Dietary Behaviour and the Nutritional Status among Type II Diabetic Patients in the Diabetic Unit, Central Hospital, Vientiane Capital, Lao PDR

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ABSTRACT

Type 2 diabetes is a growing global health concern, especially in Laos. Research highlights the importance of diet and nutrition in managing the disease. This study aimed to evaluate the dietary behaviours and nutritional status of patients with type 2 diabetes at the Diabetic Unit of the Central Hospital.

This cross-sectional study involved 308 participants recruited through multi-stage random sampling. Researchers administered a pretested questionnaire and conducted a nutritional assessment using the Malnutrition Universal Screening Tool (MUST) to identify malnutrition, risk of malnutrition, or obesity. Participants also reported their food consumption over the past 24 hours for nutrient analysis, which will be conducted using Inmucal Nutrients Version 3.2. Data were entered into Excel and analysed in STATA version 13 using Multiple Logistic Regression, with results presented as adjusted Odds Ratios (OR) and 95% confidence intervals (CI), at a significance level of $p < 0.05$. The study also offers management guidelines for care plans.

The study found that 58.4% of participants were female, with an average age of 59. The body mass index (BMI) was 24.3 kg/m², and 2.6% were underweight. Regarding nutritional status, 20.1% were normal, 70.8% were at risk of malnutrition, and 9.1% were malnourished. Many participants had insufficient nutrient intake: 77.6% lacked sufficient protein, and nearly all were deficient in calcium (99.3%) and several vitamins. Factors affecting nutritional status in type 2 diabetes patients included income (AOR=0.6, P=0.046) and daily sugar intake (AOR=1.9, P<0.016).

Patients with type 2 diabetes are at high risk of malnutrition. Doctors should prioritise health education on healthy eating and managing sugar intake to mitigate nutritional risks.

Keywords: Dietary behaviour, nutritional status, Type II diabetes.

INTRODUCTION

Nutritional status is a state of health that results from inadequate intake of food, Absorption and use of nutrients and from any disease state that counteracts these processes (American Diabetes Association [ADA], 2018). Malnutrition is defined by the World Health Organisation as: An " imbalance" of cells during nutrient uptake, energy, and Physical needs to ensure growth, maintenance, and specific functions.

Therefore, it may progress to malnutrition. Or " at risk of obesity " (World Health Organisation [WHO] , 2021).

Non-communicable diseases are the leading cause of death and disabilities worldwide, especially type 2 diabetes 2 It is recognised as a serious public health problem that has a significant impact on humanity. and High costs of healthcare (Khan et al., 2020).

Nutritional imbalances in diabetic patients may be influenced by various factors. Such as using only over-the-counter diabetes medications, not having enough access to food, not consuming enough food, choosing foods that lack adequate nutritional value and including the presence of comorbidities that may limit adequate nutrient absorption Or Changes in appetite due to chronic illness (Varma, 2021). In low-income countries, findings show that 77% of all deaths are from non-communicable diseases (Non-Communicable Diseases [NCDs]). This increases the health burden from non-communicable diseases, including in Southeast Asia. Such as in Laos (WHO, 2021). Non-communicable diseases and Risk factors such as diabetes, high blood pressure, and cerebrovascular disease cause illness and death among the majority of the Lao population (WHO, 2021; Vonglokham et al., 2018).

Nutritional risks are assessed using screening tools, nutritionists, and doctors. Nurse. Nutritional screening of patients with diabetes can help identify those at risk of malnutrition. Several screening tools have been used to identify those at risk. Changes in diet, eating habits, daily activities, and Complications related to diabetes treatment (Varma, 2021). In that, the International Nutrition Screening Tool (Malnutrition Universal Screening Tool [MUST]) is widely used and is a precise tool for assessing the nutrition of diabetic patients (The 'MUST' Toolkit, 2020). To identify the adult diabetic population and Elderly people with nutritional deficiencies or at risk of malnutrition. Or obesity (British Association for Parenteral and Enteral Nutrition [BAPEN], 2020). It also includes guidelines for the management of diabetic patients that may help to plan future patient care. In addition, it has been confirmed that Close monitoring of patients at risk of malnutrition should be standard practice. In case there are not enough nutrition staff and the system for transporting high-risk patients is not yet standardised. (Varma, 2021). Therefore, the purpose of this study was to study food consumption behaviour, assess nutritional status using the "MUST" tool, and identify factors related to the nutritional status of patients with type 2 diabetes 2 Those who come to receive services at the diabetes clinic, Central Hospital, Vientiane Capital.

