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Factors Associated with Self-Care Behavior among Patients with Type 2 Diabetes at a Referral Hospital in Cambodia: Application of the Common Sense Model (CSM)

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ABSTRACT

Introduction

Type 2 diabetes (T2D) is a significant global health issue, particularly in low- and middle-income countries such as Cambodia, where its prevalence is rising rapidly. This study investigated the factors associated with self-care behavior among patients with T2D at a referral hospital in Cambodia, utilizing the Common-Sense Model as a framework.

Methods

A cross-sectional study involving 196 participants aged 18 to 69 years who visited the outpatient ward of Kampong Speu Referral Hospital from January to March 2024 was conducted. Data were collected through structured questionnaires assessing sociodemographic characteristics, medical status, and self-care behaviors. Statistical analyses were performed using Stata V.14 to identify associations between these factors and self-care behaviors.

Results

Overall, 65.32% of patients had poorly controlled fasting blood glucose levels (>130 mg/dL), and 39.82% were classified as obese (BMI ≥ 25 kg/m²). Self-care behaviors varied across domains. Most participants reported regular exercise (97.96%) and medication adherence (86.73%), whereas fewer adhered to recommended dietary practices (38.78%) or foot care (30.61%), and only 4.57% performed regular blood glucose testing. A greater percentage of patients with poor diet was observed among patients without a follow-up HbA1c (55.83%) and those with poorly controlled HbA1c (35.0%) than among those with controlled HbA1c (9.17%) ($p = 0.005$). Similarly, poor dietary behavior was more common among patients with missing fasting blood glucose (FBG) data (83.33%) and uncontrolled FBG (60.94%) than among those with controlled FBG (50.0%) ($p = 0.026$). Patients with a duration of diabetes greater than 10 years also reported poor dietary behavior (80.56%) compared with those with a duration of diabetes greater than 6 months ($p = 0.022$). The participants also demonstrated awareness of the importance of reporting vision changes.

Conclusion

The results underscore the need for targeted interventions to improve self-care behaviors among T2D patients, particularly in managing obesity and blood glucose levels. This study emphasizes the role of sociodemographic factors in influencing self-care practices and suggests that enhancing patient education could lead to better health outcomes. This research contributes valuable insights into the self-care behaviors of T2D patients in Cambodia, suggesting the development of improved healthcare strategies to support effective diabetes management.

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Introduction

Diabetes is a chronic metabolic disorder characterized by hyperglycemia resulting from impaired insulin secretion, insulin activity, or both (1). Globally, diabetes has become a major public health challenge, with the prevalence among adults aged 20–79 years increasing by 46% in recent decades (2). Type 2 diabetes (T2D) accounts for approximately 90–95% of all cases and is strongly linked to lifestyle and behavioral factors, with the burden being particularly pronounced in low- and middle-income countries (3). In 2017, an estimated 462 million people, or 6.28% of the global population, were living with T2D, which increased to 506 million in 2021 (4, 5). The disease caused 23.9 million new cases, 1.6 million deaths, and 75.3 million disability-adjusted life years (DALYs) in 2021, with projections suggesting that the number could reach 552 million by 2030 (4). T2D is associated with various complications, such as cardiovascular disease, neuropathy, nephropathy, and retinopathy, which increase morbidity and mortality (6). Beyond health impacts, the global direct cost of diabetes is estimated at US$ 827 billion annually, disproportionately affecting low- and middle-income countries (7).

In Cambodia, the burden of T2D is increasing rapidly. According to the Ministry of Health in Cambodia, the number of T2D patients increased to 29,730, 56,152, and 91,000 cases in 2015, 2017, and 2022, respectively (8, 9). At Kampong Speu Referral Hospital, the number of outpatient cases of T2D increased from 188 in 2018 to 602 in 2021 (10). However, these figures are derived primarily from public health facilities and may underestimate the true national burden, as many patients seek care in the private sector, which is not fully captured in routine government reports. These trends nonetheless reflect an urgent need for improved management strategies, particularly at the hospital level.

