PREVALANCE OF MALNUTRION AND RISK OF MALNUTRITION AND RELATED FACTORS IN UNCONTROLLED TYPE 2 DIABETIC OLDER PATIENTS

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The aim of this cross-sectional study was to identify the association between nutritional status and related factors among uncontrolled type 2 diabetic older patients. Variables including demographic information, body mass index, frailty, depression, physical activity daily living, comorbidity, polypharmacy and diabetic characteristics. Nutritional status was defined by Mini Nutritional Assessment Short Form. Data was entried by Redcap and analised by Spss 22.0 verson. A total 148 participants with mean of age was 76 ± 7.47 years old, and 62.2% were female. The mean of BMI total score was 22.35 ± 2.42. There were 12.8% patients with malnutrition status and 41.9% with risk of malnutrition. There was a statistically significant association between the nutritional status and factors such as BMI (p < 0.05), physical activity daily living (OR: 3.2; p < 0.05), diabetes knowledge (OR: 3.7; p < 0.05), diabetes complications (OR: 1.12; p < 0.05). The prevalence of malnutrition and risk of malnutrition were respectively high. Uncontrolled type 2 diabetes in older people with decreased physical activity daily living, poor diabetes knowledge and diabetes complication should be screened for nutritional status.

Keywords: Nutritional status, uncontrolled type 2 diabetes mellitus, older patients.

I. INTRODUCTION

The population of older people is growing faster than any other age group in many countries, which has significant implications for healthcare and social services. As per the United Nations report, the world's population aged 65 years or over is projected to grow from an estimated 703 million in 2019 to 1.5 billion in 2050.[1] Vietnam's population will officially enter the "old population" phase (when the proportion of people aged 65 and over accounts for 14% of the total population) in 2036, with the elderly population reaching 14.17% of the total population and nearly 15.46 million people.[2] The increasing number of older people worldwide has raised concern due to the health issues this age group experiences. Therefore, there is a greater demand for healthcare services and more significant healthcare expenditure.

In today's world, older people face health issues, such as reduced functional ability, mental health issues, health-related quality of life, and poor nutrition. The nutritional status of older people is a significant concern with aging populations in many countries. For example, a healthy and balanced diet supports good mental and physical health. In contrast, malnutrition can lead to various health problems, including undernutrition, weakened immune systems, and an increased risk of chronic diseases - similarly, overweight and obesity-related non-

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communicable diseases such as hypertension and type 2 diabetes.[3] Diabetes mellitus is a significant public health issue; its prevalence and associated complications increase with age. The International Diabetes Federation's 2021 report reveals that an estimated 536.6 million individuals (10.5% of adults aged 20 - 79) worldwide have diabetes, which is projected to increase to 783.2 million by 2045.[4]

With a climb in the aging population and lifestyle changes in Vietnam, the prevalence of type 2 diabetes mellitus doubled from 2.7% in 2002 to 5.4% in 2012[5]. According to data from the Vietnam 2015 STEPS survey on risk factors for non-communicable diseases, implemented by the Ministry of Health with the support of the World Health Organization, in groups 50 - 69 years old, the national prevalence of diabetes was 7.7%.[6] The studies showed a significant rise in the number of people affected by diabetes in Vietnam. Therefore, to control diabetes and prevent its chronic complications, self-care habits (using diabetic medication, implementing healthy lifestyles: balanced diet, regular exercise, quitting smoking and alcohol) play a critical role.[7] Identifying factors associated with malnutrition in elderly diabetic outpatients is the initial step toward understanding the scale of the health issue in Vietnam and developing appropriate prevention programs.[8] However, achieving the best nutritional status in older patients with uncontrolled diabetes mellitus can be challenging due to several factors. Limited studies investigate the nutritional status and associated factors in the elderly with uncontrolled type 2 diabetes mellitus in Vietnam.[9] Thus we conducted this study to evaluate the association between nutritional status with related factors in uncontrolled type 2 diabetic older patients at the National Geriatric Hospital in 2023.

II. MATERIALS AND METHODS

1. Subjects

Older inpatients and outpatients 60 years old and above were diagnosed with type 2 diabetic and treated at the National Geriatric Hospital from July to September 2023.

Recruited criteria

- Patients who were diagnosed with T2DM by specialist doctor according to the ADA 2022 and Ministry of Health (Vietnam).[10,11]
- Patients who had HbA1c ≥ 7%.
- The patients were able to have the physical and cognitive abilities to do a face-to-face interview.
- Patients and patient's family agreed to participate in the study (agree to answer questions regarding general health and disease status according to the outline proposed by the researcher).

Exclude criteria

- Patients or families refused to participate in the study.
- Patients who were unwilling to participate in any part of the study.
- Patients with mental disorders, dementia, paralysis, other psychotic disease or not enough cognitive ability to respond to the interview.
- Patients did not understand Vietnamese and inability to communicate.

2. Methods

Study design

A cross-sectional study was carried out.

