


RESEARCH ARTICLE

REVISED **Recognition of symptoms, mitigating mechanisms and self-care experiences of type 2 diabetes patients receiving insulin treatment in North-East Ethiopia [version 3; peer review: 2 approved]**

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Abstract

Background: Compliance of patients with self-care practices is the mainstay of measures to manage diabetes. This study explored self-care practices of type 2 diabetes patients receiving insulin treatment in North-East Ethiopia.







Methods: The study employed an interpretive phenomenological approach using purposive sampling. The data were collected from 24 (11 males and 13 females) participants (July 2019 to January 2020) using in-depth interviews till theoretical saturation. The data were analyzed thematically and organized using QDA Miner Lite v2.0.8.


Results: The findings were categorized into: labeling diabetes, self-care maintenance experiences, recognition of symptoms, and mitigating mechanisms. The self-care maintenance practice of patients was linked with diet input preferences and the effectiveness level of insulin. What guides the self-care behavior was the patients' preferentiality of strictly adhering to their preferred dietary inputs. Barley and wheat were the most common preferential and non-preferential inputs, respectively. The patients strictly adhered to insulin treatment because they found it effective. The most common hyperglycemia symptoms to be managed by taking an additional dose of insulin, were frequent urination, increased thirst, and their consequence (dehydration). Excessive sweating (initial), shivering (middle), and falling (final), respectively in severity, were the most common symptoms of hypoglycemia which were perceived to be treated with sweet snacks.


Originality: To our knowledge, this is the first research in Ethiopia to

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Any reports and responses or comments on the article can be found at the end of the article.

investigate the self-care experiences of type 2 diabetes patients receiving insulin using an interpretive phenomenological approach.

Keywords

Type 2 diabetes, Symptom, Insulin, Self-care, Experience, Qualitative research



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REVISED Amendments from Version 2

Based on reviewer 1 and 2's remarks, some grammar errors and faults in methodological flow were fixed.

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

Introduction

Self-care of chronic illness is somewhat different from the general issue of self-care, in that it should be illness-specific (Riegel *et al.*, 2012). Giving special attention to self-care is crucial and more important than drug treatment (Ausili *et al.*, 2014). The goal of diabetes management is to promote holistic wellbeing, an asymptomatic life, and good quality of life (QOL) by preventing complications (Ayubah & Peltonen, 2018) via self-care. Treatment begins with diet. Day-to-day carbohydrate intake and patient preferences, grounded on cultural context, are crucial (Hopper, 2007).

The critical factor to control diabetes is self-care: healthy lifestyles and adherence to treatment (Abraham *et al.*, 2011; Shrivastava *et al.*, 2013). Self-care requires the best strategies to decide the appropriate measures suitable for an individual's lifestyle issues and conditions (Abraham *et al.*, 2011; Adam, 2012; Moser *et al.*, 2008). The patients with diabetes themselves are responsible for their disease management to the extent of 95% (Abraham *et al.*, 2011; Adam, 2012; Sharma & Joshi, 2016). The patients' beliefs impact their commitment and motivation to carry out self-care behaviors (Beverly *et al.*, 2014). The struggle to self-manage and maintain new habits are influenced by the patient's perceived conditions (Ribu *et al.*, 2019).

Diabetes self-care is an ongoing process of learning to develop awareness or knowledge to survive with diabetes in a social context (Sekhar *et al.*, 2020). Knowledge of risk and a healthy lifestyle are mandatory in type 2 diabetes mellitus (T2DM) management (Tabong *et al.*, 2018). The consequence of poor adherence of patients with diabetes to self-care results in poor health outcomes (Anitha Rani & Shriram, 2019). This study aimed to explore self-care practices of

T2DM patients receiving insulin treatment in Dessie City Administration (DCA), North-East Ethiopia.

Methods

Ethical considerations

This study received approval from the "Research, Community Service, and Graduate Coordinating Office" of Medicine and Health Science College of Wollo University (Ref. No. CMHS: 443/13/11). After the provision of sufficient information about the study, written informed consent was obtained and signed by all study participants before conducting interviews. The names of participants were not indicated, but coded for the convenience of data analysis. The information collected from all participants were kept confidential.

