30 minutes on more than three days in the previous seven days; 69% reported checking their feet every day and inspecting inside their shoes; 58% reported following a healthy diet regularly. Only 33% reported following all the self-management behaviours regularly. Multiple logistic regression analysis showed that self-

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efficacy was the only social cognitive factor associated with following all the self-management practices ($p < 0.001$).

Conclusions: Participants in our study were not consistently achieving all self-management practices with dietary practices being the least adhered to behaviour by many. To improve self-management practices of people with diabetes, current health education programs should not only aim at improving diabetes related knowledge but also self-efficacy. Adopting interventions that promote self-efficacy in diabetes patients such as exposure to role models, peer education, providing positive feedback, and counselling is recommended.

Keywords

diabetes education, glycemic control, physical activity, healthy diet, foot care, social cognitive theory, environmental factors, social support



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REVISED Amendments from Version 1

The updated version of this article includes a diagram showing the relationship between Social Cognitive Theory constructs and diabetes self-management. The sample size section has been updated and we included the formula we used to calculate the sample size. The Cronbach's alpha for this study, for all the tools that were used have been given. Percentages in Table 1, Table 2 and throughout the paper have been rounded to whole numbers. Some details have been removed from table 3 to make it shorter and precise. In text references have been updated and appropriate changes made in the reference list. Other editorial revisions have been made to all sections based on the reviewers' comments to add clarity to the paper.

Furthermore, author affiliation has been changed from University of Malawi to Kamuzu University of Health Sciences. This is because the University of Malawi was restructured in May 2021, such that College of Medicine and Kamuzu College of Nursing (previously constituent colleges of the University of Malawi) were merged to form Kamuzu University of Health Sciences.

Any further responses from the reviewers can be found at the end of the article

Introduction

Diabetes mellitus significantly contributes to morbidity and mortality from non-communicable diseases in Malawi¹. Diabetes is the ninth-leading cause for admissions in adult medical wards at Queen Elizabeth Central Hospital (QECH) in Blantyre, the largest public teaching hospital in Malawi². The inpatient mortality for the people admitted due to diabetes at QECH is 19%². There is no recent literature on glycemic control among people living with diabetes at QECH. However, a previous survey at QECH by Cohen *et al.*, conducted 10 years before the present study found that 74% of people living with diabetes had poorly controlled sugar levels and many suffered from diabetes related complications³. This previous survey also found that 45% of patients living with diabetes had poor dietary practices. Among the patients that were on insulin, about 22% had problems with proper injection technique³. Subsequent to the study by Cohen *et al.*, clinical guidelines and protocols for the management of diabetes and nurse-led education classes for diabetes patients were introduced at QECH³. The nurse-led education classes offer lessons to people living with diabetes on lifestyle practices related to diet, exercises, medication adherence, smoking cessation, foot care, and management of symptoms generated by the disease to help keep diabetes under control and to prevent its complications.

Although the study by Cohen *et al.* had shown that people living with diabetes in Malawi had poorly controlled glucose³, little was known about their self-management behaviours especially regarding diet, exercising, self-monitoring of blood glucose, medication adherence, and foot care. Furthermore, since the introduction of the nurse-led diabetes education classes, no follow-up study was conducted to evaluate if there has been an impact on people's diabetes self-management behaviours.

The conceptual framework guiding the study was adapted from social cognitive theory (SCT) by Albert Bandura⁴. Recent

studies continue to show that the propositions made in the SCT on determinants of health behaviour remain valid to date, not only for diabetes but many other chronic conditions⁵⁻⁷. A systematic review of theory based interventions in promoting diabetes self-management found that the SCT was one of the effective theories⁶. The social cognitive theory outlines several factors that are key to the acquisition of knowledge and skills which influence health and wellbeing of individuals. Some key concepts of the social cognitive theory are self-efficacy, health knowledge, health goals, outcome expectations, and environmental impediments and facilitators^{4,8}. These key concepts are the factors that influence human action, motivation and wellbeing and hence are hypothesized to be associated with diabetes self-management for this present study⁸. Self-management was assessed using the Summary of Diabetes Self-care Activities (SDSCA) measure (Toobert). The aim for this study was to assess the level of self-management and identify factors associated with practicing all self-management behaviours among adults living with diabetes at QECH. This is part of a larger study exploring self-management practices and experiences among people living with diabetes attending the QECH diabetes clinic.

Methods

A cross-sectional design using standard face-to-face surveys was conducted to collect demographics, clinical, diabetes knowledge, self-efficacy, outcome expectations, social support, environmental barriers and diabetes self-management data. Ethical approval for the study was granted by the College of Medicine Research and Ethics Committee (Ref: P.08/17/229). All participants provided written informed consent to participate in the study.

Inclusion and exclusion criteria

Recruitment of clients was done on diabetes clinic days at QECH. The diabetes clinic at QECH runs once a week. Clients were eligible to participate if they were aged 18 years and above, had clinically confirmed type 1 or type 2 diabetes mellitus for over six months and were available at the clinic between 9am and 1pm, the time when data were being collected. Clients were excluded if they had cognitive impairment or communication difficulties, had lived with diabetes for less than 6 months or were acutely ill. To avoid selection bias, systematic sampling was used and an invitation was made to every third person on the queue who met the recruitment criteria until the required sample size was met.

Sample size considerations

Sample size was calculated using the formula⁹:

$$n = p(1-p) \left(\frac{Z_{1-\alpha/2}}{MoE} \right)^2$$

Where:

MoE: margin of error

p: estimate of proportion

1-α: confidence level to be used

Z_{1-α/2}: Z value corresponding to the confidence level to be used

It was assumed that the proportion of participants achieving good self-management could be 0.26 (26%), based on the previous study at QECH by Cohen *et al.* (2010) since there were no recent local studies³. To determine the true proportion with satisfactory self-management at the 95% confidence level and at 4% level of precision, a minimum sample size of 462 people living with diabetes was required. The final sample size of 510 was obtained after a 10% adjustment for refusals and to account for potential confounding factors (age, sex, type of diabetes and duration of diabetes since diagnosis).

Data collection and instruments

Data were collected between November 2017 and May 2018 using a standardized face-to-face survey¹⁰. The survey questionnaire was administered by the first author and five other trained research assistant all of whom have a background in nursing. To mitigate social desirability bias whereby respondents tend to over-report healthy behaviours or under-report unhealthy behaviours, during recruitment the participants were informed of the anonymity of the data and how their participation or refusal to participate in the study would not affect their care at the diabetes clinic¹¹. Furthermore, the researcher and research assistants did not wear nurses' uniform during data collection to create a neutral environment. The questionnaire collected data on the participants' demographics, clinical history, social cognitive theory constructs (diabetes knowledge, self-efficacy, outcome-expectations, environmental barriers to proper self-management and social support) and self-management and it is available as *Extended data* on Figshare¹⁰. Clinical data were extracted from participants' health passport books and included weight, height, body mass index (BMI), blood pressure reading for that day, fasting blood glucose (FBG) reading for that day and for the client's last two clinic visits, creatinine checked within the last 12 months, time since diabetes diagnosis, type of diabetes, type of treatment, diabetes complications, and if there were any comorbidities including HIV status.