T2D is a lifelong condition requiring continuous medical care and active patient involvement in self-care. The American Diabetes Association (ADA) emphasizes self-care as essential for preventing complications, reducing hospitalizations, and lowering emergency visits (11). Core self-care behaviors include dietary control, physical activity, medication adherence, blood glucose monitoring, and foot care (12). Adherence to these practices improves glycemic control, reduces complications, enhances quality of life, and decreases healthcare costs (13-16). However, adherence is often influenced by patients' perceptions and beliefs. In Cambodia, low health literacy and poor diabetes knowledge have been reported, particularly in rural areas. A study in Kampong, Speu Province, revealed low self-efficacy and limited understanding of diabetes management among patients with T2D (17, 18). These findings highlight barriers to effective self-care in resource-limited settings.

The common-sense model (CSM) of self-regulation provides a useful framework for understanding how individuals form illness representations and beliefs related to the identity, cause, timeline, consequences, and controllability of illness that influence coping and self-care behaviors (19). Research has shown that positive control perceptions are associated with proactive self-care and better outcomes, which are often mediated by self-efficacy and coping strategies (20). CSM-based interventions, such as structured education and counseling, have improved self-care adherence and self-efficacy among T2D patients (21). In addition, patients' perceptions strongly influence the effectiveness of self-monitoring practices such as blood glucose testing (22).

Self-care behaviors among patients with T2D are influenced by sociodemographic and psychosocial factors such as age, education, income, disease duration, knowledge, and self-efficacy (23, 24). While these determinants have been widely studied in other contexts, evidence from Cambodia remains limited, particularly regarding how such factors influence self-care in hospital settings. Given the increasing burden of T2D and the gaps in local research, there is a clear need to investigate the factors associated with self-care behaviors in Cambodian hospital contexts. The findings provide evidence to inform contextually appropriate interventions aimed at strengthening diabetes management and improving patient outcomes in Cambodia. Therefore, this study uses a common-sense model to explore the status of self-care behaviors and associated factors among patients with T2D at Kampong Speu Referral Hospital, Cambodia.

Methods

This study employed a cross-sectional design to assess self-care behaviors among patients with T2D at Kampong Speu Referral Hospital, Cambodia. The research utilized a reliable and valid instrument to measure self-care behaviors, ensuring that the data collected were both accurate and relevant to the study's objectives.

A. Sampling and sample size

We used a convenience sampling method, which is particularly useful for researchers with limited time and resources in health facilities. This approach allowed the researchers to select participants who were readily available and willing to participate in the study. The inclusion criterion was that only patients who had been diagnosed with T2D and had been receiving treatment at OPD, Kampong Speu Referral Hospital (KPS-RH), were included. The final sample consisted of 196 patients with T2D.

B. Research instrument

The research instrument used in this study was developed in alignment with CSM, which highlights the interaction between illness perceptions, coping behaviors, and health outcomes in chronic disease management. It consisted of four parts. The first part focused on sociodemographic characteristics and included nine items: sex, age, religion, education, household income, occupation, marital status, family members, and social health protection schemes. Within the CSM framework, these contextual factors shape patients' illness perceptions and coping responses.

The second part addressed the medical status of the participants and included nine variables: HbA1c level, fasting blood glucose level, type of treatment, duration of diabetes, health education, body mass index (BMI), complications, comorbidities, and smoking status. These indicators are conceptually related to the illness identity and perceived consequences dimensions of the CSM. Data for this section were obtained from patients' medical records and verified with participants during the interview to ensure accuracy and completeness. Objective clinical data such as HbA1c levels, fasting blood glucose levels, BMI, complications, and comorbidities were extracted directly from the most recent hospital records (over the past three months). Moreover, variables such as type of treatment, duration of diabetes, smoking status, and prior health education were confirmed through self-reports and cross-checked with medical files. The third part, including the Diabetes Self-Care Knowledge Questionnaire (DSCK-30), is a validated thirty-item questionnaire aimed at evaluating the self-care knowledge of patients with T2D. It was structured with three main components: modifiable lifestyle factors (18 items), adherence to diabetic self-care (8 items), and the consequences of uncontrolled blood sugar levels (4 items). It is a structured test with two possible answers, "yes" and "no." It is unique, simple, and specific for measuring diabetes self-care knowledge. Each participant's DSCK-30 score was calculated. Every right answer was worth one point, and every incorrect answer was worth zero. The percentage was used to determine the overall score. High levels of self-care knowledge are attributed to study participants who correctly answered 70% or more of the knowledge questions. Conversely, participants who answered fewer than 70% of the knowledge questions were considered to have low levels of self-care knowledge (25).