Design and setting

From July 2019 to January 2020, an interpretive phenomenological inquiry was utilized to delve into the experiences of T2DM patients receiving insulin treatment at Dessie Comprehensive Specialized Hospital (DCSH) in DCA, North-East Ethiopia (Table 1). It is the largest tertiary hospital, with the widest catchment area, in the North-East region of Ethiopia (Getachew, 2020).

Data collection tool and procedures

A semi-structured interview guide prepared in Amharic was used to collect data. All study materials including the interview guide can be found as extended data (Bayked *et al.*, 2021). The data collection period started on July 3, 2019 and ended on January 23, 2020. The participants were identified preliminarily by the principal investigator (EMB) at the diabetic clinic using the registration cards of patients with diabetes. Inclusion criteria were T2DM patients receiving insulin treatment at DCSH, with no known or overt psychiatric problems, willing to participate, 18 years and above, with no type 1 and gestational diabetes and able to communicate. And 24 participants were recruited purposively and interviewed by EMB using face-to-face in-depth interviews and an audio recorder. The interviews were done in the patients' appointment time, lasted for a range of 23 to 71 minutes with an average of 46 minutes, in quiet areas free from distractions: at separate places of the hospital compound, isolated spots of cafes, secured work areas,

Table 1. Summary of the Description of Dessie City Administration (DCA), South Wollo Zone, Amhara Region, North-East Ethiopia, 2020.

Significance	Largest urban center in North-East Ethiopia (Dimon, 2018)
Population	Town (209,226), Rural (35,903), Total (245,129) (Central Statistical Agency, 2013)
Ethnic groups	Amhara (94.89%), Tigre (3.79%); Others (0.67%) (Central Statistical Agency, 2007)
Religions	Islam (58.62%), Orthodox (39.92), Protestant (1.15%), and Others (0.31%) (Central Statistical Agency, 2007)
Language	Amharic (95%), Tigrigna (4%); Others (1%) (Central Statistical Agency, 2007)
Economy	Economically active (50.85%), Economically inactive (49.15%) (Central Statistical Agency, 2007)
Employment	Employed (88%), Unemployed (12%) (Central Statistical Agency, 2007)

and homes of participants. Then, the data collection came to an end when theoretical saturation was achieved.

Data processing and analysis

The interviews were transcribed verbatim into MS Word by the researchers themselves and rechecked. Transcripts were read repeatedly before translated into English to ensure good understanding. The coding and analysis procedures were started immediately after the first interview and done along with data collection. Interviews continued until all key themes were saturated. The coding activity was done by moving back and forth repeatedly to find out further emerging themes and to gain a detailed description of the themes. Each transcript was coded line by line and these codes were organized into higher-order conceptual themes. Sections of original transcripts and key quotes were considered to be illustrative of the emerging themes. Individual codes and themes were discussed at group meetings of the researchers until consensus was reached on basic themes and subthemes across the transcripts. Finally, the themes were incorporated into a conceptual model of the participants and their perceptions of diabetes self-care practices and discussed using an interpretive paradigm. The data analysis was organized by using [QDA Miner Lite](#) v2.0.8.

The researchers pursued various strategies to assure the quality of the data. The interview guide was pre-tested on two individuals with similar cases and adjusted accordingly (personal experiences of mitigating symptoms were included). The transcripts and findings were shared with participants who confirmed that the interpretations accurately reflected their perceptions and experiences. The write-up was guided by the “Standards for Reporting Qualitative Research (SRQR) checklist” ([O’Brien et al., 2014](#)).