To measure self-management, we adapted ten items from the SDSCA measure and one item from the expanded version of the SDSCA developed by Toobert *et al.*¹². We used all four items of the SDSCA on diet. We dropped one of the two items on exercises as the participants who took part in the content validation of the questionnaire felt that the items were asking the same thing. The items on blood sugar testing were dropped as content experts who reviewed the tool felt that the questions were not applicable in the Malawian setting since many people may not have a personal glucometer. Instead we included a question that asked the participants if they have a glucometer at home. Reliability and validity of the SDSCA measure has been proven from previous studies with a high correlation with other scales of self-care¹². The adapted SDSCA assessed level of self-care related to diet (four questions), exercise (one question), blood sugar testing (one question), foot care (two questions), smoking (two questions) and medication (one question). For each subscale, the respondent was asked to mention number of days they performed a particular activity in the past one week. Reverse scoring was done for the question on fat intake. Self-management was considered satisfactory if a person reported following the recommended practices related to diet,

medication, and foot care on all days in the past seven days, and being active for at least 30 minutes on three days in the past seven days.

Diabetes knowledge was measured using items adapted from the Diabetes Knowledge Questionnaire (DKQ)¹³. We used all the 24 items of the DKQ to measure knowledge on causes, signs and symptoms, pathophysiology and treatment of diabetes. The tool had shown construct validity and reliability in a Mexican-American population with Cronbach's alpha coefficient α of 0.78¹³. The Cronbach alpha coefficient for this study was 0.76. For each item, the respondents answered either "yes", "no" or "I don't know". The total number of correct answers was calculated at the end to obtain the knowledge score.

Self-efficacy is a person's belief or judgement in their ability to accomplish specific acts¹⁴. The Self-efficacy for Diabetes Tool¹⁵ was used to measure self-efficacy. All the eight items of the tool were used to ask of the respondents' confidence to perform various diabetes self-management tasks on a scale of 1 to 10, where 1 was "not at all confident" and 10 was "totally confident"¹⁶. Scoring of the scale was based on the mean of at least six items with higher scores indicating higher self-efficacy. This tool had been used in previous studies with a Cronbach's alpha coefficient of 0.85 and a test-retest validity of 0.8¹⁶. For this study, the Cronbach's alpha coefficient was 0.77.

Outcome expectations refers to a persons' belief or anticipated result for executing a particular behaviour⁸. The Outcome expectations were assessed using items adapted from the multi-dimensional diabetes questionnaire¹⁷. We adapted all six items related to outcome expectations from the questionnaire to ask participants' perceptions on the effects of performing particular self-care activities on their glucose control or prevention of diabetes related complications. The scores ranged from 1 (not at all important) to 10 (totally important). Scoring of the scale was based on the mean of the six items with higher scores showing more positive expectancies. A previous study assessing the validity of this test found a Cronbach's alpha coefficient of 0.86¹⁷, and in this study, it was 0.73.

Environmental factors that were assessed were social support and barriers to self-management. Social support is a multidimensional construct that refers to a network of family, friends, neighbours, and community members that is available in times of need to give psychological, physical, and financial help¹⁸. Social support was assessed using a nine-item measure of social support with a five-point-Likert scale. The tool assessed availability of emotional, informational support, networking support and sources of social support¹⁹. This tool was adapted from the Medical Outcomes Study social support and the items showed reliability (Cronbach's alpha coefficient ranging 0.74 to 0.93) and construct validity²⁰. For this present study, the Cronbach's alpha coefficient was 0.63. Scoring was based on the frequencies of each item.

We used 24 items out of the 31 items of the environmental barriers to diabetes adherence tool²¹ to assess environmental barriers of the participants. Six items on self-glucose monitoring were

dropped during content validation of the tool to suit context as most people living with diabetes in Malawi do not have personal glucometers. One other item that stated “I feel sore and stiff” was dropped as participants in the content validation exercise of the Chichewa version felt that the item had the same meaning with the item that stated “I don’t feel well”.

The interrelationship between self-efficacy, outcome expectations, knowledge and environmental factors with diabetes self-management is presented in [Figure 1](#).

Data analysis

Data were entered into a Microsoft Access database then exported into Stata version 14.0 for cleaning and analysis. Descriptive statistics were used to show proportions and 95% confidence interval (CI) for categorical factors and mean and standard deviations (SD) for continuous factors that were normally distributed. Median and interquartile range (IQR) were calculated for factors that were not normally distributed. The outcome variable was self-management as measured by the SDSCA. Participants were categorized as having adequate self-management behaviour if they were adherent to all four self-management practices (diet, exercise, medication and foot care). There were only 14 people who were not on any diabetes medication, who were therefore excluded in the final analysis. Adherence to blood glucose self-monitoring was not assessed as only 12% of the participants had personal glucometers and all reported not to have measured themselves in the last seven days. Smoking status was not included as there were only three active smokers. Univariate logistic regression was used to investigate associations between demographics, clinical and social cognitive factors with the outcome variable. Chi-square (or Fisher’s exact) test and

t-test (Wilcoxon rank sum test) were used for testing association between the binary outcome of self-management behaviour with categorical explanatory factors and continuous factors, respectively. Factors that showed association with adequate self-management at alpha 0.1 or less were included in the multivariate logistic regression model. Participants’ sex, diabetes type and duration of diabetes diagnosis were included in the multivariate logistic regression model because they were believed to be possible confounders. Associations were considered significant at alpha less than 0.05.

Results

Participant background

A total of 554 clients were selected and invited to participate in the study using systematic random sampling, of which 538 met the recruitment criteria and 28 refused to participate. In total, 510 consented to participate, representing a response rate of 95%. Overall, there were more females (82%). A total of 14 participants were excluded from the final analysis for having no data on medication adherence. [Table 1](#) contains the demographic characteristics and in [Table 2](#) are the clinical characteristics of the study participants.

