ASSESSMENT OF NUTRITIONAL STATUS AND RELATED FACTORS OF TYPE 2 DIABETES MELLITUS OUTPATIENTS AT MILITARY HOSPITAL 175

Bui Thi Duyen[1], Do Thi Hang[1]*,
Chau Huynh Uyen Khanh[1], Nguyen Thi Khanh Van[1]

ABSTRACT

***Objective:** To describe the nutritional status and related factors of outpatients with type 2 diabetes mellitus at Military Hospital 175 in 2023.*

***Methods:** A cross-sectional descriptive study was conducted on 246 type 2 diabetes mellitus patients from March 2023 to December 2023.*

***Results:** According to the BMI classification of the World Health Organization Western Pacific Regional Office (WPRO), the results showed that type 2 diabetic patients had normal weight in 35.9%; underweight in 4.3%; the rates of overweight and obesity were 25% and 34.8%, respectively. Factors significantly associated with overweight and obesity (OW/OB) (p < 0.05) included: the group with a disease duration of < 5 years had a 2-fold higher risk of OW/OB compared to the group with disease duration $\geq$ 5 years (95%CI: 1.1 – 3.9, p = 0.024); the group with hypertriglyceridemia had a 2.01-fold higher risk of OW/OB compared to the group with controlled triglyceride levels; the group with inadequate nutritional knowledge had a 2.2-fold higher risk of OW/OB compared to the group with adequate nutritional knowledge (95%CI: 1.3 – 3.8, p = 0.004); the group with poor nutritional practice had a 1.89-fold higher risk of OW/OB compared to the group with good nutritional practice (95%CI: 1.06 – 3.36, p = 0.028); the group without diabetes nutritional education had a 1.86-fold higher risk of OW/OB compared to the group with nutritional education (95%CI: 1.08 – 3.2, p = 0.025).*

Conclusion: A high prevalence of overweight and obesity (OW/OB) (59.8%) was observed among outpatients with type 2 diabetes mellitus. The patient's nutritional status exhibited a statistically significant association with factors such as disease duration, triglyceride control, and nutritional knowledge and practice. Accordingly, implementing nutrition education and counseling programs for these patients is warranted.

Keywords: *Type 2 diabetes mellitus, nutritional status, Military Hospital 175.*

I. INTRODUCTION

Diabetes Mellitus (DM) is a chronic non-communicable disease closely linked to nutrition and lifestyle. Chronic hyperglycemia over a prolonged period causes metabolic disturbances in carbohydrates, proteins, and lipids, leading to damage to various organ systems, particularly the heart, blood vessels, kidneys, eyes, and nerves [1]. According to the International Diabetes Federation (IDF), in 2021, there were 537 million people worldwide living with diabetes, and this figure is projected to reach 643 million by 2030 and 783 million by 2045 [9]. The prevalence of diabetes among adults in Vietnam in 2019 was 6.0% of the population [10]. Clinical nutrition is an essential component in the management of type 2 diabetes, contributing to improved glycemic control, supporting weight loss, and reducing cardiovascular risk [11]. In Vietnam, a study by Dong Thi Phuong showed that patients still have limited nutritional knowledge and practices [2]. Military Hospital 175 is a tertiary referral hospital for the military in the Southern region, managing a diverse and complex patient population. Currently, the number of diabetic patients receiving outpatient treatment constitutes a significant proportion. However, the assessment of nutritional status for outpatients has not been sufficiently prioritized, and nutritional counseling for patients has not received adequate attention. Therefore, we conducted this study to contribute to enhancing the efficiency and quality of outpatient treatment for diabetic patients. The study entitled: "Assessment of nutritional status and related factors of type 2 diabetes mellitus outpatients at Military Hospital 175" aimed to achieve the following two objectives:

1. Assess the nutritional status of type 2 diabetes outpatients at Military Hospital 175.

2. Identify factors related to the nutritional status of type 2 diabetes outpatients at Military Hospital 175.

II. SUBJECTS AND METHODS

2.1. Study Subjects

2.1.1. Inclusion Criteria:

- Patients aged 18 years or older diagnosed with type 2 diabetes according to the 2020 Diagnosis and Classification Criteria of the Ministry of Health – "Guidelines for diagnosis and treatment of type 2 diabetes"; Patients currently receiving outpatient treatment at the Endocrinology Clinic, Military Hospital 175.

- Patients who consented to participate in the study.

- Patients who are alert and capable of communication.