Reflexivity

The principal investigator (EMB) realizes that the results of the study come from the interaction of him and the research participants. He has been the part of the community since his childhood. He is grown with the communities’ norms and is very familiar with the customary terms (local slang). This makes him fit to understand and interpret every word from lay perspectives. EMB could also be an appropriate investigator since he is a BSc nurse familiar with nursing practice and a lecturer in social and administrative pharmacy (SAP). He has taught at different health science colleges in both fields. He has been currently teaching and researching with SAP at Wollo University, and practicing as a nurse in a private hospital. However, his prior knowledge of the local jargon and the medical terminologies and diabetes might have resulted in bias if he did not remain mindful throughout the research process. He was conscious of the biases, values, and experiences that he brought to the study and only interpreted the concepts raised by participants.

Results

As it is given in [Table 2](#), a total of 24 patients (11 males and 13 females) were interviewed. The range age of the participants was 35 to 75 years. Their median and interquartile range (IQR) ages

Table 2. Description of study participants (n = 24).

Description	No. of patients	Description	No. of patients
Age (years)		Occupational status	
30–39	4	Farmer	5
40–49	4	Merchant	3
50–59	6	Public servant	5
60–69	5	House wife	3
≥70	5	Retired	3
Marital status		Unemployed	5
Married	17	Diabetes duration (year)	
Widowed	6	1–5	6
Divorced	1	6–10	7
Religion		11–15	3
Orthodox	11	16–20	4
Muslim	12	21–25	2
Protestant	1	26–30	1
Educational status		31–35	1
Illiterate	11	Insulin use duration (years)	
Basic literacy	4	<1	4
Secondary school	4	1–5	13
Diploma	2	6–10	4
Graduate	2	11–15	1
Postgraduate	1	16–20	1
Residence		21–25	1
Urban	17		
Rural	7		

were 57 and 58 years, respectively. Their approximate average lifespan with diabetes was 12 years, and 5 years with insulin treatment.

The results of the study were grouped into four main themes: labeling diabetes, self-care maintenance experiences (lifestyle preferences and medication adherence), recognition of symptoms (hyperglycemia and hypoglycemia), and mitigating mechanisms of symptoms (hyperglycemia and hypoglycemia).

Labeling diabetes

In Amharic, diabetes mellitus is “*Ye-Siquar Beshita*” which means “*The disease of Sugar*” and the short-term diabetes is called “*Siquar*” which means “*Sugar*.” The term “*Siquar*” was also used to express blood glucose as well as table sugar. Thus, “*Siquar*” was being understood contextually whether it was said to express diabetes or blood glucose. The sweet snacks and

drinks as a whole were called “*Tafachi*” or “*Markesha*.” The most commonly used term was “*Tafachi*.” This term was used to express *any drink or food items which were supposed to be taken to ameliorate insulin induced hypoglycemia*, but the second term “*Markesha*” literally means “*antidote*.”

Self-care maintenance experiences

Life-style preferences. The self-care maintenance practices of patients were expressed in terms of what would be permitted or prohibited, and the effect of the choice on blood glucose and disease as well as their value to health and well-being. These were related to food (ingredient selection, preparation, content of carbohydrate or tastes), clothing (shoe size like narrow or wide, style like being heel or flat, being open or closed, manufacturing material like being rubber or leather), hygiene, and protection from physical hazards (trauma, extreme heat like cold and increased temperature). So, these could be classified as prohibited/non-preferential or permitted/preferential. They would also be categorized according to whether they are supposed to be approached negatively or positively. Physical activity and foot hygiene were the least preferred practices.

To your surprise, what is important for patients with “Siquar” (diabetes) is wide cloth and wide shoes. And others tested for us to bathe if it (the water) is warm. If you are caught by “Siquar,” your body will get thin, and cold will extremely hurt you. And we wash after it was tested. (Male, 46 years)

Among the self-care practices by abstinence regarding food choice and feeding, the most common non-preferential practice or abstinence mentioned was not eating wheat followed by sweets, pea, and butter. It was also not good to eat until the stomach is very full. The others were white meat (fat), “*Tinkish*” (type of sugar cane), potato, spaghetti, macaroni, and cattle meat. Almost all of these food inputs are among foods with high carbohydrate content (sweets). Regarding food choice, the most commonly preferred were plant products. Accordingly, barley was the most preferred item (ingredient) followed by chickpea, Teff, lentil, salad, oat, and cabbage. The others were nuts, mango, corn, bean, tomato, egg, chicken, and milk. All participants agreed that sweet foods and drinks should be avoided unless in case of hypoglycemia, which is induced by insulin excess.