Participant questionnaire responses

The median knowledge score on the diabetes knowledge questionnaire was 14 (IQR 12–16) with lowest knowledge scores being on causes of diabetes, importance of diet and exercising and recognition of hypoglycemia or hyperglycemia. The median self-efficacy score was 8.6 (IQR 7.5–9.5), and the participants had lower self-efficacy on eating evenly spaced meals regularly and exercising for at least 30 minutes three times a week. The median for outcome expectations score was 10 (IQR 10–10), suggesting

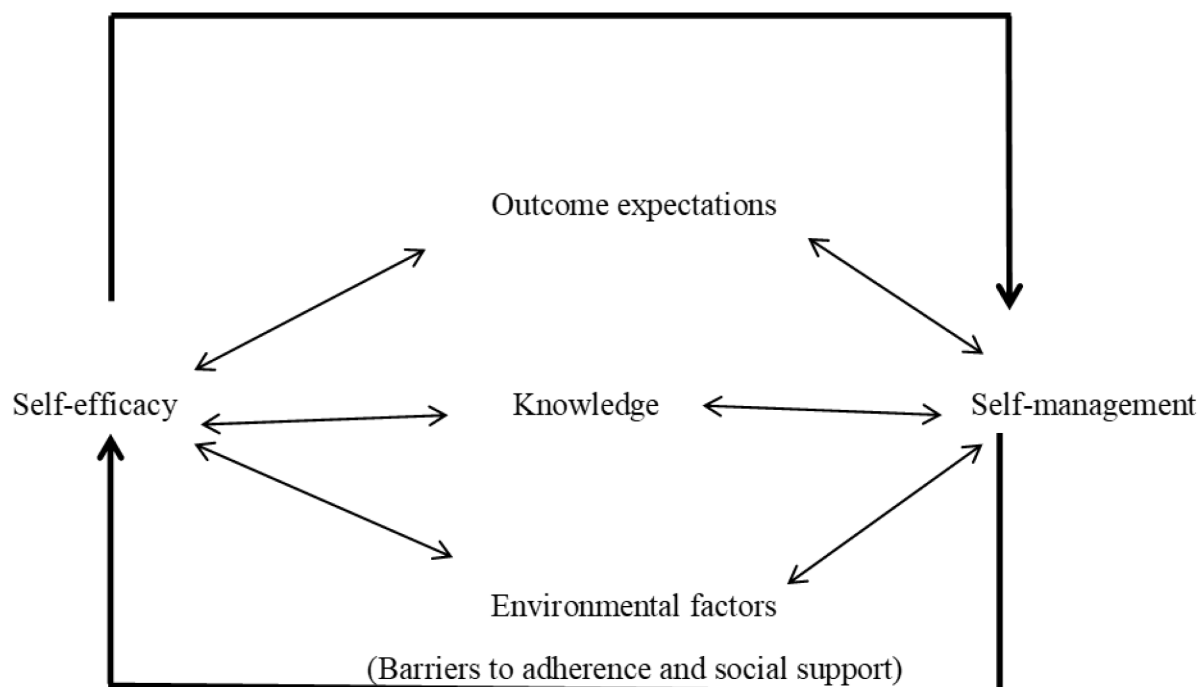


Figure 1. A diagrammatic presentation of SCT constructs and self-management.

Table 1. Participants demographic characteristics at QECH, Malawi.

Demographic Characteristics	Characteristic	n*	%
Sex	Male	91	18
	Female	419	82
Age, years	Mean (SD)	53.65 (13.31)	
Marital status	Never married	14	3
	Married	220	65
	Divorced	39	8
	Widowed	119	23
	Separated	8	2
Education	Never been to school	54	11
	Primary school	249	49
	Secondary school	180	35
	Tertiary education	27	5
Occupation	Employed	51	10
	Farming	64	13
	Small scale business	214	42
	Unemployed	148	29
	Retired	33	6

*Unless indicated. SD, standard deviation.

that participants had positive expectations in following recommended self-management behaviours. The median social support score was 4.9 (IQR 2.9–5). The most commonly mentioned sources of social support were spouses and daughters. The median score for environmental barriers to self-care was 1.5 (IQR 1.3–1.8). Barriers to medication were infrequent with only 7% of the participants reporting encountering barriers at any point. Barriers to healthy diet and exercising were reported by 37% and 33% of the participants respectively.

Most participants reported taking their medication everyday as recommended (89%) and also reported being physically active for at least 30 minutes on three or more days per week (71 %). Physical activities reported included walking or engaging in one's daily duties. Daily foot care was reported by 69% of the participants. For the general diet, 57% of the participants reported a healthy diet 6–7 days per week. On the specific diet, none of the participants reported taking at least five portions of fruits and vegetables per day, while 49% reported not to have taken any high fat food on any day in the previous seven days. Participants were considered to have satisfactory self-management behaviour if they reported regular adherence to the general diet, exercising, foot care and medication intake. Only 33% of the participants were adherent to all the four

Table 2. Clinical characteristic of participants at QECH, Malawi.

Variable Characteristics	Characteristic	n*	%
Duration	5 years or less	272	54
	6 – 10 year	130	26
	11 – 15 years	57	11
	More than 15 years	44	9
Diabetes type	Type 1	56	11
	Type 2	443	87
	Unknown	11	2
Treatment	Insulin only	92	18
	Oral agents	348	68
	Insulin and oral agents	55	11
Complications	Diet and exercise only	14	3
	None	208	41
	One	229	45
HIV status	Two or more	73	14
	Negative	406	80
	Positive	76	15
Comorbidities	Unknown	28	5
	None	181	35
	One	306	60
BMI	Two or more	23	5
	Underweight	26	5
	Normal	152	31
FBG	Overweight	162	33
	Obese	153	31
Systolic BP	Median (IQR)	171.37 (129.24–234.51)	
Diastolic BP	Median (IQR)	131 (118–146)	
	Median (IQR)	84 (75–91)	

*Unless indicated. BMI, body mass index; BP: blood pressure; FBG: fasting blood glucose; IQR, interquartile range.

self-management behaviours. [Figure 2](#) shows the percentage of participants who reported adherence to specific self-management behaviours and all self-management behaviours. All responses are given as *Underlying data*¹⁹.

Univariate and multivariate analysis

To investigate the factors associated with adhering to all the self-management behaviours, univariate and multivariate regression analyses were done. The unadjusted logistic regression analyses showed that satisfactory self-management was associated with self-efficacy, social support and diabetes barrier score (the results are shown in [Table 3](#)).