The fourth part assessed self-care behaviors using the Summary of Diabetes Self-Care Activities (SDSCA) scale developed by Toobert and Glasgow (26). This scale was adapted to measure coping responses as outlined in the CSM and included items across five domains: diet (five questions), physical activity (two questions), blood glucose monitoring (two questions), medication adherence (three questions), and foot care (five questions). Patients were asked to report the frequency of each activity during the past seven days, with responses scored on an 8-point scale ranging from 0 to 7, where 0 represented the least desirable behavior and 7 the most desirable. This section reflects the coping strategy component of the CSM,

illustrating how patients' illness perceptions are translated into practical self-care behaviors that influence health outcomes.

C. Data collection process

Data collection was conducted between January and March 2024. The researcher (principal investigator) carried out all the data collection procedures. Prior to data collection, the researcher ensured adherence to ethical standards and followed standardized procedures for administering questionnaires and extracting clinical data. An informed consent was obtained from all participants before their inclusion in the study. The researcher administered the adapted SDSCA and DSCK-30 scales, ensuring that the participants clearly understood each question and the purpose of the study. For the medical status section, clinical data, including HbA1c, fasting blood glucose, BMI, comorbidities, and complications, were collected from participants' hospital medical records by reviewing their most recent laboratory and clinical entries.

Additional information, such as treatment type, duration of diabetes, health education history, and smoking status, was obtained through direct interviews and verified against medical records when available. Data collection was conducted in a systematic manner to ensure accurate and consistent recording of responses. To minimize recall bias, participants were asked to report their self-care behaviors over the past seven days, excluding any days when they were unwell. This structured and careful approach enhanced the reliability and validity of the study findings.

D. Ethical consideration

The final study protocol was reviewed and approved by the NECHR on December 5, 2023 (Ref # 2402). The researchers ensured the protection of participants' privacy and confidentiality by not using their names or any identifiable information in the study documentation. Additionally, the study was designed to avoid any harm to participants, adhering to core research ethics principles.

E. Data analysis

Descriptive statistics were used to summarize participants' demographic characteristics, medical status, self-care knowledge, and self-care behaviors, which were measured by the SDSCA scale, which includes five domains—diet, exercise, blood glucose testing, medication adherence, and foot care. Bivariate analyses to assess associations between sociodemographic and medical variables and self-care behaviors were performed using chi-square tests. Statistical significance was set at $p < 0.05$. All analyses were conducted using Stata version 14 (Stata Corp, College Station, TX, USA).

Results

A. Demographic characteristics

The average age of the participants was 56.91 years, with the majority being female (56.12%) and married (98.98%). The largest proportion of participants completed elementary school (39.8%) and were nonofficers (84.18%). A significant portion (63.27%) had a monthly income less than 800,000 riels, and 78.06% had social health protection.