Eating bread prepared from barley and oat has no problem, but it is not good to eat the bread of wheat. (Male, 52 years)

Concerning feeding, I use Barley, Teff, Corn, Beans, and Oats in my diet; I mix all together; compound all to make one, and use the mixture. Oh... no! I did not use sweets. As the doctor told me, if I eat, I will die, and I never touch it. (Male, 46 years)

I take care of myself a lot, because it (diabetes) is a serious illness. And I do not use sweet foods. I take recommended foods. I do not use prohibited items. I use everything that is not sweet. If I do not have a whim, I will not use butter too. (Female, 35 years)

Regarding food preparation, the most commonly mentioned were bread and ‘*Injera*’ (Soft flatbread) with their supplement or “*Shiro*” (*sauce* or main ingredient to make *sauce*). The preferentiality however is determined by the inputs, whether prohibited or permitted. These are cultural foods of the society. The others were “*Alcha*” (sauce with no red pepper), “*Kolo*” (roasted grain), juice, “*Nifro*” (*cooked grain*), “*Shamet*” (a drink prepared as suspension from powdered roasted barley), and biscuits. These were preferred to ameliorate hypoglycemia. They were also among the “*Markeshas*” (antidotes of insulin).

If there is no a biscuit, I will hold a loaf of bread in my pocket or highly cooked “Nifro” of beans or “Shamet” with my bag. I hold the “Shamet” with its solvent right now too. (Male, 63 years)

Regarding dressing, the most commonly preferred type of cloth was a comfortable wide open shoe to be protected from extreme cold and physical trauma. Closed and heel shoes, especially shoes made from rubbers were not-preferred, but open shoes were not also preferred in case of a long journey if the weather condition was assumed to be very cold.

I wear sandals and normal shoes at home. I feel pain inside my feet. My feet are going to be dry. And while I go to bed, I use “Vaseline” (ointment). I wear wide-closed shoes outside. Previously, I was saved when I had worn narrow shoes. It wounded me and I was in pain for a long time. Then, I am very cautious; just be careful not to hurt my feet. (Female, 35 years)

Insulin adherence. Most of the participants had experienced the positive outcome of insulin. They reported that there was a significant improvement in their overall health status after they started insulin. They have been strictly adhered to their insulin treatment. This was because they found it effective. They expressed that there would not be life if insulin was absent.

I have never missed it (insulin). It is life; is there more than life? The injection (insulin) is fine, nothing strange with it. (Male, 58 years)

After I started insulin for my “Siquar” (diabetes), I got that it (insulin) is the spice of life. (Female, 38 years)

Recognition of symptoms

Most patients reported that they had no glucometer to monitor their blood glucose level, but they used symptoms to monitor its fluctuations. They were practicing self-monitoring of blood glucose by being conscious of the symptoms of hypo- and hyperglycemia.

Hyperglycemia. These were symptoms used to monitor blood glucose levels. They were also used as alarms to remind the time of medication administration. The most common symptoms experienced by patients, while on insulin treatment,

whether due to under or missed dose of it, were frequent urination and increased thirst, and their consequence (dehydration). These symptoms were common to all patients. They were used as alarming clocks to control elevated blood glucose.

If I missed to take it (insulin), it (blood glucose) would be increased. When it does increase, you will feel increased thirst, frequent urination, and your mouth will dry. (Male, 66 years)

If I forgot it (insulin), I would be thirsty. When I realized it was forgotten, I became anxious, and used it right away. (Male, 63 years)

The other symptom was increased hunger. Fewer common symptoms, tremor, worrying, feeling of bad odor, and headache, were also mentioned.

