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RESEARCH ARTICLE

Lifestyle patterns and dietary habits of patients living with type 2 diabetes mellitus attending primary healthcare facilities in Limpopo province, South Africa

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Background: Type 2 diabetes mellitus (T2DM) affects millions globally, including nearly two million South African adults, with increased projections by 2045.
Objectives: To assess lifestyle patterns and dietary habits of patients attending primary healthcare facilities in Limpopo Province, South Africa.
Design: This cross-sectional study assessed the sociodemographic profile, clinical data, lifestyle patterns, and dietary habits of patients living with T2DM. A structured researcher-administered questionnaire was used to collect data in Sepedi. Data were analysed descriptively using STATA 18 SE.
Setting: Community health centres and clinics in Blouberg Municipality. Participants: 225 consecutively sampled adults living with T2DM, aged ≥ 20 years.
Results: Most participants were over 60 years old (60%), female (72.44%), and had poor glycaemic control (62%). Overweight and obesity were 37.27% and 32.73%, respectively. Most women (88.28%) had high-risk waist circumferences. Tobacco and alcohol use were 13.78% and 5.78%, respectively. Most engaged in light activity (88%), and 49.78% spend 4–7 hours daily sitting at work. Daily fruit consumption was very low (4.89%), and 53.22% consumed vegetables 2–3 times per week. White porridge was the staple carbohydrate (76%), often consumed in double portions (52%). Conversely, 68.89% avoided sugary drinks, salt, and fats, and 90.67% consumed home-prepared meals.
Conclusion: Our study revealed that T2DM is prevalent among elderly women, with low fruit and vegetable intake and high carbohydrate consumption possibly linked to affordability and unavailability, rather than non-compliance with dietary recommendations. Socioeconomically tailored dietary advice, promoting vegetable gardening and physical activity among patients, as well as continuous education of healthcare professionals and community health workers, should be considered.

Keywords: alcohol, diabetes, diet, lifestyle, physical activity, smoking

Introduction

Type 2 diabetes mellitus (T2DM) is a chronic condition characterised by elevated blood sugar levels resulting from insulin resistance and beta-cell dysfunction.[1] It is a major clinical and public health issue globally and in developing countries, accounting for high rates of morbidity and mortality of people living with diabetes.[2,3] The recent International Diabetes Federation (IDF) report (2025) indicates that 11.1% (589 million) of the adult population (20–79 years) worldwide were living with diabetes in 2024. In South Africa, nearly 4.2 million adults were diagnosed with diabetes, and this number is expected to increase from 5.4 million among people aged 20–79 years in 2030 to 7.5 million in 2045, with a further 1.9 million among those who are undiagnosed.[4]

High rates of being overweight or obese, physical inactivity, and poor dietary practices are significant contributors to T2DM.[5,6] Moreover, diabetes is known to impact the quality of life and cause disability such as decreased bodily function, task performance, and activities of daily living.[7] Behavioural and lifestyle factors, such as alcohol consumption, unhealthy diet, smoking, and physical inactivity, should be considered by healthcare professionals in the prevention of diabetes.[8–10] In one study, moderate alcohol intake was associated with a reduced risk of T2DM, while smoking significantly elevated this risk fourfold.[11] Engaging in physical activity, even at moderate levels, has been shown to aid in weight loss, which reduces the risk of diabetes by approximately 27%.[10,12] High glycaemic load and trans-fats are associated with the development of T2DM in individuals with a higher body mass index.[13] To prevent or delay type 2 diabetes mellitus, the American Diabetes Association (ADA) (2025) advises maintaining a healthy weight, staying physically active, avoiding tobacco use, and avoiding excess sugar and saturated fats.[14]

A healthy diet helps lower glycated haemoglobin A1c (HbA1c) levels below the acceptable limit of 7%.[9,10] A healthy diet requires an average of 30% of the total energy intake being dietary fats, less than 10% intake from processed sugars, and an average of 15% of recommended dietary protein.[12,13,15] While nutrition's crucial role in controlling and preventing T2DM is established, food presents a significant challenge and a source of conflicting information for those managing the condition.[16] Research indicates that foods with the same amount of carbohydrate exchange can have a fivefold difference in glycaemic impact.[16]