RESEARCH METHODS

This study is a cross-sectional analytical design to investigate the food consumption behaviors and nutritional status of patients diagnosed with type 2 diabetes. Utilizing the Malnutrition Universal Screening Tool (MUST), the research incorporates quantitative methods and face-to-face interviews to gather data on a 24-hour dietary intake. This approach allows for a nuanced analysis of the factors influencing the dietary habits of diabetic patients. The study was conducted at the Central Hospital in Vientiane Capital, providing valuable insights into the intersection of nutrition and diabetes management within this specific population. By understanding these dietary behaviors, the research aims to contribute to enhanced nutritional interventions for individuals living with type 2 diabetes.

This study focuses on the Central Hospital in Vientiane Capital, which comprises six institutions: Maha Sod Hospital, Maternal and Newborn Hospital, Setthathirat Hospital, Mittaphab Hospital, Children's Hospital, and Eye Health Hospital. For the purposes of this research, a central hospital featuring a general internal medicine department and a diabetes clinic was selected. The primary facilities selected for the study include Maha Sod Hospital, Friendship Hospital, and Setthathirat Hospital. The research commenced in March 2025 and is scheduled for completion in December 2025. This timeline allows for a comprehensive analysis of the selected hospitals' capabilities and their impact on patient outcomes, particularly concerning diabetes care. The study aims to assess the efficacy of the internal medicine department and the diabetes clinic in providing quality healthcare services to the community.

Methodology and Sampling Design

Study Population and Eligibility Criteria

The target population comprises individuals diagnosed with type 2 diabetes receiving routine clinical services. To ensure data validity and participant safety, specific eligibility requirements were established:

- Inclusion Criteria:
  - Clinical diagnosis of type 2 diabetes.
  - Attendance at routine follow-up examinations under medical supervision.
  - Proficiency in spoken and written Lao to ensure comprehension of assessment procedures.
  - Provision of voluntary informed consent to participate in the study.

Sample Size Calculation

The sample size calculation was derived using the statistical framework established by Santin et al. (2019). Based on this formula, the required sample size was determined to be $N = 308$ participants.

Sampling Method

A multi-stage proportionate sampling strategy was employed to select participants across representative healthcare institutions:

- Stage 1 (Hospital Selection): Three central hospitals were selected out of the total six available central hospitals.
- Stage 2 (Proportionate Allocation): The target sample size ($N = 308$) was proportionally distributed among the three selected institutions based on monthly patient volume in their respective General Internal Medicine Departments and Diabetes Clinics.
- Stage 3 (Participant Selection): Simple random sampling was conducted daily from the registration logs of attending patients within each selected department.

Tools

The tools used in this data collection include: Demographic characteristics of people with diabetes, history of diabetes, awareness of diabetes, food consumption behaviour using a 24- hour food diary, physical activity, and sleep. Demographic characteristics There are 6 The question is gender, Age, occupation, educational level, marital status, religion, and average monthly family income; Diabetes history factors consisted of 8 questions: duration of diabetes, medications used to treat diabetes, duration of use of medications to treat diabetes, medication discontinuation, duration of medication discontinuation, occurrence of diabetic ulcers, diabetes-related comorbidities, and existing comorbidities; Diabetes awareness, The questionnaire was adapted from the study of (Mphasha, et al., 2021; Alemayehu, et al., 2020), there will be a total of 22 questions. The questions include both positive and negative aspects. Each question has 5 possible answers, rated 1 to 5. For positive questions, the scoring is 1 = strongly disagree, 2 = disagree, 3 = not sure, 4 = agree, 5 = strongly agree. For negative questions, the scoring is 5 = strongly disagree, 4 = disagree, 3 = not sure, 2 = agree, 1 = strongly agree. The classification of cognitive level groups is based on Bloom's taxonomy. 1985, which will be classified as 2 levels: High awareness requires a score Overall average > 80% And low awareness must have an overall average score ≤ 8 0% Which phrase was adapted from (Mphasha, et al., 2021; Alemayehu, et al., 2020); Physical activity 12 The questions are:

Vigorous physical activity (in the past 7 days, how many days did you do vigorous physical activity, lifting heavy objects, digging, mowing the lawn, doing aerobics, riding a fast bike), Moderate physical activity (in the past 7 days, how many days did you do moderate physical activity, carrying small objects, riding a bike at a normal speed, playing tennis), Light physical activity (in the past 7 days, did you walk at least 10 How many minutes a day, in the past 7 days, how much time did you spend sitting ?) The correlation analysis is divided into 2 groups: 1. Have an active level of physical activity (practical) ≥ 8 0% and 2. Has a low level of physical activity (practical) < 8 0%. This will ask about the activities carried out in 1 Week. Sleeping: Adapted from a study by (Hansen et al., 2013). There are 4 in total. The question consists of Sleep problems, fatigue from insomnia, use of insomnia medication, and the average number of insomnia episodes per 1 Last week.

Data Analysis

The Excel program is used for data entry, followed by analysis in Stata Version 13.0. Descriptive statistics summarise the data with measures such as counts, percentages, mean, standard deviation, median, and range (min and max values).

Inferential statistics explore relationships in type 2 diabetes factors using univariate logistic regression to assess associations between independent variables and a dependent variable, with results presented as odds ratios, confidence intervals, and p-values.

For the final analysis, multiple ordinal logistic regression is conducted, including only variables with a p-value less than 0.25 from the univariate analysis, with results reported as adjusted odds ratios, confidence intervals, and p-values.

Research Ethics

The research ethics approval was granted by the Research Ethics Committee of the University Science Health under Issue No. 308/REC, dated 10/5/2025. The study was conducted in accordance with established procedures, respecting individual rights. Participants were closely monitored to ensure that the ethics surrounding the sample group were upheld. Before answering the questionnaire, participants were fully informed and provided their consent. Their privacy and confidentiality were guaranteed, and all information collected was kept confidential, accessible only to the researchers involved.

RESEARCH RESULTS

Demographic characteristics of diabetic patients

Table 1 outlines the demographic characteristics of diabetic patients classified by gender among the 308 study participants. The data reveal that a significant majority of these patients (58.4%) are female, reflecting a notable gender disparity within the population studied. The cohort primarily consists of older adults, with the average age reported at 59 years, indicating that 53.3% fall into this age category.

Employment status among participants shows a predominance of individuals working as housewives or housekeepers, accounting for 35.7% of the sample. Education levels among the group display a wide range, with 28.9% having attained primary school education and 16.2% achieving junior high school graduation. This variation suggests disparities in educational attainment that may impact health literacy and management of diabetes.

In terms of financial stability, over three-quarters of the participants (85.7%) reported that their average monthly family income was below the threshold of 2,600,000 Kip, with 51.3% of these individuals earning at or below this level. The income distribution further illustrates a minimum monthly income of 1,000,000 Kip and a maximum reaching up to 60,000,000 Kip, highlighting significant economic variation among patients. This comprehensive demographic understanding is crucial for tailoring health interventions and support systems for diabetic patients within this population.

Table 1. Demographic characteristics of diabetic patients by gender

Variable	Number (n=308)	Percentage (%)
Gender		
Man	128	41.6
Woman	180	58.4
Age		
≤ 59	164	53.3
> 60	144	46.7
Mean=59; SD=9.529; Min=31; Max = 84		
Occupation		
Government employee	32	10.4
Private employee	18	5.8
Retired employee	5 9	19.1
Worker	11	3.6
Trade	23	7.5
Housewife / Housefather	110	35.7
Farmer	3	1
Gardener / Farmer	8	2.6
Others (private business, garment factory, beauty salon, etc.)	44	14.3
Highest level of education		
Not studying / Never studied	22	7.1
Primary school	89	28.9
Floor High school	50	16.2
Floor High school	46	14.9
Basic vocational training	10	3.2
Middle-class profession	27	8.8
Higher education	21	6.8
University and above	43	14.1
Marital status		
Single	14	4.5
Marriage	264	85.7
Not divorced/widowed.	30	9.8
Average monthly family income		
≤2,600,000	158	51.3
>2,600,000	150	48.7
Median= 2,600,000; Min=1,000,000; Max = 60,000,000.		