If my medicine (insulin) fails to control it (blood glucose), it goes up. So, sometimes, at night, I feel hungry, and I eat “Injera” (soft flatbread) with “Berbere” (dried powdered red pepper). (Female, 71 years)

It (elevated blood sugar) brings me whatever could not be happened. When it becomes the worst, I assume me to be in death. If it is gone up, I feel the odor of black soil. (Female, 71 years)

Hypoglycemia. Shivering, excessive sweating, and falling were the most common symptoms of lowered blood glucose (hypoglycemia). Next to these were lethargy (tiredness) and grabbing (clutching) of the tongue. The most common initial and final symptoms were excessive sweating and falling, respectively.

When it (blood glucose) goes down, it causes me to sweat; it shakes my body and I will fall apart. (Female, 51 years)

When it (blood glucose) gets smaller, my sweat comes in; my body becomes watery; the whole of my body oozes hot water. Then, next, my mouth gets stuck; I speak incomprehensively, my body shakes, and I finally lied down on the land. (Female, 45 years)

When it (blood glucose) goes down, it sweats me, shakes me, my body becomes lethargic, and it throws me away. (Male, 59 years)

Dizziness and drowsiness were symptoms magnifying the major symptoms of hypoglycemia, but were the least common.

When it (blood glucose) lowered, I experienced excessive sweat; I feel dizzy, drowsy, and fainting. When the sweat dries, I fall. (Female, 70 years)

Mitigating mechanisms of symptoms

The most common management mechanism of hyperglycemia, while on insulin treatment, was taking an additional dose of

insulin. Next to that was a checkup (consulting doctors) and analysis of underlying causes. The third one was abstinence from sweet foods and drinks. The least common and seems to be strange were taking something bitter and bathing.

When the “Siquar” (blood sugar) lowered, I use “Mirinda” or sugar. Then I become fine. If it elevates, I use an additional dose of insulin, and I stop using sweet things. (Female, 38 years)

I will take a little something sweet when it (blood glucose) is going down. When it increases, I use something bitter, because, since sugar is sweet, it should be opposed by something bitter like that of light is disappeared by dark... you should do the opposite...should take bitter to disappear the sweet. (Female, 55 years)

When it does increase, I would go into the shower and let it (my body) cool down. And stop something sweet; stop at all, and then everything becomes alright. (Male, 46 years)

The universal means of correcting lower blood glucose was taking foods with carbohydrate content (all sweet things as their accessibility). However, the most commonly and customarily used mechanisms were using “Mirinda” (soft drink) and table sugar.

When the “Siquar” (blood sugar) goes down, if you give me a little sugar, I will be better; if “Mirinda” is at home, I will use it. (Female, 45 years)

Discussion

This study revealed that self-care maintenance include “*abstaining from what is prohibited*” and “*doing what is allowed*”. These were labeled to be preferential (to be approached positively) and non-preferential (to be approached negatively). These both were labeled in terms of food and clothing. The foods were also labeled based on their inputs whether the inputs contain carbohydrates or sometimes with no known reason (only based on local beliefs). So, based on this perception, wheat followed by pea was labeled to be the most non-preferential input. All food preparations containing it or prepared from it were prohibited. However, maybe due to the vitamin richness of whole wheat grain, high intake of whole grains has found to reduce the risk of T2DM ([Askari et al., 2013](#)).

All sweet preparations were also labeled to be forbidden unless in case of hypoglycemia due to insulin excess. Similarly, according to a study in India, most patients made restrictions to sweet intake ([Anitha Rani & Shriram, 2019](#)). Barley was labeled to be the most preferential input. All food preparations containing it or prepared from it were permissible. With no overlooking the strict classification of dietary preferences in this study, according to a quantitative study in public hospitals of Addis Ababa (Ethiopia), there were similar classifications of dietary patterns by patients with T2DM ([T/Michael, 2016](#)).