Although the South African government has set out the goal of a "Long and healthy life for all" and recognises the need for

policies and strategies to reduce the quadruple burden of non-communicable diseases, diabetes remains one of the major challenges in the country. Non-compliance with treatment and lack of behavioural modification are common among adults with T2DM.[3,4,17] Consequently, patients with uncontrolled T2DM usually present with elevated blood glucose levels, and over time this may result in complications, poor quality of life, and increased risk of mortality.[18] This situation is further compounded by healthcare providers and health systems' related issues, such as prolonged waiting time due to a shortage of human resources.[12] Several studies have shown that suboptimal care of patients, partly as evidenced by uncontrolled blood glucose, is particularly prevalent in clinics, specifically in rural areas.[8,19] Therefore, this study aimed to assess lifestyle patterns and dietary habits of patients living with type 2 diabetes mellitus who attend primary healthcare facilities in the Blouberg Municipality, Limpopo province, South Africa.

Methodology

Study design and setting

This study used a cross-sectional descriptive design, where a standardised researcher-administered questionnaire was utilised to collect data from patients living with T2DM. The study was conducted in primary healthcare facilities within the Blouberg Local Municipality, located in the northern part of the Capricorn District of Limpopo province. The most common language spoken in the area is Northern Sotho (Sepedi). The municipality has 24 clinics and two Community Health Centres (CHCs). These healthcare facilities are divided into three local areas. Participating clinics were selected according to the highest reporting of chronic T2DM patients in each local area.

Study participants and sampling

The population consisted of patients diagnosed with T2DM, aged 20 years and above, who attended the healthcare facilities in Blouberg Municipality. The Raosoft sample size calculator (Raosoft.com) was used to calculate the required minimum sample size based on a target population of 6 520 adults with T2DM per year, an estimated 50% response rate, with a 5% margin of error and a 95% confidence interval. The estimated minimum sample size was 363 patients diagnosed with T2DM. Considering a 10% buffer to cater for non-response, the total sample was increased to 400. Of the 363 participants, 225 took part in the study, resulting in a response rate of 62%.

The study employed a multi-stage sampling method to select healthcare facilities. Initially, clinics in each local area were grouped and categorised by patient headcount. Subsequently, two clinics with the highest patient numbers were selected. All CHCs were included to ensure representativeness. This resulted in a sample of six clinics and two CHCs; however, one clinic did not grant permission to conduct the study. In the district, most patients receive their medication through the Central Chronic Medicines Dispensing and Distribution (CCMDD) programme and periodically visit the clinics to renew their prescriptions. This resulted in a limited number of patients being available at any given time in the facilities. Consequently, patients were selected consecutively until the minimum sample size was reached.

Data collection tool and data collection procedure

The data collection tool was designed for this study and guided by the WHO STEPwise approach to surveillance (STEPS). It was structured into four sections, using closed-ended questions. Section A comprised 11 items on sociodemographic variables (including age, gender, and marital status) and clinical parameters (such as blood glucose levels, body weight, and duration of treatment). Section B consisted of 10 items evaluating lifestyle factors, with particular emphasis on patterns of alcohol and tobacco consumption, including frequency, duration, and quantity of use. Physical activity levels were assessed in Section C using eight items that examined the intensity of occupational and domestic activities. The final section (Section D) incorporated 13 items investigating dietary behaviours, focusing on the consumption frequency of fruits and vegetables, predominant cooking methods (e.g. frying, boiling), and intake levels of sugar-sweetened beverages and dietary sodium.

The researcher read an information leaflet in Sepedi explaining the study to the participants while they waited in line. Participants who expressed interest in the study were guided individually to a private room for interviews. Each participant signed an informed consent before the commencement of the interviews. Each interview lasted approximately 15–20 minutes. Data collection took about 10 months, from September 2022 to July 2023. Raw data was captured on Google Forms™ (Google LLC), and then converted to an Excel spreadsheet (Microsoft Corp, Redmond, WA, USA) upon completion of data collection. Electronic questionnaires with missing data exceeding 10% were excluded from the analysis.