Table 1. Description of the sociodemographic data of patients with T2D who attended the OPD of Kampong Speu Referral Hospital, Cambodia (n = 196)

Variables	Frequency	Percentage
Sex		
Male	86	43.88
Female	**110**	**56.12**
Age group (years)		
< 45 years	31	15.82
45 - 54 years	41	20.92
55 - 69 years	**124**	**63.27**
Mean age in years (SD)	56.91 (9.88)	
Marital status		
Single	2	1.02
Married	**194**	**98.98**
Education levels (years)		
No schooling	28	14.28
Primary school (1 - 6)	**78**	**39.80**
Secondary school (7 - 9)	47	23.98
High school and above	43	21.94
Occupation		
Officer	31	15.82
Nonofficer	**165**	**84.18**
Religion		
Buddha	**195**	**99.49**
Christian	1	0.51
Monthly income		
Low (< 209.5$)	**124**	**63.27**
Medium (209.5-767.5)	72	36.73
Family members		
1-2	34	17.35
3-5	**107**	**54.59**
≥ 6	55	28.06
Mean family numbers (SD)	4.62 (2.19)	
Social health protection schemes		
No	43	21.94
Yes	**153**	**78.06**

B. Medical status

Medically, 31.13% of participants did not have controlled HbA1c levels (≥ 7%), and 65.32% had high fasting blood glucose levels. The majority (97.45%) were on oral medication, and 39.82% were classified

as obese (BMI ≥ 25 kg/m²). Notably, 90.31% received health education from health providers, 71.94% had comorbidities, and 90.82% were nonsmokers.

Table 2. Description of the medical status of patients with T2D (n = 196)

HbA1c level (%)	**Frequency**	**Percentage**
Control (< 7%)	31	15.81
Not control (≥ 7%)	**61**	**31.13**
Not follow up (2 to 3 months)	104	53.06
Fasting blood glucose (mg/dl)		
Control (80 - 130 mg/dl)	44	22.44
Uncontrolled (> 130 mg/dl)	**128**	**65.32**
Missed data	24	12.24
Type of treatment		
Diet control only	1	0.51
Oral medication only	**191**	**97.45**
Oral medication + insulin	4	2.04
Duration of diabetes		
(6 months - 5 years)	**121**	**61.73**
(6 - 10 years)	39	19.9
(> 10 year)	36	18.37
Body mass index (kg/m^2)		
Underweight (≤ 18.49 kg/m^2)	7	3.57
Normal (18.5 - 22.9 kg/m^2)	71	36.21
Overweight (23 - 24.9 kg/m^2)	40	20.4
Obese (≥ 25 kg/m^2)	**78**	**39.82**
Mean BMI (SD)	23.92 (3.27)	
Health education		
No	19	9.69
Yes	**177**	**90.31**
Comorbidities		
No	55	28.06
Yes	**141**	**71.94**
Complication		
No	67	34.18
Yes	**129**	**65.82**
Smoking status		
No	**178**	**90.82**
Yes	18	9.18

C. Self-Care Knowledge and Behaviors

A study revealed that 78.34% of patients had a high level of self-care knowledge. Table 3 shows the frequency of diabetes self-care behaviors among the study participants based on the Summary of Diabetes Self-Care Activities (SDSCA) scale. Most participants engaged in regular exercise, with 97.96% reporting exercising five to seven days per week. Medication adherence was also high, with 86.73% of participants taking their prescribed medications consistently. In contrast, only 38.78% of participants reported following a healthy diet for five to seven days per week, defined as consuming vegetables, fruits, and whole grains regularly while limiting the intake of sugar, salt, and saturated fat. Adherence to footcare practices was low, with only 30.61% of the participants performing footcare on most days of the week. Similarly, blood glucose monitoring was the least practiced self-care activity, with only 4.59% of participants performing it regularly.

Table 3. Frequency of diabetes self-care behaviors among study participants based on the SDSCA scale

Self-care behavior	0 - 4 days/week, n (%)	5 - 7 days/week, n (%)
Diet	120 (61.22)	76 (38.78)
Exercise	4 (2.04)	192 (97.96)
Blood glucose testing	187 (95.41)	9 (4.59)
Foot care	136 (69.39)	60 (30.61)
Medication adherence	26 (13.27)	170 (86.73)