According to a review article, the seven essential self-care maintenance behaviors in people with diabetes were healthy eating, being physically active, monitoring of blood sugar, compliance with medications, good problem-solving skills, healthy coping skills, and risk-reduction behaviors (Shrivastava *et al.*, 2013). In supporting the perceptions of patients in this study, dietary patterns were reported to be effective for diabetes risk reduction if individual preferences are taken into account (Guess, 2016). It was also recommended that initial treatment of T2DM should be started with lifestyle changes (diet, exercise, and weight reduction) along with consultation of a registered dietitian and appropriate diabetes education (Wexler, 2020). The compliance of self-care maintenance practices of patients regarding diet in India was high (Selvaraj *et al.*, 2016), but according to a study conducted in Addis Ababa (Ethiopia), patients did not adhere to dietary recommendations (Tewahido & Berhane, 2017). However, no reports were found from other studies towards strict stratification of self-care maintenance practices by patients concerning diet input preference. The participants in this study had their-own model of self-care maintenance practices. As their perceptions, they are strict because if they do “*what is prohibited*,” they will become sick, but healthy if not. As their beliefs, if they do “*what is prohibited*,” they will get bad outcome.

Most patients reported that insulin was effective and had positive outcomes (impacts), particularly improvement in health. Their reason for the strictest adherence to insulin treatment was its effectiveness. They perceived that their adherence was the outcome of its effectiveness, and their health improvement was the impact of their adherence. It increased their confidence to survive. They stated that while diabetes took everything they had (physical capacity and psychosocial moods that they had been enjoying), insulin brings everything that they did not have (quality of life and emotional stabilities that they never expected). A cross-sectional study in Kuwait also reported that using an insulin pump was found to improve patients’ glycemic control and QOL as a consequence of improved satisfaction and adherence to doses (Alsairafi *et al.*, 2018). Similarly, patients in Butajjira and Addis Ababa (Ethiopia) have strictly adhered to their diabetes medicines (Habte *et al.*, 2016). Medication adherence was also found to be high in quantitative (Chinnappan *et al.*, 2020; Karthik *et al.*, 2020; Uma Maheshwari *et al.*, 2017) and qualitative (Selvaraj *et al.*, 2016) studies conducted in India. However, a quantitative study in southwest Ethiopia reported that medication adherence was low as a result of poor self-care behaviors (Kassahun *et al.*, 2016). According to quantitative studies conducted in Harar and Dire Dawa (Ayele *et al.*, 2019), Benishangul Gumuz (Chali *et al.*, 2018), and Gondar (Aschalew *et al.*, 2019) (Ethiopia), most patients with diabetes did not adhere to self-care maintenance activities.

Frequent urination and increased thirst with dehydration (dryness of tongue/mouth) were the most common symptoms experienced by patients with diabetes. These symptoms were the most common reasons for patients to seek health care. These were experienced by patients in case of uncontrolled blood glucose (hyperglycemia) due to inappropriate time or dose

estimation of insulin or because of forgetting to take it. These symptoms thus were used by patients whether to seek health care or to monitor their blood glucose. Frequent urination, increased thirst, and dehydration were common symptoms of hyperglycemia (Hopper, 2007). These symptoms were found to be key in diagnosing T2DM (Chege *et al.*, 2015).

Regarding lowered blood glucose (iatrogenic hypoglycemia), in their decreasing order of occurrence, excessive sweating (diaphoresis), shivering (shaking), and falling (fainting) were the most common symptoms. The most common initial (quickest) symptom of lowered blood glucose was excessive sweating while the final (worst) was falling. The symptom between these symptoms at the time of occurrence was shivering. They can also be neurogenic (shakiness, trembling, and sweating) and neuroglycopenic (difficulty speaking, ataxia, stupor, seizures, and coma) (Briscoe, 2006; Cryer, 2020; Diabetes Canada Clinical Practice Guidelines Expert Committee *et al.*, 2018). Nevertheless, no patients from other studies reported the symptoms of hypoglycemia in the level of their severities. This might be the patients in this study could be conscious of the temporal relationship of the symptoms in their time of occurrence. Such leveling and being conscious of the symptoms in the order of severity should be incorporated in diabetes education program.