Statistical analysis

Data were imported into STATA version 18 (StataCorp LLC, College Station, TX, USA) for cleaning, coding, and analysis. Descriptive statistics were used to analyse data. Frequency distribution was used to analyse categorical data and presented as frequencies and proportions using tables and graphs.

Ethical considerations

Ethical clearance was obtained from the Sefako Makgatho Health Sciences University Research Ethical Committee (SMUREC) (reference number SMUREC/H/138/2022:PG). The Limpopo Provincial Department of Health granted permission to conduct the study in the healthcare facilities. Before data collection, participants were informed about the purpose of the research and their rights to voluntary participation and withdrawal from the study. Those who chose to participate were requested to sign an informed consent form before proceeding with the interviews. Confidentiality and privacy were ensured by using codes instead of names, and the data recorded were not shared.

Results

Demographical and clinical characteristics

Table 1 indicates that 60% ($n = 135$) of the participants were over the age of 60 years, mostly female (72.44%, $n = 163$), married (66.22%, $n = 149$), unemployed (75.56%, $n = 170$), receiving social grants (60%, $n = 135$), with no formal schooling (38.67%, $n = 87$). Over half of the participants (55.11%, $n = 124$) were on treatment for less than five years, and the majority used oral medication (91.56%, $n = 206$). About 61.57% ($n = 133$) of the participants had hemoglucotest results (HGT) above 10 mmol/l, and 37.27% ($n = 82$) were overweight. Most females (88.28%,

Table 1: Sociodemographic and clinical characteristics of the participants($n = 225$)

Variable	Frequency	Percentage (%)
Age categories		
< 30 years	3	1.33
30–39 years	6	2.67
40–49 years	27	11.11
50–59 years	56	24.89
60 + years	135	60.00
Gender		
Female	163	72.44
Male	62	27.56
Marital status		
Single	50	22.22
Married	149	66.22
Divorced	3	1.33
Widowed	23	10.22
Employment status		
Unemployed	170	75.56
Employed	12	5.33
Self-employed	2	0.89
Pensioner	41	18.22
Receiving government grant		
Yes	135	60
No	90	40
Educational level		
Primary school	75	33.33
Secondary school	35	15.56
Grade 12	21	9.33
College/University	7	3.11
No school	87	38.67
Duration on medication		
< 5 years	124	55.11
5–10 years	71	31.56
> 10 years	30	13.33
Both	13	5.78
Medication type		
Oral	206	91.56
Insulin	6	2.67
Both	13	5.78
HGT readings		
< 5 mmol/L	7	3.24
5–10 mmol/L	76	35.19
> 10 mmol/L	133	61.57
BMI categories		
< 18.5 kg/m^2	5	2.27
18.5–24.9 kg/m^2	61	27.73
25–29.9 kg/m^2	82	37.27
> 30 kg/m^2	72	32.73
Waist circumference		
Female		
Normal < 80 cm	14	33.33
Moderate risk 80–85 cm	20	39.39
High risk > 85 cm	128	88.28
Male		
Normal < 95 cm	28	66.67
Moderate risk 95–100 cm	13	60.61
High risk > 100 cm	17	11.72

$n = 128$) had a waist circumference (WC) greater than 85 cm, while 66.76% of males ($n = 28$) had a waist circumference less than 95 cm.

Lifestyle patterns

Tobacco use patterns among patients living with T2DM

Table 2 shows that most participants (86.22%, $n = 194$) in the study did not smoke. The 31 participants (13.78%) who reported smoking, smoked between one and ten cigarettes per day. Of the 194 participants who were not currently smoking, 3.61% ($n = 7$) had a history of smoking. Among those with a history of smoking, 57.14% ($n = 4$) smoked for over five years, and a similar proportion quit smoking a year or more ago.