D. Self-care behaviors in patients with T2D in specific questions of each domain

Diet: Half of the diabetes patients in the study followed a healthy diet (53.57%) for five to seven days per week, defined as consuming vegetables, fruits, and whole grains regularly while limiting sugar, salt, and saturated fat intake in accordance with the WHO and ADA recommendations. Most of them adhered to the meal/drink plan for the past month (54.08%) and ate five or more portions of fruits and vegetables (60.2%) for zero to four days per week. However, “Eating red meat and/or whole milk derivatives," the scores of which are inverted, revealed that diabetes patients were likely to eat foods rich in fat (66.84%) on most days, and diabetes patients did not distribute the number of carbohydrates evenly (56.12%). **Exercise:** The proportion of diabetes patients who exercised was very high, at most five to seven days per week; more (97.96%) of them exercised at least 30 minutes of physical activity, but half of them performed specialized exercise (56.63%) for zero to four days per week. **Blood glucose testing:** Looking at the proportion of regular blood glucose tests, it was very low; approximately 4% of patients checked their blood glucose levels at home, and approximately 4.6% checked their blood glucose levels at the recommended frequency. **Foot care:** In this dimension, for five to seven days per week, approximately 66.33% of the diabetes patients checked their feet, 57.65% performed dry cleaning between toes, and 93.88% performed foot washing. However, they performed from zero to four days per week, such as checking the inside of their shoes (54.06%) and doing foot baths (93.88%). **Medication adherence:** Medication adherence was the last dimension; most diabetes patients took oral medications as directed (86.73%), and 85.71% took the indicated number of antidiabetic pills for five to seven days per week.

Table 4. Frequency of self-care behaviors among patients with T2D for each specific item (n = 196)

Self-care behaviors under (SDSCA)	Implementation Frequency			
	0 - 4 days/week		5 - 7 days/week	
	n	%	n	%
1. Diets				
Following a healthy diet	91	46.43	105	**53.57**
Adhering to the meal/drink plan for the past month	106	**54.08**	90	45.92
Eating five or more servings of fruits and vegetables	118	**60.20**	78	39.80
Eating foods rich in fat	65	33.16	131	**66.84**
Distribute the amount of carbohydrates evenly	110	**56.12**	86	43.88
2. Exercise				
Exercising at least 30 minutes of physical activity	4	2.04	192	**97.96**
Exercising specialized physical activities	111	**56.63**	85	43.37
3. Blood glucose testing				
Testing blood glucose level at home	188	95.92	8	**4.08**
Checking your blood glucose levels at the recommended frequency	187	95.41	9	**4.59**
4. Foot care				
Checking patient's feet	66	33.67	130	**66.33**
Checking the inside of a patient's shoes	104	**53.06**	92	46.94
Performing foot wash	12	6.12	184	**93.88**
Doing a foot bath	184	**93.88**	12	6.12
Performing dry cleaning between toes	83	42.35	113	**57.65**
5. Medication adherence				
Taking oral medications as directed	24	12.24	170	**86.73**
Injecting insulin and oral medications as indicated	0	0	4	**2.04**
Taking the indicated number of anti-diabetic pills	26	13.27	16	**85.71**

E. Associations with self-care behaviors

Several significant associations between clinical and sociodemographic factors and self-care behaviors are shown in Table 5. Poor dietary behavior varied significantly by glycemic status. A greater percentage of patients with poor diet was observed among patients without a follow-up HbA1c (55.83%) and those with poorly controlled HbA1c (35.0%) than among those with controlled HbA1c (9.17%) ($p = 0.005$). Similarly, poor dietary behavior was more common among patients with missing fasting blood glucose data (83.33%) and uncontrolled fasting blood glucose (60.94%) than among those with controlled fasting blood glucose (50.0%) ($p = 0.026$). The proportion of patients who reported poor dietary behavior was greater for those with a duration of diabetes greater than 10 years (80.56%) than for those with a duration of diabetes between 6 months and 5 years (58.68%) or between 6 and 10 years (51.28%) ($p = 0.022$). Poor foot care was significantly associated with health education and comorbidity status. A greater percentage of participants who did not receive health education received poor foot care than did those who received health education did (89.47% vs 67.23%; $p = 0.046$). Similarly, poor foot care was more common among participants without comorbidities than among those with comorbidities (80.0% vs 65.25%; $p = 0.044$).