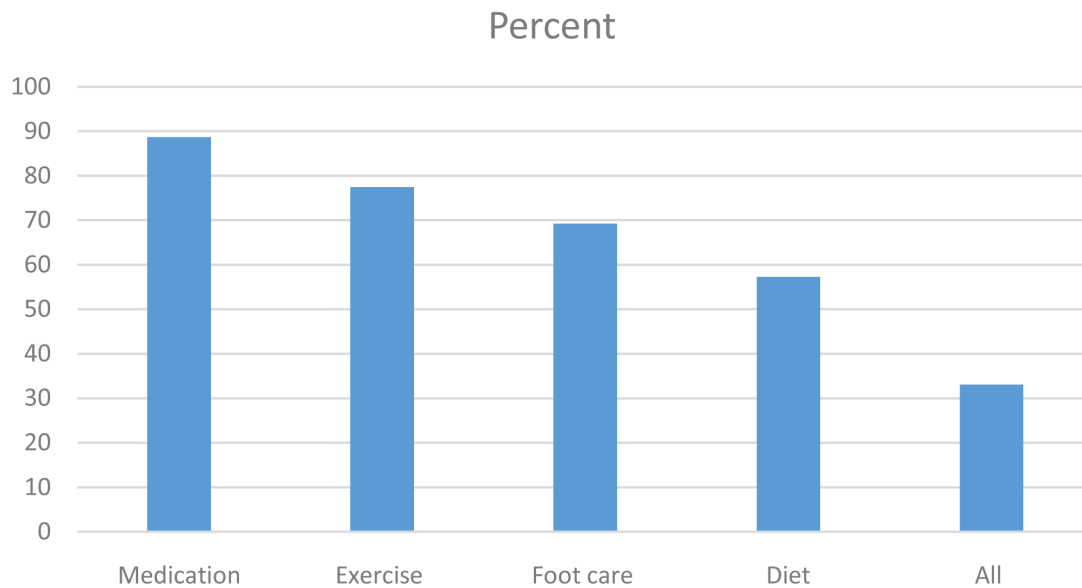


Figure 2. Percentage of participants reporting adherence to self-management behaviours.

Table 3. Associations between social cognitive theory constructs with satisfactory self-management.

Variable	Characteristic	aOR	CI	p Value
Knowledge	Every additional score	0.960	0.894–1.030	0.416
Self-efficacy	Every additional score	1.499	1.288–1.744	0.0001
Outcome expectations	Every additional score	1.386	0.954–2.013	0.087
Social support	Every additional score	1.276	1.031–1.579	0.025
Total barrier score	Every additional score	0.536	0.321–0.893	0.017

CI, confidence interval; aOR, adjusted Odds Ratio

In the multivariate logistic regression model, we adjusted for age, sex, duration since diabetes diagnosis and type of diabetes. The results showed that self-efficacy was the only significant factor associated with satisfactory self-management ($p < 0.001$). For a one-unit increase in the self-efficacy score, the odds of having satisfactory self-management increase by 1.5 (CI 1.2 – 1.7).

Discussion

This study applied the social cognitive theory to assess self-management behaviours and its associated factors among patients living with diabetes at an urban diabetes clinic in Blantyre, Malawi. Medication adherence was highest of all the self-management behaviours that were assessed. High rate of adherence to medication have also been reported in previous studies from the USA¹², Ethiopia^{22,23} and rural Malawi²⁴. Our results

suggest that people living with diabetes attending the QECH diabetes clinic have fewer environmental barriers to medication adherence than to other self-care practices. The high levels of adherence to medication could also suggest that people living with diabetes prioritize medication intake over other self-management behaviours. Although medication adherence is associated with better glycemic control²⁵, it should be accompanied with lifestyle modifications for better results^{26,27}.

A total of 71% of the participants also reported being physically active for at least 30 minutes three times a week as part of their daily work. The level of physical activity among the participants in our study was lower compared to findings from a population-based survey that was conducted in Malawi which reported that 91% adults were physically active²⁸. Engaging

in regular physical activity among people living with diabetes contributes to cardiorespiratory fitness, improved glycaemic control, decreased insulin resistance, improved blood lipid profile and improved blood pressure^{26,27,29}. Our results suggested that the participants had low self-efficacy to exercise and frequently encountered barriers to exercising. This corresponds to findings from other studies from USA, Nigeria and Ethiopia, who also found lower rates of physical activity among people living with diabetes; this was attributed to low self-efficacy and high perceived barriers to physical activity^{22,23,30,31}.

Foot care was another self-management aspect practiced by most participants. Although foot care may not directly influence glycaemic control, it is an important self-management practice for the prevention of foot ulcers and leg amputations^{27,32}. People living with diabetes are prone to foot ulcers due to peripheral neuropathy which result from poor glycaemic control^{26,27}. In total, 69% of the participants in our study reported checking their feet daily and checking inside their shoes before wearing them every day. This contrasts with the findings of Assayed *et al.*, at Mangochi District Hospital in Malawi, where only 17% of diabetic patients reported inspecting their feet regularly, and 15% did not wear shoes at all²⁴. This observed difference between our study and that of Assayed *et al.* could be due to differences in settings and the quality of service delivery. Mangochi district is mostly rural and has a limited capacity of providing diabetes self-management education²⁴. Although many patients reported daily foot care, it is however not adequate considering that most of them had peripheral neuropathy. Literature shows that QECH has a high number of people living with diabetes who present late with ulcers, which may result in limb amputations³³.

Following a recommended healthy diet was the least regularly practiced self-management behaviour and corresponds with findings from a study that was conducted in the USA³¹. The recommended diet for people with diabetes mainly consists of foods that have low carbohydrate, low salt, whole grains, fruits and vegetables^{26,27,34}. Additionally, a healthy diet restricts fats, sweetened foods or beverages, and recommends eating of small food portions spread out evenly throughout the day^{26,27,34}. For their general diet, 57% of the participants reported following a healthy diet as recommended at least six days a week. The specific diet assessment showed that none of the participants were taking at least five portions of fruits and vegetables every day. This is similar to what was found in a population-based national survey conducted in Malawi, where fruit intake was on average two days per week²⁸. Following a healthy diet plan can reduce glycated haemoglobin (HbA1C) levels by up to 2% and is protective from cardiovascular and non-cardiovascular disease mortality for people living with diabetes^{26,35}; therefore, it should be encouraged.

Self-monitoring of blood glucose was not assessed as only 12% of the participants reported to have a glucometer at home. Nevertheless, lower rates of self-monitoring of blood glucose have been reported in previous studies conducted in sub-Saharan African countries like Tanzania³⁶ and Kenya³⁷. Low rates of

self-monitoring of blood glucose in people living with diabetes in Africa has been attributed to financial constraints^{36,38}. In contrast, studies conducted in high-income countries like France³⁸, Sweden³⁶ and Italy³⁶ have reported regular self-monitoring of blood glucose among people living with diabetes. Regular monitoring of blood glucose is associated with good glycemic control³⁶.