Sample size and sampling

The sample size is calculated sing the formula:

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

n: study sample size; d = expected error (d = 0.06).

α: statistical significance level, with α = 0.05;

$(Z1-\alpha/2) = 1.96$.

p = 0.159 (Prevalence of older adults with diabetes mellitus at risk of malnutrition according to Maria Vieira de Lima Sain train's study).[12]

From the formula, the estimated sample size was 143 patients. And the total participants included in the study were 148 people.The reponse rate was 74% in total 200 patients were invited.

Sampling: convenience sampling. All the participants visited clinic room 1, 2 and 5 in the outpatient department were asked to participate in the study if they met all inclusion criteria.

Variables

Demographic information (age, gender, marital status, family caregiver, educational level, living status).

Body mass index (BMI).

Actual BMI can be calculated using the following equation: Body mass index = weight (kg)/ [Height (m)]^2.

Anthropometric: Height (cm), weight (kg).

BMI was divided into 3 groups: Lower weight, normal weight, overweight and obesity.

Nutritional status: Mini Nutritional Assessment – short form (MNA – SF)[13]

The MNA is a simple and useful clinical tool to assess the nutritional status of the elderly. It is a well – proven instrument with high sensitivity, specificity, and reliability. However, completing a full MNA takes 10 – 15 minutes, so the researchers have produced a MNA short form (MNA-SF) with less than 4 minutes to complete.

The MNA-SF is a screening scale with six questions: dietary questionnaire, subjective assessment (food intake, neuropsychological problems/acute disease), mobility and anthropometry (BMI, weight loss). It consists of six items: food intake, weight loss over the past 3 months, mobility, psychological stress or acute disease in the past 3 months, neuropsychological problems; and body mass index or calf circumference.

Evaluation:

+ If MNA-SF score is less than 8, the patient has malnutrition.

+ If MNA-SF score is in range 8 – 11, the patient was at risk of malnutrition.

+ If MNA-SF score is greater than 11, the patient has no malnutrition.

Component 1: Food intake

- Question: "Has the amount of food you have eaten changed since your last assessment?"

- The answer is one in 4 options: Score (0) = Severe decrease in food intake; (1) = Moderate decrease in food intake; (2) = No decrease in food intake

Component 2: Weight loss

- Question: "Have you lost any weight without trying over the last 3 months?"

- The answer is one in 4 options: Score (0) = Weight loss greater than 3 kg; (1) = Does not know; (2) = Weight loss between 1 and 3 kg; (3) = No weight loss

Component 3: BMI

Body Mass Index:

Measure body weight (kg), height (m).

BMI is calculated by the formula: BMI (kg / m^2) = weight (kg) / [height (m)]^2

BMI classification according to the Asian-Pacific.[14]

Diabetic characteristics

- Duration of diagnosis.
- History of family.
- HbA1c.
- Diabetes complications.
- Diabetes medications.

Depression symptoms: Patient Health Questionnaire - 9 (PHQ-9)

"The Patient Health Questionnaire (PHQ) is a self-administered version of the PRIME-

MD diagnostic instrument for common mental disorders."

PHQ-9 is the major depressive disorder module of the full PHQ. The scale has 9 items about problems during the past 2 weeks.

Evaluation: With a maximum score of 27 points and a minimum score of 0 points, the result was classified as follows.[15]

0 – 4: Minimal depression or none.

5 – 27: Positive depression symptom.

Frailty Assessment

The Clinical Frailty Scale (CFS) is a prominent, well-validated, and frequently used score among these options. It allows identification of patients at risk for adverse outcomes due to frailty and can assists providers to implement timely preventive strategies to maximize patient outcomes.[16]

Evaluation: The severity of frailty increases with each numbered level, and there is a visual chart to assist with the frailty classification.[17]

The CFS was collapsed into.[18]

Non-frail (CFS 1 - 4).

Mild-to-moderately frail (CFS 5 - 6).

Severely frail (CFS 7 - 9).

Functional independence

Activities of daily living (ADLs) are used in healthcare to assess to ability of people's daily self-care activities. It included 6 questions: eating, toileting, dressing, grooming, transferring, and bathing.

Poly-pharmacy: assess participants who used more than 5 types drug together.

Score: 1 - yes / 2 – no.

Data analysis

The process of data coding and entry into Redcap software. Data analysis would be done using SPSS software version 22.0.

Descriptive statistics were adopted to examine data characteristic: number, %, mean, median, and minimum, maximum, range. Inferential statistics would be done to compare between groups –using chi-square, ANOVA (if compare between more than 2 mean groups, use ANOVA and ≥ 2 groups, use t-test).

The correlation between malnutritionand its related factors was determined by using crosstabs method for classified variables.

Statistical significance was defined as any p-value is less than 0.05.

3. Research ethics

The participants were explained clearly about the purposes of the study and consented to take part in the study by signing to the inform consent form. This study was approved by Hanoi Medical University Ethical committee (Ref: 923/GCN-HDDDNCYSH-DHYHN on 7th July 2023).