Medical History Factors

The study conducted on factors associated with a history of diabetes provides important insights into the management and comorbidities prevalent among diabetic patients. Findings indicate that a significant portion of participants (66.6%) had been diagnosed with diabetes for over five years, highlighting the chronic nature of the disease in this population. Among these long-term patients, a substantial majority (90.6%) utilized oral medications as their primary method of management, which underscores the reliance on pharmacological intervention in controlling diabetes.

Moreover, the data reveals that 66.6% of participants had been on diabetes medications for five years or more, suggesting a consistent adherence to prescribed treatment regimens. Notably, an overwhelming 92.9% of these individuals reported never running out of their medication, indicating effective access and management of pharmaceutical supplies. In terms of complications related to diabetes, the study observed

that almost all participants (96.1%) were free of wounds, which reflects positively on the overall foot care and monitoring within this group. However, for those who did experience wounds, a significant majority (66.8%) reported these occurrences on the right foot, pointing to potential areas for enhanced vigilance and preventive care.

Additionally, the study highlighted that a considerable percentage of the diabetic patients (70.0%) presented with other comorbidities, with high blood pressure being the most prevalent condition, affecting 72.5% of the participants. These findings imply a need for comprehensive management strategies that address not only diabetes but also associated health conditions to improve patient outcomes. Further details of the study can be found in Table 2, which provides a more extensive breakdown of the data.

Table 2. Diabetes information

Variable	Number (n=308)	Percentage (%)
Time since diagnosis of diabetes by a physician (years)		
≤5 years	103	33.4
>5 Years	205	66.6
Mean=8.07; SD=6.5; Min=1; Max = 39		
Use of diabetes medication		
Medicine	279	90.6
Medicine and Injection	29	9.4
Duration of diabetes medication use (year)		
≤5 Years	103	33.4
>5 years	205	66.6
Mean=8.07; SD=6.5; Min=1; Max = 39		
What type of medication are you taking? Are you currently on any diabetes medication		
Ever	22	7.1
Never	286	92.9
Number of times missed (n=22)		
1	16	72.7
2	4	18.3
4	1	4.5
5	1	4.5
Number of days without medication (n=22)		
≤30	20	90.9
>30	2	9.1
Body wounds		
Yes	12	3.9
None	296	96.1
If yes, area of wound on body		
Right arm	1	8.3
Right foot	8	66.8
Left hand	1	8.3
Right hand	1	8.3
Left foot	1	8.3
Besides diabetes, you have other comorbidities.		
Yes	216	70.1
None	92	29.9
Other co-morbidities		
Eggs are in bad shape.	24	8.9

High blood pressure	195	72.5
Heart doctor	13	4.8
Pneumonia	2	0.7
Rheumatoid arthritis	7	2.6
Cancer	2	0.7
Other conditions include fat deposits in the heart, anaemia, and gastrointestinal issues.	26	9.8

Diabetes Awareness

The Diabetes Awareness Study provides critical insights into the dietary management strategies adopted by individuals living with diabetes. The findings underscore the importance of specific dietary goals aimed at maintaining nutritional status and decelerating the progression of the disease. A significant 62.3% of participants reported having established goals for managing their diabetes diet, indicating a proactive approach to their health. Furthermore, 61.4% acknowledged the potential for diabetes to adversely affect kidney function, highlighting a common concern among diabetic patients regarding the long-term implications of their condition.

The study also revealed a preference for meal frequency among respondents, with 64.3% agreeing that consuming small meals throughout the day is an effective strategy for managing blood sugar levels. This aligns with the understanding that large meals could lead to spikes in blood sugar; an assertion supported by 69.8% of participants.