Overall, we found that only one-third (33%) of the participants were following all (diet, exercise, foot care and medication) the recommended self-management practices. Other studies have also found that most people living with diabetes do not follow all the recommended self-management practices. A study in Ethiopia, found that only 39% were following all the self-management practices²². A study in Mexico found that only 26% were following all the recommended self-care activities³⁹. In another study by Zulman *et al.* in USA, only 26% reported performing four or five of the five self-management behaviours which they assessed³⁹. Failure to follow all recommended self-management behaviours may be due to the fact that each self-management behaviour has different barriers and requires different knowledge, skills and motivation⁴⁰.

We found that self-efficacy was the only significant ($p < 0.001$) social cognitive theory factor associated with following all self-management behaviours. Many studies have also found self-efficacy as a predictor to all self-management behaviours independently or collectively^{30,41–45}. The social cognitive theory suggests that people with high self-efficacy set high goals for themselves, are more positive minded and have better analytical skills⁸. Additionally, studies have shown that diabetes self-efficacy is also associated with other predictors of diabetes self-management such as health literacy, health related quality of life and social support^{45–47}.

The other social cognitive theory constructs (outcome expectations, social support, environmental barriers and knowledge) showed no statistically significant association with satisfactory self-management. Social support and environmental barriers to self-care scores were however associated with satisfactory self-management in the univariate analysis ($p < 0.05$) but lost their significance in the multivariate logistic regression model. There are mixed findings on the association between outcome expectations, social support, knowledge and environmental barriers as predictors of one or more self-management behaviours. Some studies have reported an association of any of these with self-management^{30,48–50} while others reported no associations^{51–53}. Self-efficacy is, however, the main factor that regulates all the other constructs of the social cognitive theory as it influences feelings, motivation, thoughts, expectations and goals⁵⁴. Self-efficacy is also associated with other social cognitive constructs such as social support⁵⁵; therefore, more studies are required to explore further the relationship of the other social cognitive theory constructs with each other and diabetes self-management.

Study limitations

This study had several limitations. One of the limitations was that the participants were predominantly female. However, at

univariate analysis, we found no statistically significant differences in following of self-management behaviours between males and females. There were no statistically significant differences in following of self-management behaviours between males and females. Another limitation was that the study was hospital-based and recruited participants from one health facility only. Participants attending the clinic may be more compliant to self-management behaviours than those who do not come to the clinic. Additionally, generalizability of the findings is limited to central hospitals or health facilities of similar nature. Since this was a cross-sectional study, we were only able to identify factors associated with diabetes self-management and not the causes. Experimental studies are needed to identify locally appropriate and acceptable interventions that can improve self-efficacy in diet and all other self-management behaviours.

Conclusion

The findings of this study show that people living with diabetes attending QECH diabetes clinic were not consistently following all the recommended self-management practices. Dietary practices were the least adhered to self-management behaviour compared to medication, foot care and exercising. Management protocols and guidelines for people living with diabetes at QECH should therefore include interventions aimed at improving self-efficacy such as exposure to role models, peer education, providing positive feedback, and counselling. We also noted that most of the people living with diabetes lacked access to resources that enabled them to perform self-monitoring of

blood glucose. We recommend availability of blood glucose monitoring devices at primary health care level and even to all individuals living with diabetes to allow regular monitoring of blood glucose, which is necessary for the adjustment of medication, diet and exercise intensity.

Data availability

Underlying data

Figshare: Diabetes self-management and social cognitive factors. <https://doi.org/10.6084/m9.figshare.9757076.v1>¹⁹.

This project contains answers to each question from each respondent. The first row contains the question number from the questionnaire (see *Extended data*) to which the answer pertains.

Extended data

Figshare: Factors associated with diabetes self-management questionnaire. <https://doi.org/10.6084/m9.figshare.9757115.v1>¹⁰.

Data are available under the terms of the [Creative Commons Attribution 4.0 International license](#) (CC-BY 4.0).

Acknowledgements

We wish to acknowledge the study participants, research assistants and all staff working at QECH diabetes clinic for their support during the study.

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Open Peer Review

Current Peer Review Status: ? ? ✓

Version 2

Reviewer Report 25 July 2024

<https://doi.org/10.21956/aasopenres.14466.r31072>

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Elmari Deacon 

Faculty of Health Sciences & Department of Psychosocial Health, North-West University, Vanderbijlpark, South Africa

Thank you for the opportunity to review this manuscript. The topic of self-management in the African context is not well research and this study adds to literature.

As for the manuscript, I would reconsider the keywords, to also include self-efficacy as this is one of the important constructs in the findings.

I was not sure about referring to the participants as "clients" under the method section and I have not seen the the inclusion of the sample size formula in previous manuscripts and wondered what it added to the arguments. The same goes for Figure 1 as the relationships between the different scale/constructs are not explained in text and is also not used in the discussion.

The discussion followed well and answered the research questions. There was just a smaller typo in the last paragraph before the conclusion in the third line on p.9 "males and females. There were", should read "males and females. There were..."

Is the work clearly and accurately presented and does it cite the current literature?

No

Is the study design appropriate and is the work technically sound?

Yes

Are sufficient details of methods and analysis provided to allow replication by others?

Partly

If applicable, is the statistical analysis and its interpretation appropriate?

I cannot comment. A qualified statistician is required.

Are all the source data underlying the results available to ensure full reproducibility?

Partly

Are the conclusions drawn adequately supported by the results?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Diabetes self-management

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Reviewer Report 17 January 2022

<https://doi.org/10.21956/aasopenres.14466.r29066>

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Nicola Brew-Sam 

Department of Health Services Research and Policy, Research School of Population Health, Australian National University, Canberra, Australia

Abstract:

1. " ... last seven days was 88.6% ... " - please correct in abstract without decimals (to be consistent).

Introduction:

2. "These key concepts are the factors that influence human action, motivation and wellbeing and hence are hypothesized to be associated with diabetes self-management for this present study⁸. Self-management was assessed using the Summary of Diabetes Self-care Activities (SDSCA) measure (Toobert). The aim for this study was to assess the level of self-management and identify factors associated with practicing all self-management behaviours among adults living with diabetes at QECH. This is part of a larger study exploring self-management practices and experiences among people living with diabetes attending the QECH diabetes clinic."

I would change the paragraph as follows for better readability and clarity:

These key concepts are the factors that influence human action, motivation and wellbeing⁸ [remove second part of sentence, aim has to be mentioned before hypothesis].
[new paragraph] The aim for this study was to assess the level of self-management and identify SCT factors associated with practicing all self-management behaviours among adults living with diabetes at QECH. This is part of a larger study exploring self-management practices and

experiences among people living with diabetes attending the QECH diabetes clinic.