Alcohol consumption patterns among patients living with T2DM

Table 3 reveals that the vast majority of participants (94.22%, $n = 212$) reported never consuming alcohol. Among those who reported alcohol consumption (5.78%, $n = 13$), only 4% ($n = 9$) had consumed alcohol in the past 12 months. Of these individuals who recently consumed alcohol, more than half (55.56%, $n = 5$) did so one to three days per month. All participants with recent alcohol consumption ($n = 9$) reported having at least one alcoholic beverage on one or two occasions. Most current drinkers (92.31%, $n = 12$) reported consuming alcohol at weekends, mainly Saturdays.

Physical activity among patients living with T2DM

Employment-related physical activity patterns

Table 4 indicates that 6% ($n = 14$) of participants were employed. Among those employed, only 1 participant (7.14%) reported occupational activities involving vigorous-intensity physical exertion, while 21.43% ($n = 3$) engaged in moderate-intensity work activities. The majority (71.43%, $n = 10$) described their employment as primarily sedentary, involving prolonged periods of sitting.

Domestic physical activity engagement

Of the 225 participants, only 4% ($n = 9$) engaged in vigorous physical activities at home. Those involved in domestic activities of moderate intensity constituted 40.44% ($n = 91$). Most participants (88%, $n = 198$) reported engaging in light physical activity during domestic routines. Almost half of the participants (49.78%, $n = 112$) reported sitting daily for durations between 4 and 7 hours. Regarding walking habits, 46.12% ($n = 95$) maintained a routine of walking for at least 10 minutes three to five times per week.

Dietary practices among patients living with T2DM

The results presented in Table 5 indicate that the majority of participants (58.22%, $n = 131$) consume fruit once a week, with a significant proportion (93.53%, $n = 188$) consuming only one serving of fruit per day. Apples were the most frequently consumed fruit (34.67%, $n = 78$). Regarding vegetable consumption, over half of the participants (54.22%, $n = 122$) consumed vegetables at least 2–3 days a week, and many (94.67%, $n = 213$) had at least one vegetable serving daily. The most frequently consumed leafy green vegetables were spinach (48%, $n = 108$) and "morogo" (30.22%, $n = 68$).

White porridge was the most commonly consumed starch (76%, $n = 171$), and 52% ($n = 117$) of the participants consumed two portions of starch per meal. A notable proportion of participants (68.89%, $n = 155$) reported not consuming sugar-sweetened beverages. Over half of the participants (55.56%, $n = 125$)

Table 2: Summary of smoking habits of T2DM participants($n = 225$)

Tobacco use		Frequency (*n*)	Percentages (%)
1. Do you currently use any tobacco products, such as cigarettes, pipes, or snuff?	Yes	31	13.78
	No	194	86.22
2. How many cigarettes do you smoke per day?	1–10	31	100
3. Did you previously smoke?	Yes	7	3.61
	No	187	96.39
4. How long did you smoke?	1–2 years	1	14.29
	3–5 years	2	28.57
	> 5 years	4	57.14
5. When did you stop using tobacco	1–6 months ago	2	28.57
	6–12 months ago	1	14.29
	1 year ago, and more	4	57.14

Table 3: Alcohol consumption patterns of participants with T2DM ($n = 225$)

Alcohol consumption		Frequency (*n*)	Percentages (%)
1. Have you ever consumed an alcoholic drink such as beer, wine, spirits or cider?	Yes	13	5.78
	No	212	94.22
2. Have you ever consumed alcohol within the past 12 months?	Yes	9	4.00
	No	216	96.00
3. During the past 12 months, how frequently did you have at least one alcoholic drink?	1–3 days per month	5	55.56
	Less than once a month	4	44.44
4. During the past 30 days, on how many occasions did you have at least one alcoholic drink?	1–2 occasions	9	100
5. Which days of the week would you normally consume alcohol?	Monday	1	7.69
	Saturday	9	69.23
	Sunday	3	23.08

Table 4: Physical activity among participants with T2DM($n = 225$)