Table 5. Sociodemographic and medical status factors associated with self-care behaviors among patients with T2D (n = 196)

Variables	Poor diet		Good exercise		Poor blood glucose testing		Poor foot care		Good medication adherence	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Sex										
Male	50	58.14	85	98.84	83	96.51	62	72.09	79	91.86
Female	70	63.64	107	97.27	104	94.55	74	67.27	91	82.73
Aged group (years)										
< 45 years	14	45.16	31	100.00	30	96.77	24	77.42	30	96.77
45 - 54 years	28	68.69	41	100.00	40	97.56	29	70.73	31	75.61
55 - 69 years	78	62.90	120	96.77	117	94.35	83	66.94	109	87.90
Marital status										
Married	119	61.34	190	97.97	185	95.36	134	69.07	169	87.11
Single	1	50.00	2	100.00	2	100.00	2	100.00	1	50.00
Education levels (years)										
No schooling	17	60.71	28	100.00	28	100.00	17	60.71	27	96.43
Primary school (1 - 6)	55	70.51	76	97.44	74	94.87	56	71.79	64	82.05
Secondary school (7 - 9)	25	53.19	46	97.87	45	95.74	37	78.72	41	87.23
High school and above	23	53.49	42	97.67	40	93.02	26	60.47	38	88.37
Occupation										
Officer	21	67.74	31	100.00	29	93.55	23	74.19	27	87.10
Nonofficer	99	60.00	161	97.85	158	95.76	113	68.48	143	86.67
Monthly income										
Low	77	62.10	121	97.58	118	95.16	87	70.16	109	87.90
Medium	43	59.72	71	98.61	69	95.83	49	68.06	61	84.72
HbA1c level										
Control	11	**09.17****	30	96.77	29	93.55	24	77.42	29	93.55
Poor controlled	42	**35.00**	59	96.72	59	96.72	45	73.77	51	83.61
No follow-up HbA1c	67	**55.83**	103	99.04	99	95.19	67	64.42	90	86.54
Fasting blood glucose (mg/dl)										
Control (80 - 130 mg/dl)	22	**50.00***	44	100.00	41	93.18	31	70.45	39	88.64
Uncontrolled (> 130 mg/dl)	78	**60.94**	124	96.88	122	95.31	91	71.09	108	84.38
Missed data	20	**83.33**	24	100.00	24	100.00	14	58.33	23	95.83

Variables	Poor diet		Good exercise		Poor blood glucose testing		Poor foot care		Good medication adherence	
	Freq	**%**	**Freq**	**%**	**Freq**	**%**	**Freq**	**%**	**Freq**	**%**
Type of treatment										
Medication only	117	61.26	187	97.91	183	95.81	133	69.63	165	86.39
Diet control only	0	0.00	1	100.00	1	100.00	1	100.00	1	100.00
Oral medication + Insulin	3	75.00	4	100.00	3	75.00	2	50.00	4	100.00
Duration of diabetes (years)										
6 months - 5 years	71	**58.68**	118	97.52	115	95.04	87	71.90	100	82.64
6 - 10 years	20	**51.28***	39	100.00	38	97.44	28	71.79	36	92.31
More than 10 years	29	**80.56**	35	97.22	34	94.44	21	58.33	34	94.44
Body mass index kg/m^2)										
Underweight (≤ 18.49 kg/m^2)	6	85.71	7	100.00	7	100.00	7	100.00	6	85.71
Normal (18.5 - 22.9 kg/m^2)	40	56.34	70	98.59	69	97.18	44	61.97	62	87.32
Overweight (23 - 24.9 kg/m^2)	21	52.50	40	100.00	38	95.00	27	67.50	36	90.00
Obese (≥ 25 kg/m^2)	53	67.95	75	96.15	73	93.59	58	74.36	66	84.62
Health education										
No	15	78.95	18	94.74	18	94.74	17	**89.47**	16	84.21
Yes	105	59.32	174	98.31	169	95.48	119	**67.23***	154	87.01
Comorbidities										
No	33	60.00	54	98.18	53	96.36	44	**80.00**	46	83.64
Yes	87	61.70	138	97.87	134	95.04	92	**65.25***	124	87.94
Complication										
No	41	61.19	66	98.51	65	97.01	52	77.61	56	83.58
Yes	79	61.24	126	97.67	122	94.57	84	65.12	114	88.37
Smoking status										
No	107	60.11	175	98.31	169	94.94	121	67.98	154	86.52
Yes	13	72.22	17	94.44	18	100.00	15	83.33	16	88.89