The sentence "Self-management was assessed using the Summary of Diabetes Self-care Activities (SDSCA) measure (Toobert)" should be moved to methods, and contains a spelling mistake "assessed".

Methods:

3. "standard face-to-face surveys" - standardized?

4. "conducted to collect demographics, clinical, diabetes knowledge, self-efficacy, outcome expectations, social support, environmental barriers and diabetes self-management data" - which ones are SCT factors? Please clarify already here, e.g.,: to collect demographics, clinical history, diabetes self-management data, and the SCT factors diabetes knowledge, self-efficacy, outcome-expectations, environmental barriers to proper self-management and social support. Moreover, "history" is missing for "clinical".

Inclusion criteria:

5. " Recruitment of clients was done " - better undertaken.

6. Remove the "where" in formula explanation.

7. "at the 95% confidence level and at 4% level of precision" - confidence interval?

Instruments:

8. "with Cronbach's alpha coefficient α " - the α can be removed or replace the "alpha" (duplicate).

9. Remove space in "0.74 to 0. 93".

10. "environmental barriers of the participants" - better: environmental barriers as perceived by the participants.

11. Why was Cronbach's alpha not reported for environmental barriers (DAT) but all other scales? Likert scales here too? This is a bit unclear, please add scale information and alpha if applicable.

Data analysis:

12. "who were therefore excluded in the final analysis" - better: from the final analysis.

Results:

13. Why is there such a discrepancy of participation regarding gender (much more women)?

14. Table 2: Spell out FBG and BP, not all readers are familiar with these abbreviations; duration of what? Add "duration of living with diabetes" or similar.

Participant questionnaire responses:

15. "The median knowledge score on the diabetes knowledge questionnaire was 14 (IQR 12–16) with lowest knowledge scores being on causes of diabetes, importance of diet and exercising and recognition of hypoglycemia or hyperglycemia. The median self-efficacy score was 8.6 (IQR 7.5–9.5), and the participants had lower self-efficacy on eating evenly spaced meals regularly and exercising for at least 30 minutes three..."

Why were median scores used and not mean scores?

From my understanding you would have to add scale information here to set the scores in relation to the various scales? The scores are only interpretable if the reader knows if it was e.g., a 5-7-10 point likert scale here, right?

Univariate and multivariate analysis:

16. "To investigate the factors associated with adhering to all the self-management behaviours, univariate and multivariate regression analyses were done." - better: calculated.

17. The most important section on uni- and multi-variate analysis is very short, and could be extended.

Discussion:

18. "Our results suggested that the participants had low self-efficacy to exercise and frequently encountered barriers to exercising." - I am missing more detailed findings on this conclusion in the results section. The results should be more detailed. You just report satisfactory self-management as the main outcome variable in the multivariate analysis, but did you find any associations of SCT factors when looking at the single self-management practices as reported here (exercise)?

19. How does the absence of BG monitoring with a glucometer affect diabetes health outcomes? Are there any studies that could be cited here? Monitoring is a very crucial aspect, and it is a major factor that could impact outcomes here.

Overall:

20. The number of decimals should be consistent throughout; the use of present/past should be consistent in the discussion.

Is the work clearly and accurately presented and does it cite the current literature?

Yes

Is the study design appropriate and is the work technically sound?

Yes

Are sufficient details of methods and analysis provided to allow replication by others?

Yes

If applicable, is the statistical analysis and its interpretation appropriate?

Yes

Are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions drawn adequately supported by the results?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Health service research, diabetes research, mHealth/eHealth

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Version 1

Reviewer Report 24 May 2021

<https://doi.org/10.21956/aasopenres.14076.r28577>

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Nicola Brew-Sam 

Department of Health Services Research and Policy, Research School of Population Health, Australian National University, Canberra, Australia

Thank you very much for the interesting study, I think it is well conducted with some minor weaknesses in the manuscript. Please find my suggestions below:

1. The gender distribution could be added to the abstract.

2. n=494 in the abstract's result section only applies for one result, and the other results refer to N=510? This is a bit unclear. I would suggest removing n=494 from the abstract.
3. Percentages should be reported consistently without decimals 88.6% = 89%
4. "Although the study by Cohen *et al.* had shown that people living with diabetes in Malawi had poorly controlled glucose, little was known about their self-management behaviours especially regarding diet, exercising, self-monitoring of blood glucose, medication adherence, and foot care" - this is a repetition of the first paragraph.
5. "A systematic review of randomized controlled trials of SCT-based inter-ventions showed effectiveness in improving diet and exercise behaviour in cancer survivors" - I would suggest to report another example on diabetes here, the cancer example doesn't fully fit. There is plenty of diabetes research focusing on SCT.
6. "A cross-sectional design" - please specify which data collection methods were used (standardised face-to-face survey?).
7. "95% confidence **level**" - better: confidence interval.
8. "The proportion was estimated to be within 0.04 (4%), using the 95% confidence level a sample of 462 patients living with diabetes would be required" - I don't understand this, please explain.
9. "Interviewer-administered questionnaire" - is that a standardized face-to-face survey? Or semi-structured interviews?
10. Page 4 Toobert, not "Toolbert".
11. "Measure has been **proved** from previous studies" - proven.
12. "For all the questions, a higher number of days indicated satisfactory self-management" - what is a higher number? Which scale values were rated as satisfactory? Please explain this, as it is relevant for the results.
13. "The tool had **showed** construct validity" - had shown.
14. "Cronbach's coefficient alpha" - better: Cronbach's alpha coefficient.
15. "For **doing** a particular behaviour" - better: executing.
16. "Univariate logistic regression was **done** to investigate" - better: used.
17. "The unadjusted logistic regression analyses showed that satisfactory self-management was associ- ated with self-efficacy, social support, outcome expectations and diabetes barrier score (the results are shown in Table 3)." - outcome expectations is not significant in Table 3, why is it still included in these results? Please explain.

18. Include a sub-heading for "study limitations".

19. Check paper again for spelling and grammar, there are some mistakes as outlined above.

Is the work clearly and accurately presented and does it cite the current literature?

Yes

Is the study design appropriate and is the work technically sound?

Yes

Are sufficient details of methods and analysis provided to allow replication by others?

Partly

If applicable, is the statistical analysis and its interpretation appropriate?

Partly

Are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions drawn adequately supported by the results?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Health service research, diabetes research, mHealth/eHealth

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Author Response 10 Dec 2021

Chimwemwe Kwanjo Banda

Approved With Reservations

Thank you very much for the interesting study, I think it is well conducted with some minor weaknesses in the manuscript. Please find my suggestions below:

The gender distribution could be added to the abstract.