Physical activity		Frequency (*n*)	Percentages (%)
1. Does your work involve vigorous-intensity activity that causes significant increases in breathing or heart rate, like carrying or lifting heavy loads, digging or construction work, for at least 10 minutes continuously?	Yes	1	7.14
	No	13	92.86
2. Does your work involve moderate-intensity activity that causes small increases in breathing or heart rate, such as brisk walking [or carrying light loads] for at least 10 minutes continuously?	Yes	3	21.43
	No	11	78.57
3. Does your work involve sitting for long hours?	Yes	10	71.43
	No	4	28.57
4. Do you engage in vigorous physical activity/exercise such as heavy gardening, jogging, soccer, or jumping rope?	Yes	9	4.00
	No	216	96.00
5. Do you engage in moderate physical activity such as brisk walking, stair climbing, car washing, floor mopping, general gardening, or carrying small children?	Yes	91	40.44
	No	134	59.56
6. Do you engage in light physical activity such as light walking, stretching, washing dishes, cooking, doing laundry, or standing?	Yes	198	88.00
	No	27	12.00
7. How much time in a day do you spend sitting?	< 4 hours	58	25.78
	4–7 hours	112	49.78
	> 7 hours	55	24.44
8. How many days per week do you walk for at least 10 minutes to get to and from places such as work, school, or shops?	1–2 days	80	38.83
	3–5 days	95	46.12
	6–7 days	31	15.05

Table 5: Dietary practices among patients living with T2DM ($n = 225$)

Diet		Frequency (*n*)	Percentages (%)
1. How many days per week do you eat fruit?	0–1 day	131	58.22
	2–3 days	67	29.78
	4–5 days	16	7.11
	6–7 days	11	4.89
2. How many servings of fruit do you eat on one of those days?	1 serving	188	93.53
	2–3 servings	12	5.97
	4–5 servings	1	0.50
3. Top three (3) fruit commonly consumed	Apples	78	34.67
	Oranges	45	20.00
	Bananas	18	8.00
4. How many days per week do you eat vegetables?	0–1 day	36	16.00
	2–3 days	122	54.22
	4–5 days	44	19.56
	6–7 days	23	10.22
5. How many servings of vegetables do you eat on one of those days?	1 serving	213	94.67
	2–3 servings	11	4.89
	4–5 servings	1	0.44
6. Top three (3) vegetables commonly eaten	Spinach	108	48.00
	Morogo*	68	30.22
	Cabbage	53	23.56
7. Common starch/carbohydrate foods eaten	White porridge	171	76.00
	Brown porridge	52	23.11
	White rice	9	4.00
8. Which portion size of starch do you consume per meal?	1 portion	106	47.11
	2 portions	117	52.00
	3 portions	2	0.89
9. Do you drink sugar-sweetened beverages?	Yes	70	31.11
	No	155	68.89
10. Do you use fat or oil for cooking?	Yes	125	55.56
	No	100	44.44
11. Fats/oil used	Sunflower oil	109	87.20
	Olive oil	13	10.40
	Canola oil	3	2.40
12. Do you use salt when cooking?	Yes	126	56.00
	No	99	44.00
13. How often do you eat meals that were not prepared at home?	Daily	1	0.44
	Once a week	2	0.89
	Once a month	18	8.00
	Never	204	90.67

*A term used to refer to any of the following traditional leafy green vegetables, such as *Amaranthus hybridus*; *Bidens pilosa*, *Citrullus lanatus*, *Cleome gynandra*, *Solanum scabrum*, or *Vigna unguiculata*, among others.

reported using fat or oil for cooking, with sunflower oil being the most commonly used (87.2%, $n = 109$). Furthermore, the majority of participants reported using salt when cooking (56%, $n = 126$). Lastly, a large majority of participants (90.67%, $n = 204$) indicated that they never consumed meals that were not prepared at home.

Discussion

The demographic characteristics of the study population revealed notable patterns that align with the burden of type 2 diabetes mellitus among older women.[2,20,21] Most participants in this study were female and over 60 years of age. The prevalence of type 2 diabetes mellitus increases with age for both genders and is higher in women in South Africa.[20] However, the IDF (2024) found no difference in the global prevalence between males and females.[22] The predominance of female participants may be attributed to health-seeking behaviour among women and/or a higher prevalence of T2DM among women in that setting. Most of these participants were unemployed, had low educational levels, and relied on social grants, highlighting the intersection between T2DM and socioeconomic vulnerability. Similar findings were reported in the Free State.[2] The above-mentioned issues influence health literacy, access to care, and the ability of patients to manage their conditions.[23] Socioeconomic inequalities significantly impact the prevalence of T2DM, which is observed to be higher among wealthier populations.[22,24] However, the most significant increase in prevalence is primarily seen in low- and

middle-income regions worldwide.[22] These findings highlight the importance of customised public health strategies that consider age, gender, and socioeconomic status in the prevention and management of T2DM in similar communities.