The patients adapted different management mechanisms of hyperglycemia and hypoglycemia episodes while on treatment by using the major symptoms as alarm clocks (tools). During hyperglycemia, patients had an experience of taking an additional dose of insulin, which was the most common followed by a check-up and getting management at health institutions. Given the natural history of most patients with T2DM is the gradual rise of blood glucose, there should be a requirement of continuous treatment to maintain normoglycemia (Wexler, 2020). Thus, over time, additional prandial boluses of insulin may be required to maintain daytime normoglycemia (Bretzel *et al.*, 2009). In the case of hypoglycemia, most patients had been taking something sweet with carbohydrate content (being sugar and “*Mirinda*” the most common). Apple or orange juice, regular soft drinks and sweet beverages have been recommended. However, milk and orange juice are slower to increase blood glucose levels and provide symptom relief (Diabetes Canada Clinical Practice Guidelines Expert Committee *et al.*, 2018). Since, iatrogenic hypoglycemia is the limiting factor in diabetes management (Cryer & Arbeláez, 2016; Cryer, 2020), reducing the danger of hypoglycemia necessitates recognizing it, and applying optimum glycemic therapy (Cryer & Arbeláez, 2016) along with patient education and empowerment, regular self-monitoring of glycemia, individualized glycemic goals, flexible and rational insulin regimens, and ongoing professional guidance and support (Cryer, 2020).

Implications for the public

Since patients themselves are more responsible to manage diabetes, the level of their consciousness to bodily changes is the mainstay indicator to manage the condition, especially in self-care practices to maintain normoglycemia. Thus, the preferentiality principle of diet input experiences and the consciousness of

hypoglycemia symptoms in the order of their severity should be taken as inputs to diabetes education program. Incorporating these inputs in diabetes education with cultural contexts can improve diabetes self-care activities.

Strengths and limitations

The strengths of this study are that it was conducted at the largest tertiary hospital with the widest catchment in North-East Ethiopia, and three indigenous investigators participated. It employed face-to-face in-depth interviews to deeply explore the self-care experiences of patients and to our knowledge is the first interpretive phenomenological study in Ethiopia, which was conducted to explore the self-care experiences of patients with T2DM on an insulin regimen.

The limitations of this study are that it did not include type 1 and patients with gestational diabetes. It did not also consider the experiences of patients attending treatment at private hospitals. Additionally, the nature of qualitative research is inductive and context-based. Thus, it cannot be generalized to all patients with diabetes and other health institutions.

Implications for future research

Diabetes self-management is almost up to the patients' activities, and since the activities in this study were linked to preferentiality principles, research that investigates the driving behaviors for the preferentiality of self-care practices should be considered.

Conclusion

The self-care maintenance experiences of patients, concerning lifestyle issues, were labeled based on diet input preferences as preferential and non-preferential. The adherence to the preferential diet inputs and insulin treatment was strict. While the most common symptoms to recognize hyperglycemia were frequent urination, increased thirst and their consequence (dehydration), excessive sweating (quickest or severe), shivering

(middle or more severe), and falling (most severe) were alarms for hypoglycemia. The most common mitigating mechanisms of hyper- and hypoglycemia, respectively, were taking an additional dose of insulin and something sweet.

Data availability

Underlying data

All the data underlying the results, which did not bear confidentiality issues, are available as part of the article. If the de-identified transcripts are needed for scientific purposes, or to clarify ambiguities in the manuscript, they will be available from the corresponding author (ewunetie.mekashaw@wu.edu.et).

Extended data

Zenodo: Recognition of symptoms, mitigating mechanisms and self-care experiences of type 2 diabetes patients receiving insulin treatment in North-East Ethiopia. <http://doi.org/10.5281/zenodo.5112496> (Bayked *et al.*, 2021).

This project contains the following extended data:

- Patient information sheet.docx
- Research consent form.docx
- Semi-structured interview guide.docx
- Standards for Reporting Qualitative Research (SRQR) checklist.doc

Data are available under the terms of the [Creative Commons Attribution 4.0 International license](https://creativecommons.org/licenses/by/4.0/) (CC-BY 4.0).

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 **Demilade Ibirongbe** 

Department of Community Medicine, University of Medical Sciences, Ondo, Nigeria

The authors have satisfactorily revised the article in accordance with the reviews and comments made. I have no further comments and therefore approve the article to pass peer review.