***Note:** * p value < 0.05, ** p value < 0.01*

Discussion

The findings of this study on self-care behaviors among T2D patients in Cambodia align with and expand upon previous research conducted in the region. The results of this study revealed a significant number of patients with poorly controlled HbA1c levels (31.13%) and high fasting blood glucose levels (65.32%). These findings are consistent with earlier findings from the Cambodia–Korea Twinning Project, which reported low glycemic control status in adults with diabetes, where 82.9% of treated individuals did not meet the recommended HbA1c threshold. This suggests a persistent challenge in achieving effective diabetes management in Cambodia (17).

Approximately 39.82% of the participants were obese (BMI $\geq$ 25 kg/m^2), which is comparable to findings from Ghana (40.1%), Thailand (41.64%), and Vietnam (46.8%) (27, 28, 29). These similarities may reflect shared lifestyle, cultural, and economic factors. However, the lower prevalence in South India (20.5%) and higher rates in Tamil Nadu (58%) and Saudi Arabia (48%) suggest the influence of dietary patterns, physical activity, socioeconomic conditions, and healthcare access (30, 31, 32). Populations with better healthcare services benefit from regular screening, nutritional counseling, and treatment programs that help prevent and manage obesity. In contrast, limited healthcare access may delay diagnosis, reduce opportunities for health education, and restrict access to professional support, leading to higher or poorly managed obesity rates.

Our study revealed that 71.94% of participants had comorbidities or combined diseases (hypertension and kidney failure), which is similar to a study in Egypt that reported 85.6% (33). However, differences in comorbidity rates were reported in other studies, such as 51.7% in Southwest Ethiopia and 85.3% in Malaysia (34, 35). These variations may be due to differences in lifestyle factors, sample size, healthcare access, and socioeconomic conditions. For example, diet and exercise can affect the development of comorbidities. Approximately 65.82% of participants experienced complications from T2D (including hypertension, neuropathy, foot ulcers, numbness, and eye problems), which aligns closely with a study from the Oromia Region of Ethiopia that reported a rate of 64.8% (36). This similarity may be due to shared demographic and lifestyle factors among the population, such as common dietary habits, physical activity levels, and access to healthcare. In contrast, other studies reported varying rates of complications, with rates of 32.1%, 40.8%, 50% and 70.8% (29, 34, 37, 38). Such variations could be attributed to differences in sample size, geographical location, and the timing of data collection.

The current research revealed that while 78.34% of patients had high levels of self-care knowledge, the actual performance of self-care behaviors varied significantly. For instance, only 4.57% of the participants consistently tested their blood glucose levels. This discrepancy between knowledge and practice has been noted in other studies, indicating that despite being aware, many patients struggle to implement effective self-care routines. Previous research has highlighted that the failure of diabetes health initiatives is often due to patients' self-care routines being overlooked (39). Furthermore, the findings of this study reveal several significant factors associated with self-care behaviors among patients with diabetes. A statistically significant association was observed between comorbidity status and poor foot care practices ($p = 0.04$). Poor foot care was more prevalent among participants without comorbidities (80.00%) than among those with comorbidities (65.25%). These findings suggest that individuals without additional health problems may perceive themselves as less vulnerable and therefore may pay less attention to preventive foot care. In contrast, patients with comorbidities may have more frequent contact with healthcare providers, providing greater opportunities for counseling and the reinforcement of self-care behaviors. These findings are consistent with those of Bodke et al. (40), who emphasized that diabetes is commonly accompanied by multiple comorbidities that increase the risk of complications, potentially heightening patients' awareness of preventive practices.