Awareness regarding dietary components is prevalent, as evidenced by 62.3% of respondents recognizing the need to limit high-fat dairy products and protein-rich animal products. Similarly, 62.7% highlighted the importance of avoiding high-sodium foods, which is crucial for overall health management in diabetic individuals. Crucially, there is a strong consensus on the role of nutrition in diabetes management, with 69.5% of participants affirming its significance. The study further emphasizes the essential inclusion of fruits and vegetables in the diet for controlling blood sugar levels, supported by 69.2% of respondents. Additionally, effective management of food intake is deemed necessary for weight loss, particularly among the overweight population, as echoed by 68.2% of participants. In conclusion, the Diabetes Awareness Study elucidates the dietary priorities and concerns of individuals with diabetes, reflecting a communal understanding of the importance of nutrition in managing their health. For further statistical details, readers are encouraged to refer to Table 3.

Table 3. Diabetes awareness and Food consumption

Variable	Answer n=308 (%)				
	Str on	Di sa gre	No t sur e	Ag ree d	T o t a
Diabetes is a condition in which the body has higher than normal blood sugar levels due to a lack of insulin or insulin resistance	1 (0.3)	2 (0.7)	149(48.4)	109(35.4)	47(15.2)
Diabetes is a disease that cannot be cured.	1(1.9)	12(3.9)	38(12.3)	149(48.4)	103(33.5)
The goal of food management is to organise meals for diabetics to maintain good nutritional status, slowing the development of complications.	0	1(0.3)	42(13.6)	192(62.3)	73(23.8)
Diabetes can cause eye problems or may lead to blindness	0	1(0.3)	22(7.1)	170(55.2)	115 (37.4)
Diabetes is caused by the failure of the kidneys to filter sugar from the urine.	6(1.9)	22 7.1)	59(19.2)	141(45.8)	80(26.0)
In untreated diabetes, blood sugar levels often increase.	0	1(0.3)	16(5.2)	172(55.8)	119 (38.7)
Diabetes can lead to a loss of sensation in the hands,	0	2(0.6)	23(7.4)	166(53.9)	117

fingers, and feet.					(38.1)
Shaking and sweating are signs of low blood sugar.	0	5(1.6)	42(13.6)	182(59.2)	79(25.6)
Frequent urination and Thirsty It is a symptom of high blood sugar.	0(0.1)	3(1.0)	28(9.1)	172(55.8)	105 (34.1)
Diabetes can damage kidney function.	0	3(1.0)	33(10.3)	188(61.4)	84(27.3)
Diabetes control: Food control and Exercise More important than medicine	0	6(1.9)	39(12.7)	154(50.0)	109 (35.4)
Dietary habits in diabetic patients are important in preventing the development of osteoarthritis *	5(1.6)	19 6.2)	175 56.8)	98(31.8)	11(3.6)
It is good to eat small meals, often. To manage blood sugar	1(0.3)	1(1.6)	31(10.1)	198(64.3)	73(23.7)
Most diabetic foods are special foods.	3(1.0)	21 6.8)	172 55.8)	97(31.5)	15(4.9)
Eating a large amount of food at once may cause blood sugar levels to rise.	0	5(1.6)	20(6.5)	215(69.8)	68(22.1)
Avoid high-fat dairy products, including high-protein animal products.	0	4(1.3)	35(11.4)	192(62.3)	77(25.0)
It's good to cut down on salty foods. Including foods high in sodium such as Ready-made food	0	6(1.9)	30(9.7)	193(62.7)	79(25.7)
It is good to reduce sugary foods, including avoiding added sugar in drinks and foods	0	2(0.6)	19(6.2)	180(58.4)	107 (34.8)
Nutrition plays a key role in managing diabetes.	0	0	32(10.4)	214(69.5)	62(20.1)
Vegetables and Fruits must be eaten. Because it is good for controlling blood sugar.	0	1(0.3)	50(16.2)	213(69.2)	44(14.3)
High-fibre whole grains are recommended as a healthy source of carbohydrates.	0	1(0.3)	148 48.0)	148(48.0)	11(3.7)
When there is too much water as a diabetic, it is good to control your diet to lose weight.	0	11 3.6)	50(16.2)	210(68.2)	37(12.0)

Daily energy and nutrient intake of type 2 diabetic patients

Table 4 provides a comprehensive overview of the daily energy and nutrient intake of patients diagnosed with type 2 diabetes. The findings of the study indicate that a significant majority of patients achieved adequate levels of calcium (Ca), vitamin B1, and vitamin B2, with intake rates recorded at 99.3%, 89.6%, and 88.3%, respectively. In contrast, vitamin C intake was deemed insufficient in a notable 87.7% of the patient population.