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: I am an Epidemiologist and public health physician. My area of interest includes health care policy and management, health economics and infectious disease epidemiology

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 06 April 2022

<https://doi.org/10.21956/emeraldopenres.15750.r28107>

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 **Cathrine Tadyanemhandu** 

Department of Physiotherapy, School of Therapeutic Sciences, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, South Africa

The authors have revised all comments to my satisfaction, therefore I approve for the article to pass peer review.

Competing Interests: No competing interests were disclosed.

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.

Version 2

Reviewer Report 25 March 2022

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Cathrine Tadyanemhandu 

Department of Physiotherapy, School of Therapeutic Sciences, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, South Africa

Thank you for the opportunity to review the manuscript. I want to thank the authors for conducting such an important and relevant study. Please see my comments below

1. Second paragraph in the introduction, third sentence, change from diabetes patients to patients with diabetes and the whole document
2. Design and setting - revise the first sentence for it to read well, where you mention design and time frame.
3. Results - give the median age together with the interquartile range
4. The data procedure section to be more detailed for someone to be able to replicate the study. Give a detailed account, step by step.

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

Is the argument information presented in such a way that it can be understood by a non-academic audience?

Yes

Does the piece present solutions to actual real world challenges?

Yes

Is real-world evidence provided to support any conclusions made?

Yes

Could any solutions being offered be effectively implemented in practice?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: qualitative research, health promotion, patient education, quality of life of patients

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 28 Mar 2022

Ewunetie Mekashaw, Wollo University, Dessie, Ethiopia

We would like to thank you for your detailed view and constrictive comments. We have fixed all the issues you raised and provided as follows.

- Second paragraph in the introduction, third sentence, change from diabetes patients to patients with diabetes and the whole document

Thank you; We made the necessary changes in response to the feedback.

- Design and setting - revise the first sentence for it to read well, where you mention design and time frame.

Thank you; we have revised and adjusted it as needed.

- Results - give the median age together with the interquartile range,

Thank you; we have provided it.

- The data procedure section to be more detailed for someone to be able to replicate the study. Give a detailed account, step by step.

Thank you; this has been clearly and accurately re-presented as per the comment provided.

Competing Interests: No competing interests were disclosed.

Reviewer Report 29 October 2021

<https://doi.org/10.21956/emeraldopenres.15455.r27770>

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Demilade Ibirongbe 

Department of Community Medicine, University of Medical Sciences, Ondo, Nigeria

The article is on compliance of type 2 diabetes patients receiving insulin treatment in North-East Ethiopia with self-care practices, using an interpretive phenomenological approach. Data were collected from 24 participants using in-depth interviews till theoretical saturation. The data were analyzed thematically and organized using QDA Miner Lite v2.0.8. The study found that self-care maintenance practice of patients was linked with diet input preferences and the effectiveness level of insulin. Also, the patients strictly adhered to insulin treatment because they found it effective.

The study is clearly and accurately presented, with appropriate study design and statistical analysis. Current literature were also cited. The data, and results were clearly presented; and the conclusion is relevant to real world challenges. Implications for the public and for future research were discussed. While the article is technically sound, to improve readability, the authors should review the grammar of the article, especially in the Result and Discussion sections.

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

Is the argument information presented in such a way that it can be understood by a non-academic audience?

Yes

Does the piece present solutions to actual real world challenges?

Yes

Is real-world evidence provided to support any conclusions made?

Yes

Could any solutions being offered be effectively implemented in practice?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: I am an Epidemiologist and public health physician. My area of interest includes health care policy and management, health economics and infectious disease epidemiology

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.

Author Response 28 Mar 2022

Ewunetie Mekashaw, Wollo University, Dessie, Ethiopia

Thank you for your thorough analysis and insightful feedback.

- While the article is technically sound, to improve readability, the authors should review the grammar of the article, especially in the Result and Discussion sections.

Thank you; we have precisely fixed this.

Competing Interests: No competing interests were disclosed.