2.1.2. Exclusion Criteria:

- Patients with severe, acute complications such as coma, stroke, etc.

- Patients with kyphoscoliosis or limb amputation.

- Pregnant patients.

2.2. Research methods

2.2.1. Study design:

Cross-sectional descriptive study.

2.2.2. Study period:

From March 2023 to December 2023.

2.2.3. Study location:

Endocrinology Clinic – Military Hospital 175.

2.2.4. Sample size:

Applying the sample size formula for estimating a proportion:

$$n = \frac{Z^2_{1-\alpha/2} \times p\,(1-p)}{d^2}$$

o   n: Sample size.

o $Z_{(1-\alpha/2)}$ = 1,96 (for 95% confidence level).

o   d = 0,05 (allowable error).

o   p = 0,2 (The prevalence of overweight/obesity in T2DM patients managed at Quang Nam General Hospital in 2017 according to the study by Pham Thi Thuy Huong [3]).

➔   Substituting into the formula, we calculated n = 246 patients. In practice, 256 patients were recruited.

Sampling method: Convenience sampling of patients meeting the inclusion criteria until the sample size was reached. Each subject provided data only once during the data collection process.

2.2.5. Evaluation indicators

- Assessment based on Body Mass Index (BMI) classification according to WPRO (2004) standards for Asians:

Table 1. BMI Classification according to WPRO

Classification	WPRO, BMI
Chronic Energy Deficiency (CED)	<18.5
Normal nutritional status	18.5–22.9
Overweight	≥23.0
Pre-obese	23.0−24.9
Obese Class I	25.0−29.9
Obese Class II	≥30.0

- Based on: Guidelines for Diagnosis and Treatment of T2DM of the Ministry

of Health (2020) for non-pregnant adults:

Table 2. Treatment Targets for Patients with T2DM

No.	Indicator		Treatment target		Unit
			Achieved	Not Achieved	
1	HbA1c		< 7.0	≥ 7.0	%
2	Fasting plasma glucose		4.4 – 7.2	< 4.4 or >7.2	mmol/l
3	HDL - C	Male	> 1.0	≤ 1.0	mmol/l
		Female	> 1.3	≤ 1.3	
4	LDL-C (no cardiovascular complications)		< 2.6	≥ 2.6	mmol/l
5	LDL-C (with cardiovascular complications)		< 1.7	≥ 1.7	mmol/l
6	Total cholesterol		3.1 – 5.2	< 3.1 or >5.2	mmol/l
7	Triglycerides		< 1.7	≥ 1.7	mmol/l
8	Systolic blood pressure		< 140	≥ 140	mmHg
9	Diastolic blood pressure		< 90	≥ 90	mmHg

- Knowledge, Practice, and Communication regarding Nutrition in T2DM patients:

No.	Indicator	Achieved/Good/Yes	Not Achieved/Poor/No
1	Knowledge (15 questions – 45 points)	Score ≥≥ 22.5/45 (> 50% of total score)	Score < 22.5/45 (< 50% of total score)
2	Practice (12 questions – 36 points)	Score ≥≥ 18/36 (> 50% of total score)	Score < 18/36 (< 50% of total score)
3	Nutritional Education	Has received nutritional counseling from healthcare staff, media, relatives, or friends.	Has never received nutritional counseling from healthcare staff, media, relatives, or friends.

2.2.6. Bias and Control

- Measurement Bias:

+ Height and weight instruments were standardized before measurement.

+ A pilot test was conducted before data collection.

- Response Bias:

+ Clear explanation of the study's meaning and objectives to subjects.

+ Interviews were conducted in a quiet location, minimizing external factors affecting the interview process.

- Interviewer Bias:

+ Investigators in charge of the KAP questionnaire were thoroughly trained via multiple methods: presentation, group discussion, role-playing.

+ Two collaborators were trained specifically for anthropometric measurements throughout the study.

- Interview Bias: Thorough training for investigators on interview methods.

- Recall Bias: Encouraging or prompting patients to recall information (if possible).

2.2.7. Data Processing

- Data was checked and cleaned immediately after collection.

- Data was entered using Epidata 3.1 software and analyzed using SPSS 22.0.

- Differences were tested using the χ^2 test (Chi-square) or Fisher's exact test for proportions; T-test or Mann–Whitney test for mean values.

- Determine the association between factors (age, gender, education level, medical history...) and the nutritional status of subjects using p-values and Odds Ratios (OR) with 95% confidence intervals.