Despite being on treatment, most participants had abnormal random blood glucose levels, which may indicate poor glycaemic control. Studies in South Africa have reported that patients with T2DM had poor glycaemic control.[20,21,25] Poor glycaemic control is also common, affecting 45–93% of individuals with type 2 diabetes mellitus worldwide.[22] These factors were found to be associated with low educational attainment and advanced age,[25,26] both prevalent in this study population. Enhancing self-efficacy to promote self-care management can lead to better glycaemic control.

Obesity increases the risk of developing T2DM by promoting insulin resistance and is responsible for most cases globally.[22] Studies in South Africa reported a higher rate of obesity among women.[2,20,27] This trend is also observed in this study. Waist circumference measurements, which measure visceral fat, indicate that females are at a higher risk of developing T2DM and, consequently, cardiovascular diseases. These results are consistent with those of Huebschmann et al.[28] who also reported greater risk among women. The increasing prevalence of overweight, obesity, and high waist circumference is a public health concern due to higher mortality and morbidity related to obesity and the associated NCDs.[1]

Evidence shows that regular smoking is a significant risk factor for cardiovascular morbidity and mortality in patients living with T2DM.[13,29] Tobacco inhalation causes endothelial cell dysfunction, increases lipid oxidation, and activates both pro-inflammatory and pro-coagulation states, which cause coronary arterial disease.[30] Our study shows that most participants do not smoke. A study conducted by Boua et al.[31] found that most smokers were males, indicating a gender-specific pattern, as older females, in particular, preferred chewing tobacco. Campagna et al.[29] indicated that people who quit smoking still face a 10–20% risk of developing cardiovascular diseases compared with those who have never smoked. The low prevalence of smoking observed among participants in this study reflects positive health behaviour, which may contribute to slowing the progression of diabetes complications and reducing cardiovascular risk in this population.

In this study, a low prevalence of alcohol consumption was observed among participants with T2DM. Among the few participants who did report drinking, the majority indicated infrequent alcohol consumption, typically limited to one to three days per month, often at weekends. This pattern closely aligns with the findings of Reid et al.[2] These findings suggest that, compared with the general population, participants exhibit lower alcohol consumption, characterised by infrequent and minimal intake. This observed behaviour may contribute to improved glycaemic control and reduced risk of alcohol-related complications. If patients living with T2DM choose to consume alcohol, they must do so in moderation, defined as no more than one drink per day for women and two for men.[9,15] Alcohol consumption can increase the risk of hypoglycaemia, particularly when combined with insulin or insulin secretagogues,[9] and may also lead to premature death.[13] Therefore, patient education on safe alcohol use is critical in diabetes management.

Despite the established benefits of physical activity for diabetes management,[8] our study reveals low levels of physical activity and prolonged sitting, with limited or no vigorous activities. Walking, a key activity for diabetes management, falls below recommended levels for nearly half the participants. These findings contrast with studies that found higher activity levels among rural communities engaged in manual labour.[2] The results of this study, however, align with observations of low activity in older adults.[32] A systematic review conducted in South Africa has linked physical inactivity to the increasing burden of T2DM.[13] Engaging in regular physical activity aids the body cells in absorbing glucose, thereby reducing blood glucose levels. People with T2DM should be encouraged to perform 150 minutes of moderate-intensity aerobic exercise, at 50–70% of maximal heart rate, per week, as well as resistance training three times per week.[9] Our data suggest a need for interventions that encourage increased physical activity, particularly among those individuals who engage in prolonged sitting and light activity, regardless of their specific occupational or age demographics.