Similarly, health education was significantly associated with foot care practices ($p = 0.046$). Poor foot care was more common among participants who did not receive health education, indicating the important role of structured educational interventions in promoting preventive behaviors. As highlighted by Bodke et al. (41), effective patient education is a key component of comprehensive diabetes management, particularly in reducing preventable complications. Strengthening continuous and structured health education programs may therefore contribute to improving foot care practices and minimizing long-term adverse outcomes. In addition to foot care, dietary practices were significantly associated with key clinical indicators, including the HbA1c level ($p = 0.005$), fasting blood glucose (FBG) level ($p = 0.026$), and duration of diabetes ($p = 0.022$). A poor diet was more prevalent among participants with poorly controlled or unmonitored glycemic levels and among those living with diabetes for more than 10 years.

These findings suggest that inadequate dietary adherence is closely linked to poor glycemic control and may decline over time, possibly because of treatment fatigue or reduced motivation. This pattern is supported by Bross et al. (42), who reported that patients often face practical and perceptual barriers to maintaining healthy eating behaviors, and by Salvia and Quatromoni (43), who emphasized that sustained, behavior-focused nutritional strategies are essential for effective glycemic management. Collectively, these results underscore the need for continuous, patient-centered education and long-term behavioral support to strengthen self-care practices and improve clinical outcomes in patients with diabetes.

Limitations

This study has several limitations that should be acknowledged. Selection bias cannot be excluded, as the data were collected exclusively from a single referral hospital (RH) in KPS Province; therefore, the findings may not be generalizable to broader populations. Additionally, the small sample size may have influenced the results, resulting in some categories being classified as "empty and omitted," which may affect the robustness of the conclusions. Furthermore, the study focused solely on Cambodian individuals with T2D, which may limit the applicability of the findings to other cultural contexts. The cultural context encompasses variations in dietary practices, health beliefs, use of traditional medicine, lifestyle behaviors, socioeconomic conditions, and access to healthcare services, all of which can influence the onset, management, and outcomes of T2D. For example, differences in staple diets, perceptions of disease, health-seeking behaviors, and levels of social and familial support may affect treatment adherence and glycemic control. Consequently, these findings may not be fully generalizable to populations in different cultural or geographic settings. Future research should include more diverse populations to enhance external validity.

Conclusion

A study on self-care behaviors among patients with T2D at a referral hospital in Cambodia revealed several critical insights. While diabetes self-care knowledge was generally high, adherence to self-care behaviors, particularly dietary habits and blood glucose monitoring, was notably low in key areas. This gap indicates a significant challenge in translating knowledge into practice, which is crucial for effective diabetes management. The findings suggest that various factors, including cultural beliefs, healthcare access, and education level, play a role in influencing self-care behaviors. This study highlights the need for tailored interventions that consider these factors to improve self-care practices among T2D patients in Cambodia.

To enhance self-care behaviors among T2D patients in Cambodia, the following recommendations are proposed, with educational interventions implemented to implement targeted educational programs that focus on practical self-care skills, such as meal planning, regular blood glucose monitoring, and the importance of medication adherence. These programs should be culturally sensitive and accessible to patients with varying educational backgrounds. Community support programs establish community-based support groups that encourage the sharing of experiences and strategies among patients. Such groups can

foster a sense of belonging and motivate individuals to adhere to self-care practices. Finally, healthcare providers train-train healthcare providers to better understand the barriers faced by patients in managing their diabetes. This training should include strategies for effective communication and support to empower patients in their self-care efforts.

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Conflict of interest

There are no conflicts of interest.

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