Furthermore, the data reveal that most participants maintained normal levels of fat, energy, and carbohydrate consumption, with adherence rates reported at 98.4%, 95.1%, and 81.2%, respectively. However, it is concerning that over three-quarters of the patients (77.6%) experienced protein intake deficits, while the cohort collectively exceeded the recommended daily sugar intake by a significant margin of 36.0%. These insights highlight critical areas for dietary intervention among individuals managing type 2 diabetes, pointing to a need for improved micronutrient intake, particularly regarding vitamin C and protein consumption.

Table 4. Daily nutrient intake for type 2 diabetic patients

Variable	Number (n=308)	Percentage (%)
Calcium (mg)		
Not enough (> 900 mg)	306	99.3
Enough (≤ 900 mg)	2	0.7

Mean = 195.5575; SD = 193.919; Min=12.67993, Max=2331.479		
Vitamin B1 (mg)		
Not enough (Male > 1.2 mg , girl > 1.1 mg)	276	89.6
Enough (Male ≤ 1.2 mg , female ≤ 1.1 mg)	32	10.4
Mean = 0.6902503; SD = 0.528649; Min=0.061301, Max=3.596236		
Vitamin B2 (mg)		
Not enough (Male > 1.3 mg , girl > 1.1 mg)	272	88.3
Enough (Male ≤ 1.3 mg , female ≤ 1.1 mg)	36	11.7
Mean = 1.028256; SD = 6.01665; Min=0.0316965, Max=105.8358		
Vitamin C (mg)		
Not enough (Male > 90 mg , girl > 75 mg)	270	87.7
Enough (Male ≤ 90 mg , female ≤ 75 mg)	38	12.3
Mean = 42.15503; SD = 59.7055; Min=0, Max=594.7128		
Energy (Kcal)		
Usually (Male > 2100 Calories , girl > 1750 Kcal)	293	95.1
Exceed (Male ≤ 2100 Kcal , female ≤ 1750 Kcal)	15	4.9
Mean = 1006.552; SD = 540.8812; Min=138.3559, Max=5240.22		
Carbohydrates (grams)		
Usually (Male > 262.5 gr ,girl > 218.5 gram)	250	81.2
Exceed (Male ≤ 262.5 gr , girl ≤ 218.5 grams)	58	18.8
Mean = 168.5429; SD = 99.76093; Min=23.75485, Max=998.6478		
Fat (grams)		
Usually (Male > 70 gr ,girl > 58.3 grams)	303	98.4
Exceed Male ≤ 70 gr , girl ≤ 58.3 grams)	5	1.6
Mean = 18.41911; SD = 17.29823; Min=0.9796648, Max=167.863		
Protein (grams)		
Not enough (Male > 57 gr ,girl > 52 grams)	239	77.6
Enough (Left ≤ 57 gr ,girl ≤ 52 grams)	69	22.4
Mean = 41.66415; SD = 25.14385; Min=5.34128, Max=256.1192		
Daily sugar intake behavior (grams)	grams)	
Usually (Male > 17 grams , girl > 17 grams)	197	64.0
Exceed (Male ≤ 17 gr , female ≤ 17 grams)	111	36.0
Mean = 17. 0 389; SD = 19.34041; Min=1, Max=118.6024		

Amount of energy and nutrients consumed in the past 24 hours

A study examining the daily energy and nutrient intake of a sample group revealed the following findings: women received a greater percentage of the Daily Recommended Intake (DRI) for energy, at 59.1%, compared to men. However, when it came to protein, carbohydrates, and fats, men had a higher intake, receiving 81.9%, 72.1%, and 30.0% of their respective DRIs.

In terms of vitamins, women outperformed men in vitamin C and vitamin B1, with intake levels at 56.9% and 81.8% of the DRI, respectively. Conversely, men consumed more vitamin B1 and calcium, achieving 66.7% and 23.6% of their DRIs, respectively. (Further details can be found in Table 5.)