Our study reveals a significantly lower frequency of fruit and vegetable consumption among the study participants, with only one serving per week. The situation is even less encouraging for vegetable consumption. Similarly, Reid et al.[2] reported lower vegetable consumption in their study; however, fruit intake was higher. The low fruit and vegetable consumption may be due to affordability issues,[33] as most participants are elderly and unemployed, or due to seasonal availability.[13] The low consumption of fruits and vegetables is prevalent globally.[19] Type 2 diabetes patients should be encouraged to increase their intake of high-fibre fruits and vegetables, aiming for at least five servings per day.[9] These foods enhance satiety and provide phytonutrients, vitamins, and minerals that combat oxidative stress.[9]

White porridge was the dominant carbohydrate source in this study, closely followed by sorghum or brown porridge. Few participants consumed one portion of carbohydrates per meal; however, over half consumed two or more portions. This pattern suggests potentially high overall carbohydrate intake, warranting closer monitoring for glycaemic control. Foods that are high in carbohydrates should be whole grain and rich in B and E vitamins, and fibre, as these nutrients help improve glycaemic control and enhance satiety.[9] Individualised carbohydrate recommendations based on each patient's glucose levels will be beneficial. On a positive note, sugary-sweetened beverages (SSBs) seem to be consumed infrequently among the study participants. Cardiometabolic risk factors like increased blood pressure due to trans fats and salt intake play a significant role in the development of diabetes-related complications.[13] However, in this study, salt and fat/oil use seem to be limited, with over half of the participants avoiding them during cooking. Most participants prepared their food at home, which helped them manage their salt and fat intake. This suggests positive dietary behaviours in controlling salt and fat, though further investigation into overall carbohydrate intake may be warranted to optimise diabetes management.

Study limitations

This study is not without limitations. It was conducted in a specific geographical area, but with a limited sample size due to challenges in obtaining the requisite number of participants. As previously indicated, most participants visited the clinics only periodically because they received their medication through

the CCMDD programme. The small sample size may limit the generalisability of the results. The study may also have suffered from social desirability bias, where participants may underreport unhealthy behaviours or overstate acceptable practices, affecting the accuracy of the results. The random blood glucose test without HbA1c testing may overlook fluctuations in glucose management and glycaemic control, limiting the interpretation of glycaemic control outcomes. The study did not examine cultural beliefs or local food accessibility, which may have influenced dietary choices. Similarly, barriers to physical activity were not explored, which could explain more about sedentary lifestyles.

Conclusion and recommendations

This study highlights critical clinical and lifestyle characteristics among patients with T2DM in the study setting, indicating poor glycaemic control, low physical activity, and suboptimal dietary practices, particularly in fruit and vegetable consumption. Despite low smoking and alcohol use, the high prevalence of overweight and obesity, especially among women, and sedentary lifestyles highlights significant modifiable risk factors for diabetes complications. The socioeconomic vulnerability of participants, including unemployment and low education levels, further exacerbates these challenges, necessitating targeted interventions.

Healthcare professionals should tailor dietary recommendations to patients' socioeconomic circumstances, with a particular emphasis on appropriate portion control and affordable low-glycaemic index carbohydrate alternatives, such as sourdough bread, intermediate milled sorghum, and pearl millet. Practical advice should include food preparation techniques that reduce glycaemic impact, such as freezing and reheating bread. To support sustainable nutrition, patients should be encouraged to establish home vegetable gardens, an approach that simultaneously addresses dietary requirements and promotes physical activity.

Continuous training of healthcare professionals is crucial for improving diabetes self-management education and counselling competencies. This should also be extended to community health workers, who can deliver practical support at the grassroots level. Given the escalating global diabetes burden, targeted awareness campaigns must be prioritised to combat rising prevalence and mortality rates. Diabetes care programmes should incorporate mental health services to address the psychological dimensions of chronic disease management. Lastly, a multi-sectoral collaboration with stakeholders such as the Department of Agriculture could facilitate the establishment of community farming cooperatives to improve access to fresh produce. Complementary patient education on food preservation methods, including freezing and drying techniques – would help maintain year-round supplies of nutritious foods. These combined strategies would address both immediate nutritional needs and long-term food security for the community.

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