The gender distribution has been added in the abstract

n=494 in the abstract's result section only applies for one result, and the other results refer to N=510? This is a bit unclear. I would suggest removing n=494 from the abstract.

N = 494 has been removed. This number was used because 16 people with diabetes who were recruited in the study were not on diabetes medication.

Percentages should be reported consistently without decimals 88.6% = 89%

Thank you. All percentages have been rounded up to whole numbers and decimals removed

"Although the study by Cohen et al. had shown that people living with diabetes in Malawi had poorly controlled glucose, little was known about their self-management behaviours especially regarding diet, exercising, self-monitoring of blood glucose, medication adherence, and foot care" - this is a repetition of the first paragraph.

The sentence in the previous paragraph has been deleted.

"A systematic review of randomized controlled trials of SCT-based interventions showed effectiveness in improving diet and exercise behaviour in cancer survivors" - I would suggest to report another example on diabetes here, the cancer example doesn't fully fit. There is plenty of diabetes research focusing on SCT.

The cancer article has been removed and replaced with one reporting SCT in diabetes.

"A cross-sectional design" - please specify which data collection methods were used (standardised face-to-face survey?).

The data collection methods have been specified as follows: "A cross-sectional design using standardised face-to-face survey was conducted"

"95% confidence level" - better: confidence interval.

Thank you. Confidence level has been changed to confidence interval

"The proportion was estimated to be within 0.04 (4%), using the 95% confidence level a sample of 462 patients living with diabetes would be required" - I don't understand this, please explain.

This has been rephrased to add clarity:

To determine the true proportion with satisfactory self-management at the 95% confidence level and at 4% level of precision, a minimum sample size of 462 people living with diabetes was required.

The formula used to calculate the sample size has been given.

"Interviewer-administered questionnaire" - is that a standardized face-to-face survey? Or semi-structured interviews?

Yes- it is standardized face-to-face survey. "Interviewer administered questionnaire" has been replaced with "standardized face-to-face survey for clarity.

Page 4 Toobert, not "Toolbert".

The name has been corrected from Toolbert to Toobert.

"Measure has been proved from previous studies" - proven.

This has been corrected

"For all the questions, a higher number of days indicated satisfactory self-management" - what is a higher number? Which scale values were rated as satisfactory? Please explain this, as it is relevant for the results

Thank you. This has been explained as follows: "Self-management was considered satisfactory if a person reported following the recommended practices related to diet, medication, and foot care on all days in the past seven days, and being active for at least 30 minutes on three days in the past seven day.

"The tool had showed construct validity" - had shown.

This has been corrected

"Cronbach's coefficient alpha" - better: Cronbach's alpha coefficient.

This has been corrected

"For doing a particular behaviour" - better: executing.

"Executed" used instead of "doing"

"Univariate logistic regression was done to investigate" - better: used.

"done" replaced with "used"

"The unadjusted logistic regression analyses showed that satisfactory self-management was associated with self-efficacy, social support, outcome expectations and diabetes barrier score (the results are shown in Table 3)." - outcome expectations is not significant in Table 3, why is it still included in these results? Please explain.

Thank you for noting this. Outcome expectations were not associated with self-management as shown in Table 3. This has been corrected in the text

Include a sub-heading for "study limitations".

This has been included

Check paper again for spelling and grammar, there are some mistakes as outlined above.

Thank you. This has been done.

- Is the work clearly and accurately presented and does it cite the current literature?

Yes

- Is the study design appropriate and is the work technically sound?

Yes

- Are sufficient details of methods and analysis provided to allow replication by others?

Partly

- If applicable, is the statistical analysis and its interpretation appropriate?

Partly

- Are all the source data underlying the results available to ensure full reproducibility?

Yes

- Are the conclusions drawn adequately supported by the results?

Yes

Thank you.

More details have been added as described above.

This has been improved as suggested above.

Thank you.

Competing Interests: No competing interests were disclosed.

Reviewer Report 26 August 2020

<https://doi.org/10.21956/aasopenres.14076.r27803>

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Fazlyn Petersen

Department of Information Systems, University of the Western Cape, Cape Town, South Africa

Is the work clearly and accurately presented and does it cite the current literature? Partly:

1. "The inpatient mortality for the people admitted due to diabetes at QECH is **about** 19%" - can the actual value not be presented instead?
2. "A previous survey at QECH by Cohen *et al.*, conducted **10 years** before the present study" - more recent studies should be used.
3. Why is SCT for cancer being used when there is available literature for SCT and diabetes?
4. There is more recent literature available on diabetes self-management and SCT such as Ghoreishi *et al.* (2019¹), Bourne *et al.* (2020²), Thojampa and Sarnkhaowkhom (2019³) and

Mirzaei-Alavijeh and Jalilian (2019⁴).

5. The link between SCT and diabetes self-management could be better explained by using the references above, among others.

Is the study design appropriate and does the work have academic merit?

1. The work does have merit but I feel that SDSCA should be introduced in the last paragraph of the introduction. "Some key concepts of the social cognitive theory are self-efficacy, health knowledge, health goals, outcome expectations, and environmental impediments and facilitators". The use of SDSCA is not explicit in this sentence.

Are sufficient details of methods and analysis provided to allow replication by others?

1. Inclusion and exclusion criteria are well defined.
2. Sample size considerations - why is a 10-year-old study used as a basis instead of a sample size calculator like Raosoft? <http://www.raosoft.com/samplesize.html>
3. It would be clearer to see a research model diagrammatically presented.

If applicable, is the statistical analysis and its interpretation appropriate?

1. This tool had been used in previous studies with a Cronbach's coefficient α of 0.85 and a test-retest validity of 0.8". As this survey is a combination of other surveys with adaptations made, I would recommend that Construct Reliability and Validity and Discriminant Validity be tested for the final survey used. At least Cronbach alpha should have been tested in this study too.
2. I find Table 3 rather difficult to understand. Why are there p-values shown for demographic variables? I assume that these are for testing the associations.
3. I use structured equation modelling to test research models and hypotheses so this method is not very clear to me. "...social cognitive theory constructs (outcome expectations, social support, environmental barriers and knowledge) showed no statistically significant association with satisfactory self-management." - where are these hypotheses represented? I was expecting to see an independent and dependent variable in Table 3 to better understand the p-values.
 - It mentions "causality cannot be ascertained" but this needs to be clarified.
 - **Limitations** - "However, there were no statistically significant differences in following of self-management behaviours between males and females" - this statement is missing a reference.

Are all the source data underlying the results available to ensure full reproducibility? Yes, the survey and results are available.

Are the conclusions drawn adequately supported by the results? Yes.