Table 5. Daily Energy and Nutrient Intake of Mild Diarrhoea Patients

Energy and nutrients	Male sample group (n= 128)			Female sample group (n=180)		
	Amount received	**DRI**	**% DRI**	**Amount received**	**DRI**	**% DRI**
Energy (Kcal)	1134.0	2100	54	1035.5	1750	59.1

Protein (grams)	46.7	57	81.9	38	52	73.1
Carbohydrate (gram)	189.3	262.5	72.1	153.7	218.75	70.3
Fat (grams)	21.0	70	30.0	16.5	58.3	28.3
Vitamin C (mg)	41.2	90	45.7	42.7	75	56.9
Vitamin B1 (mg)	0.8	1.2	66.7	0.6	1.1	54.5
Vitamin B2 (mg)	0.8	1.3	61.5	1.1	1.1	81.8
Calcium (mg)	212.7	900	23.6	183.3	900	20.4

DRI = Food consumption reference from Thailand Nutrition Office (20 03)

Factors associated with food consumption behavior and nutritional status of patients with type 2 diabetes (Analysis: Multiple Ordinal Logistic Regression Analysis).

These findings underscore the critical nature of socio-economic and dietary factors in managing nutritional outcomes among patients with type 2 diabetes. Further details and statistical analyses can be referenced in Table 6. To understand the dynamics between food consumption behavior and the nutritional status of patients with type 2 diabetes, a focused univariate analysis was performed.

Key independent variables were selected based on their association with a p-value of less than 0.25. These variables encompassed demographic and behavioral factors, including age, education level, income brackets, diabetes diagnosis, diabetes medication usage, sleep patterns, fat consumption, and daily sugar intake.

Following the univariate analysis, an analysis of variance (ANOVA) technique was employed to systematically identify and eliminate variables exhibiting a p-value greater than 0.05, utilizing a backward elimination approach. This methodical process ensured that the final model retained only those variables that demonstrated a significant association with the dependent variables, characterized by a p-value of less than 0.05.

The results obtained from the Multiple Ordinal Logistic Regression analysis revealed noteworthy associations. Specifically, individuals whose monthly income was at or above 2,600,000 kip showed a 40% reduction in the risk of malnutrition when compared to their counterparts earning below this threshold (Adjusted Odds Ratio: AOR = 0.6; 95% Confidence Interval: CI: 0.3-0.9; p-value < 0.046). Furthermore, the data indicated that individuals who frequently consumed high amounts of sugar—defined as 17 grams or more daily—were 1.9 times more likely to experience undernutrition compared to those who maintained lower sugar consumption levels (AOR = 1.9; 95% CI: 1.1-3.2; p-value < 0.016).

Table 6. Factors related to nutrition (P-value < 0.05) Multiple Ordinal Logistic Regression)

Variable	Nutritional status			COR (95%CI)	AOR (95%CI)	P-Value
	Usually	**Risk of malnutrition**	**Malnutrition**			
	n (%)	**n (%)**	**n (%)**			
Income						
≤2,600,000	27(17.1)	113(71.5)	18(11.4)	1		
> 2,600,000	35(23.3)	105(70.0)	10(6.7)	0.6(0.3-1.0)	0.6(0.3-0.9)	0.046
Daily sugar intake (grams)						
Usually (≤ 17 g)	45(22.8)	139(70.6)	13(6.6)	1		
Exceeding (> 17g)	17(15.2)	79(71.8)	28(9.0)	1.8(1.0-3.0)	1.9(1.1-3.2)	0.016

DISCUSSION

The proportion of food consumption behaviours and behaviours of patients with type 2 diabetes.

The results of a study on food consumption behaviour and nutritional status among type 2 diabetic patients who received services at the Diabetes Clinic in Vientiane Capital revealed significant findings. A total of 308 individuals participated in the study. The results indicated that 70.8% of type 2 diabetic patients are at risk of malnutrition, and 9.1% are considered malnourished. This percentage is markedly higher compared to findings from Yildirim et al. (2018), who reported that 7.7% of type 2 diabetics were malnourished, and 18.3% were at risk of malnutrition. Additionally, a study conducted in India found that 55% of type 2 diabetic patients faced nutritional challenges, with a risk of malnutrition and undernutrition at 49.6% (Agarwalla, Saikia & Baruah, 2015). Similarly, research by Saintrain et al. (2019) reported a malnutrition rate of 70.6%.