III. RESULTS

3.1. General characteristics of study subjects

Table 1. General Information of Study Subjects (n=256)

	Characteristic	Number (n=256)	Percentage (%)
Gender	Male	137	53.5
	Female	119	46.5
Age group	≤ 39	5	2.0
	40 - 49	9	3.5
	50 - 59	44	17.2
	60 – 69	121	47.3
	≥ 70	77	30.1
Education Level	No formal education	0	0
	Primary School (Level 1)	12	4.7
	Secondary School (Level 2)	27	10.5
	High School (Level 3)	74	28.9
	Vocational Training /College	118	46.1
	University/Post-graduate	25	9.8
Marital Status	Single	2	0.8
	Married	220	85.9
	Other (Separated/Divorced/Widowed)	34	13.3

Table 1: Among 256 T2DM patients participating, 53.5% were male and 46.5% were female. The majority of subjects were aged ≥ 60 years, with the 60–69 age group accounting for the highest proportion (47.3%); the group < 40 years accounted for the lowest proportion at 2%. Regarding employment status, the majority were retired (66.4%); the majority had an education level of Intermediate/College (46.1%); the marital status of most patients was married/living with a spouse (85.9%).

3.2. Nutritional Status of T2DM Patients

Table 2. Nutritional Status (BMI) by Gender of T2DM Patients according to WPRO & IDI 2004 (n=256)

Nutritional status (kg/m²)	Male (n, %)	Female (n, %)	Total (n, %)	p
CED (< 18.5)	3 (2.2)	8 (6.7)	11 (4.3)	
Normal (18.5 – 22.9)	38 (27.7)	54 (45.4)	92 (35.9)	0.002
Overweight (23 – 24.9)	44 (32.1)	20 (16.8)	64 (25)	
Obesity (≥ 25)	52 (38)	37 (31.1)	89 (34.8)	

*$\chi 2$ Test

According to the WPRO & IDI 2004 BMI classification: 35.9% of T2DM patients had a normal nutritional status, 4.3% had Chronic Energy Deficiency (CED), 25% were overweight, and 34.8% were obese. The combined rate of overweight and obesity in males (32.1% and 38%) was higher than in females (16.8% and 31.1%), with a statistically significant difference (p = 0.002).

3.3. Factors Related to the Nutritional Status of T2DM Patients

Table 3. Association between Nutritional Status (BMI) and General Information (n=256)

Characteristic	Nutritional Status		OR	95% CI	p
	OW/OB (n, %)	Underweight/ Normal (n, %)			
Gender					
Male	52 (38%)	85 (62%)	1.356	0.8-2.2	0.25*
Female	37 (31.1%)	82 (68.9%)			
Age Group					
< 60	22 (37.9%)	36 (62.1%)	1.195	0.6 – 2.1	0.565*
≥ 60	67 (33.8%)	131 (66.2%)			
Education					
Secondary & below	11 (28.2%)	28 (71.8%)	0.7	0.3 – 1.4	0.35*
High School & above	78 (35.9%)	139 (64.1%)			
Marital Status					

Characteristic	Nutritional Status		OR	95% CI	p
	OW/OB (n, %)	Underweight/ Normal (n, %)			
Married	77 (35%)	143 (65%)	1.077	0.5 – 2.2	0.846*
Single/ separated/ divorced/ widowed	12 (33.3%)	24 (66.7%)			

*χ2 Test

The prevalence of overweight-obesity in males (38%) was higher than in females (31.1%). Patients < 60 years old had a higher rate of overweight-obesity (37.9%) compared to patients ≥ 60 years (33.8%). Subjects with education levels of secondary school or below had a lower risk of overweight-obesity (28.2%) compared to those with high school education or above (35.9%). Subjects who were single/separated/divorced/ widowed had a lower rate of overweight-obesity (33.3%) than those who were married (35%). There was no statistically significant association between age, gender, education level, marital status, and nutritional status (BMI) of T2DM patients (p > 0.05).

Table 4. Association between Nutritional Status (BMI) and Disease Duration/ Control of Clinical Indicators (n=256)

Indicator	Control Level	Nutritional Status		OR	95% CI	p
		OW/OB (n, %)	Underweight/ Normal (n, %)			
Disease duration	< 5 years	23 (48.9)	24 (51.1)	2.076	1.1 – 3.9	0.024*
	≥ 5 years	66 (31.6)	143 (68.4)			
Triglycerides	Not achieved	62 (35)	89 (58.9)	2.012	1.2 – 3.4	0.011*
	Achieved	27 (34.2)	78 (74.3)			
Diastolic blood pressure	Not achieved	37 (49.3)	38 (50.7)	2.415	1.3 – 4.2	0.002*
	Achieved	52 (28.7)	129 (71.3)			

*χ2 Test

Patients with disease duration < 5 years and uncontrolled triglycerides or diastolic blood pressure had a higher risk of overweight/obesity compared to the group with disease duration ≥ 5 years and controlled indices, with risks being 2.1, 2.0, and 2.41 times higher, respectively.