References

1. Ghoreishi MS, Vahedian-Shahroodi M, Jafari A, Tehranid H: Self-care behaviors in patients with

- type 2 diabetes: Education intervention base on social cognitive theory. *Diabetes Metab Syndr*. **13** (3): 2049-2056 [PubMed Abstract](#) | [Publisher Full Text](#)
2. Bourne JE, Ivanova E, Gainforth HL, Jung ME: Mapping behavior change techniques to characterize a social cognitive theory informed physical activity intervention for adults at risk of type 2 diabetes mellitus. *Transl Behav Med*. 2020; **10** (3): 705-715 [PubMed Abstract](#) | [Publisher Full Text](#)
3. Thojampa S, Sarnkhaowkhom C: The Social Cognitive Theory with Diabetes: Discussion. *International Journal of Caring Sciences*. 2019; **12** (2): 1251 [Reference Source](#)
4. Mirzaei-Alavijeh Mehdi, Jalilian F: A psychometric analysis of the socio-cognitive determinants questionnaire of type 2 diabetes prevention among a group at risk. *Iranian Journal of Endocrinology and Metabolism*. 2019; **20** (5): 224-234 [Reference Source](#)

Is the work clearly and accurately presented and does it cite the current literature?

Partly

Is the study design appropriate and is the work technically sound?

Partly

Are sufficient details of methods and analysis provided to allow replication by others?

Partly

If applicable, is the statistical analysis and its interpretation appropriate?

Partly

Are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions drawn adequately supported by the results?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: The use of technology to improve diabetes self-management.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Author Response 10 Dec 2021

Chimwemwe Kwanjo Banda

Is the work clearly and accurately presented and does it cite the current literature?

Partly:

1. "The inpatient mortality for the people admitted due to diabetes at QECH is **about** 19%" - can the actual value not be presented instead?

The sentence has been rephrased and reads: The inpatient mortality for the people admitted due to diabetes at QECH is 19%.

1. "A previous survey at QECH by Cohen *et al.*, conducted **10 years** before the present study" - more recent studies should be used.

Noted. However there was no available literature on recent studies looking at self-management or glycemic control at QECH other than the Cohen *et al.* study. This has been highlighted in the paper

1. Why is SCT for cancer being used when there is available literature for SCT and diabetes?

The reference has been replaced with one focusing on diabetes mellitus and STC.

1. There is more recent literature available on diabetes self-management and SCT such as Ghoreishi *et al.* (2019¹), Bourne *et al.* (2020²), Thojampa and Sarnkhaowkhom (2019³) and Mirzaei-Alavijeh and Jalilian (2019⁴)

Thank for the suggestions. These references have been included.

1. The link between SCT and diabetes self-management could be better explained by using the references above, among others.

Noted. This has been done

Is the study design appropriate and does the work have academic merit?

1. The work does have merit but I feel that SDSCA should be introduced in the last paragraph of the introduction. "Some key concepts of the social cognitive theory are self-efficacy, health knowledge, health goals, outcome expectations, and environmental impediments and facilitators". The use of SDSCA is not explicit in this sentence.

Thank you. A sentence has been added in the introduction paragraph to introduce the SDSCA.

Are sufficient details of methods and analysis provided to allow replication by others?

1. Inclusion and exclusion criteria are well defined.

Thank you.

1. Sample size considerations - why is a 10-year-old study used as a basis instead of a sample size calculator like Raosoft? <http://www.raosoft.com/samplesize.html>

Noted. We will consider using the given site in future. We used the old study because that was the only available local study to help us determine the proportion estimated to have

good self-management at the time of the study.

1. It would be clearer to see a research model diagrammatically presented.

A research model has been included.

If applicable, is the statistical analysis and its interpretation appropriate?

1. This tool had been used in previous studies with a Cronbach's coefficient α of 0.85 and a test-retest validity of 0.8". As this survey is a combination of other surveys with adaptations made, I would recommend that Construct Reliability and Validity and Discriminant Validity be tested for the final survey used. At least Cronbach alpha should have been tested in this study too.

Thank you for that recommendation. Cronbach alpha for this study has been calculated and included in the paper.

1. I find Table 3 rather difficult to understand. Why are there p-values shown for demographic variables? I assume that these are for testing the associations.

Table 3 has been simplified to include the association of self-management and social cognitive constructs (knowledge, self-efficacy, outcome expectations, social support and barriers) only . P values are used because the table shows results of univariate logistic regression analysis that tested independent associations between predictor variables (demographic characteristics, clinical factors and social cognitive constructs).

1. I use structured equation modelling to test research models and hypotheses so this method is not very clear to me. "...social cognitive theory constructs (outcome expectations, social support, environmental barriers and knowledge) showed no statistically significant association with satisfactory self-management." - where are these hypotheses represented? I was expecting to see an independent and dependent variable in Table 3 to better understand the p-values.

We used logistic regression analysis. The dependent variable was self-management dichotomized as satisfactory or unsatisfactory. Based on the conceptual framework guiding the study, our hypothesis was that the social cognitive theory constructs are associated with self-management. We had three categories of independent variables (1-demographic characteristics, 2- clinical characteristics and 3- social cognitive theory variables). The first step of the analysis was to test the independent associations between each of the independent variables and the dependent variable. Table 3 shows the results of the univariate logistic regression analysis, which shows the association between each of the dependent variable with self-management.

The second step was the multivariate regression analysis where independent variables that showed association with the dependent variable (self-management) were included.

1. It mentions "causality cannot be ascertained" but this needs to be clarified.

The sentence has been rephrased as follows: "Since this was a cross-sectional study, we were only able to identify factors associated with diabetes self-management and not the causes"

1. **Limitations** - "However, there were no statistically significant differences in following of self-management behaviours between males and females" - this statement is missing a reference.

This sentence has been rephrased as follows: However, at univariate analysis, we found no statistically significant differences in following of self-management behaviours between males and females.

Are all the source data underlying the results available to ensure full reproducibility?

Yes, the survey and results are available.

Thank you

Are the conclusions drawn adequately supported by the results? Yes.

Thank you

- Is the work clearly and accurately presented and does it cite the current literature?

Partly

Thank you. This has been improved and literature updated.

- Is the study design appropriate and is the work technically sound?

Partly

This has been improved

- Are sufficient details of methods and analysis provided to allow replication by others?

Partly

This has been improved.

- If applicable, is the statistical analysis and its interpretation appropriate?

Partly

This has been improved and more details of the analysis are given.

- Are all the source data underlying the results available to ensure full reproducibility?

Yes

- Are the conclusions drawn adequately supported by the results?

Yes

Thank you.

Competing Interests: No competing interests were disclosed.