Factors related to food consumption and exercise behaviour of type 2 diabetic patients.

Income.

A study has found that type 2 diabetics with incomes above 2,600,000 kip are 40% less likely to experience malnutrition compared to those with incomes of 2,600,000 kip or less. This difference may be due to the limited options for purchasing healthy foods available to individuals with low incomes. As a result, they tend to consume more high-starch foods and have less variety in their diet, which increases their risk of receiving excess amounts of certain nutrients.

Daily Sugar Consumption Behavior

A study has found that individuals with type 2 diabetes who consume higher amounts of sugar (17 grams) are 1.9 times more likely to be undernourished or malnourished compared to those with lower sugar consumption habits (17 grams). This increased risk is due to the body's tendency to convert excess sugar into fat (Ministry of Health, 2020). The World Health Organisation states that sugar contributes to various diseases and recommends that healthy individuals should limit their sugar intake to no more than 6 teaspoons (24 grams) per day. For those who are already diabetic, it is advised to consume no more than 2 teaspoons (8 grams) of sugar daily. Additionally, it is recommended that added sugars should not exceed 10% of total daily calorie intake.

Study Restrictions

This study is a cross-sectional analysis, meaning it cannot determine causality regarding diseases. The research was conducted at a central hospital in three locations within Vientiane Capital, involving a sample size of only **308** participants.

Therefore, the findings may not be representative of all individuals with type **2** diabetes across each province in the country. The study utilised face-to-face interviews that included questions about food consumption behaviour and physical activity. However, participants, primarily elderly patients, may have had difficulty recalling accurate information. As a result, the understanding of food consumption behaviours among type **2** diabetes patients remains unclear. Furthermore, the sample exclusively included patients receiving services at a hospital diabetes clinic, which may limit the accuracy of the data. Data were not gathered from district or community hospitals, which could provide a more comprehensive view of food consumption behaviours and diabetes in that patient population

CONCLUSION AND RECOMMENDATION

The research focused on educational outcomes, food consumption behavior, and nutritional status among patients with type 2 diabetes attending the diabetes clinic at Central Hospital in Vientiane Capital. The study revealed that over half of the patients were female, with the majority being older than 59 years.

Approximately two-thirds of the participants were housewives or homemakers. Most had been diagnosed with diabetes for more than five years and were using oral medications for treatment.

A study conducted in 2025 on diabetes awareness and dietary habits indicated that diabetic participants aimed to manage their diet to maintain good nutritional status and slow disease progression. The participants generally agreed that diabetes can impair kidney function and that consuming smaller, more frequent meals is beneficial for managing blood sugar levels.

The analysis of nutrient intake revealed that most patients were deficient in calcium and multivitamins. While the majority consumed adequate amounts of fat, energy, and carbohydrates, over two-thirds did not meet the recommended protein intake. Furthermore, many participants exhibited excessive sugar consumption in their daily diet.

The study also assessed physical activity levels among patients with type 2 diabetes, finding that nearly half engaged in regular exercise. Sleep issues were common, with many patients experiencing difficulties such as insomnia; about three times a week, they had trouble falling asleep or staying asleep, often resorting to medication for rest.

Regarding education, the majority of participants were found to have a high body mass index (BMI); over two-thirds had not lost weight in the past 3 to 6 months. Although some patients did achieve a weight loss of more than 3 kg, almost all reported no illness severe enough to prevent them from eating for more than five days in the previous month.

This study suggests that the nutritional status of diabetic patients is relatively adequate. However, it also highlights potential health risks associated with acute complications, such as coma from high or low blood sugar levels, as well as chronic complications, including blindness, kidney failure, central nervous system issues, foot ulcers, high blood pressure, and elevated cholesterol.

Contradiction

In this study, there were no conflicts of interest. The location of the study made it convenient to collect data. The researchers were not involved in any activities related to buying or selling, as that would violate medical ethics. Additionally, interviewees were informed and given adequate time to answer the questionnaire.

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