Table 5. Association between Nutritional Status (BMI) and Knowledge, Practice, and Media Access regarding Nutrition (n=256)

Indicator	Control Level	Nutritional Status		OR	95% CI	p
		OW/OB (n, %)	Underweight/ Normal (n, %)			
Knowledge	Not Achieved	61 (42.4)	83 (57.6)	**2.205**	**1.3 – 3.8**	**0.004***
	Achieved	28 (25)	84 (75)			
Practice	Poor	67 (39.4)	103 (60.6)	**1.892**	**1.06 – 3.36**	**0.028***
	Good	22 (25.6)	64 (74.4)			
Nutritional Education	No	35 (44.9)	43 (55.1)	**1.869**	**1.08 – 3.2**	**0.025***
	Yes	54 (30.3)	124 (69.7)			

*$\chi2$ Test

Patients with inadequate nutritional knowledge and poor practice had a risk of overweight-obesity 2.2 times and 1.89 times higher, respectively, than those who achieved these factors.

Patients who did not receive nutritional communication regarding diabetes had a 1.86-fold higher risk of overweight-obesity compared to those who had received communication.

IV. DISCUSSION

In our study, 53.5% of subjects were male and 46.5% were female. This result is consistent with the study by Khong Thi Thuy Lan [4], where the proportion of female patients was 47.2% and males 52.8%. The average age of the study subjects was 64.7 ± 9.5 years, mainly concentrated in the 60–69 age group (47.3%). This indicates that T2DM is common in middle-aged and elderly groups. The average age in our study was lower than that in a study at Saint Paul Hospital in 2019 (66.9 ± 12.5 years) [5].

Our results are similar to those of Luu Ngan Tam, where the rate of T2DM in the ≥ 60 group was 54.8% and the < 40 group was 3.5% [6]. Regarding education, the majority of subjects had Intermediate/ College education (46.1%). This differs from Pham Thi Thuy Huong's study, where patients with education below secondary school accounted for the highest rate at 63.7% [2]. This difference may be due to the location, time of study, and demographic characteristics of the region. These factors may also influence nutritional knowledge and practice, thereby affecting the

nutritional status of T2DM patients. Thus, the characteristics of T2DM patients being treated at Military Hospital 175 include a higher proportion of males, high average age, and education levels primarily at the Intermediate/College level.

According to WPRO standards, our study found the highest proportion of T2DM patients had normal BMI (35.9%), followed by obesity (34.8%), overweight (25%), and CED (4.3%). There was a difference between genders: the rate of overweight/obesity in males was higher than in females (32.1% & 38% vs. 16.8% & 31.1%), with statistical significance (p < 0.05). This result is similar to Tran Thi Phuong Lan's study (2020) on 383 diabetic outpatients at North Quang Binh Regional General Hospital, which found an overweight-obesity rate of 61.6%, higher in males (56.8%) than females (43.2%).

Many studies have proven the link between overweight-obesity and T2DM; the risk of diabetes increases as BMI increases and decreases with weight loss. In 2004, a study by Harold E. Bays on 127,420 households in the US showed diabetes prevalence across all BMI levels but highest in the obese group (BMI $\geq$ 40 kg/m^2) at 25%. Most diabetic patients were obese (BMI $\geq$ 30 kg/m^2) at 59%; when including BMI $\geq$ 25 kg/m^2 (overweight threshold), this rate increased to 87%. A study in Da Nang (2008) showed diabetes prevalence in underweight and normal groups (BMI < 23) was 4.9% and 5.3%, but rose to 10% in overweight/obese groups, and specifically to 22.6% in obese groups (BMI > 30).

Elevated serum triglycerides are a major risk factor for atherosclerosis and a significant risk factor for cardiometabolic events and ischemic stroke in diabetic patients [12]. In our study, subjects with disease duration under 5 years had a 2.07-fold higher risk of OW/OB compared to those with duration over 5 years (95% CI: 1.1 – 3.9, p < 0.05). Our study also found that subjects with elevated triglycerides (> 1.7 mmol/l) had a 2.01-fold higher risk of OW/OB compared to those with normal triglycerides (p < 0.05).

The study results showed that the rate of adequate nutritional knowledge among T2DM patients was 43.8%. This is close to the result of Luu Thi Thanh Tam at Hoc Mon Regional General Hospital in 2019, where 46.8% of patients answered correctly regarding nutritional knowledge in diabetes [7]. The rate of good nutritional practice was 33.6%, while poor practice was 66.4%. This prevalence is lower than that reported by Nguyen Trong Nhan and Vu Van Thanh at Bac Giang Endocrinology Hospital in 2019 (41.84%) [8]. This suggests that correct nutritional knowledge forms the basis for beliefs and behaviors in treatment, contributing to disease improvement and complication prevention. When the condition improves, patients gain more confidence in

nutrition, actively seek information, and modify unhealthy behaviors, including maintaining a reasonable weight.

Patients who had never accessed nutritional communication channels regarding diabetes had a 1.86-fold higher risk of overweight-obesity compared to the group that had access. This demonstrates that nutritional communication positively influences T2DM patients, creating trust, altering outdated knowledge, facilitating the adoption of new, appropriate knowledge, and enabling patients to modify behaviors for better health outcomes.

Since our study is a cross-sectional descriptive study, it only determines associations and does not demonstrate causal relationships between factors. The convenience sampling method may lead to selection bias, affecting representativeness.

V. CONCLUSION

This study identified a high prevalence of overweight and obesity (59.8%) among T2DM outpatients. This nutritional status had a statistically significant association (p < 0.05) with disease duration, blood triglyceride concentration, nutritional knowledge, nutritional practice, and the communication channels accessed by T2DM patients.

VI. RECOMMENDATIONS

The research results provide practical evidence regarding the nutritional status of T2DM outpatients and related factors at Military Hospital 175. This serves as a scientific basis for developing communication and nutritional counseling programs for both patients and healthcare staff.

REFERENCES

1. Ministry of Health (2020). *Guidelines for diagnosis and treatment of type 2 diabetes* (Issued with Decision No. 5481/QD-BYT dated December 30, 2020).

2. Dong Thi Phuong (2021). Nutritional practices and related factors among outpatients with type 2 diabetes at Dong Anh General Hospital. *Journal of Nutrition and Food*, 17(1), 23-32.

3. Pham Thi Thuy Huong (2017). *Nutritional status and related factors among patients with type 2 diabetes managed at Quang Nam Central General Hospital in 2016-2017* (Master's Thesis in Medicine). Hanoi Medical University, Hanoi.

4. Khong Thi Thuy Lan (2014). *Nutritional status, dietary intake, and eating habits of patients with type 2 diabetes at Vinh Phuc General Hospital in 2013-2014* (Master's Thesis in Medicine). Hanoi Medical University, Hanoi.

5. Do Thi Mai Phuong (2020). *Nutritional status and factors related to blood*

glucose levels of inpatients with type 2 diabetes at Saint Paul General Hospital in 2019-2020 (Master's Thesis in Medicine). Hanoi Medical University, Hanoi.

6. Luu Ngan Tam, & Doan Quyet Thang (2018). Nutritional status of hospitalized type 2 diabetic patients. *Ho Chi Minh City Journal of Medicine*, 22(5), 75-82.

7. Luu Thi Thanh Tam et al. (2019). *Assessment of knowledge, attitudes, and practices regarding nutrition and physical activity among type 2 diabetic patients at Hoc Mon Regional General Hospital in 2019* (Institutional-level Research Project). Hoc Mon Regional General Hospital.

8. Nguyen Trong Nhan, & Vu Van Thanh (2019). Status of knowledge and practices regarding dietary regimens among outpatients with type 2 diabetes at Bac Giang Endocrinology Hospital in 2019. *Journal of Nursing Science*, 2(3), 97-104.

9. International Diabetes Federation (2021). IDF Diabetes Atlas 10th edition 2021. Page 2.

10. Vietnam: Diabetes prevalence (Adults. 2019). World Obesity Federation Global Obesity Observatory.

11. American Diabetes Association. Standards of Care in Diabetes – 2024. Diabetes Care, page 4-5.

12. Wang L. Cong HL. Zhang JX. et al. Triglyceride-glucose index predicts adverse cardiovascular events in patients with diabetes and acute coronary syndrome. Cardiovascular Diabetology. 19(1), page 80.