III. RESULTS

A total of 148 participants recruited in this study at the community dwelling.

Table 1. General demographic characteristic (n = 148)

Characteristics		Frequency (n)	Percentage (%)
Gender	Male	56	37.8
	Female	92	62.2
Age group	60 - 75	69	46.6
	> 75	79	53.4

Characteristics		Frequency (n)	Percentage (%)
Education level	Secondary school or below	82	55.4
	High school or university/college and postgraduate	66	44.6
Living status	With family	141	95.3
	Alone/others	7	4.7
Living area	Urban	92	62.2
	Rural	56	37.8
Mean age ± SD		76 ± 7.47	
Mean BMI ± SD		22.35 ± 2.42	

Demographic details of patients in this study are shown in table 1. Among 148 participants, the percentage of females (62.2%) was higher than males (37.8%). The mean age of the patients was 76 ± 7.47 years old with a minimum of 69 and a maximum of 79. The age was separated into two groups: 69 people (46.6%) from 60 to 74 and 79 people (53.4%) more than 75 years old. There were 82 people (54.4%) who did not graduate from high school, some continued to study at a higher level (44.6%).

Most participants' living status was 95.3% (n = 141/148). The proportion of people living in urban areas was higher than in rural areas, with 92 people (62.2%) living in urban areas and 56 people (37.8%) living in rural.

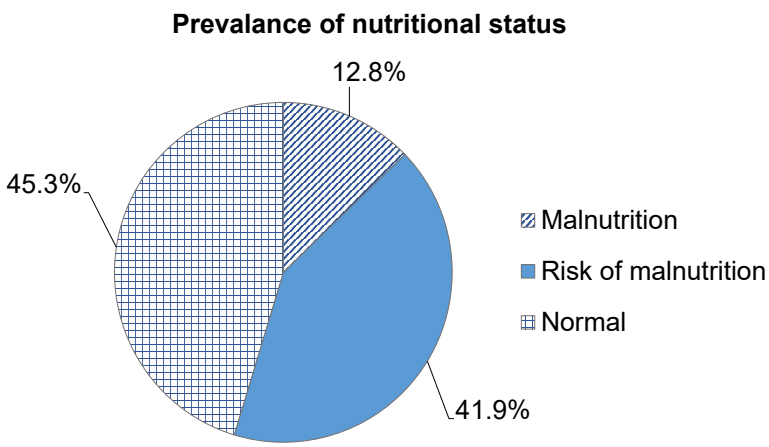

Chart 1. The proportion of nutritional status in type 2 uncontrolled diabetic older patients (n = 148)

There were 12.8% of the population with malnutrition, 41.9% were at risk of malnutrition, and the remaining 45.3% were normal (no malnutrition).

Table 2. Characteristic of uncontrolled diabetes type 2 (n = 148)

Characteristics	Classification	Frequency	Percentage
Duration diagnosis	< 1 year	8	5.4
	1 - 4 years	15	10.1
	≥ 5 years	125	84.5
History family	Yes	29	19.6
	No	119	80.4
Diabetes Complications	Yes	63	42.6
	No	85	57.4
Number of Diabetes Medications	0	46	31.1
	1 - 2	98	66.2
	≥ 3	4	2.7
Mean HbA1c ± SD (Min – Max)		9.01 ± 1.79 (7 - 15.1)	

The data indicates that many individuals with diabetes (84.5%) have been diagnosed for more than 5 years, while only a small percentage (5.4%) have been diagnosed for less than a year. About 19.6% of individuals with diabetes have a family history of the disease, while 80.4% do not have a family history. The study reveals that the mean of HbA1c levels in uncontrolled T2DM individuals was 9.01 ± 1.79 (Min 7.0, Max 15.1). Among individuals with diabetes, 42.6% have experienced complications related to the disease, while 57.4% have not reported any complications. The most significant number of diabetes medications used are one to two (66.2%).

Table 3. Association between the Nutritional status by demographic variable (n = 148)

Characteristics		Nutritional status				p
		Malnutrition (12.8%)		No Malnutrition (87.2%)		
		n	%	n	%	
Age group	60 - 74	12	8.1	57	38.5	0.122
	≥ 75	7	4.7	72	48.6	
Gender	Male	8	5.4	48	32.4	0.681
	Female	11	7.4	81	54.7	
Education level	Did not go to school/ Primary school/Secondary school	13	8.8	69	46.6	0.022
	High school College/ University/ Postgraduate	6	4.1	60	40.5	

Characteristics		Nutritional status				p
		Malnutrition (12.8%)		No Malnutrition (87.2%)		
		n	%	n	%	
Living status	With family	17	11.5	124	83.8	0.250
	With caregiver	1	0.7	1	0.7	
	Others	1	0.7	4	2.7	
Living area	Urban	9	6.1	83	56.1	0.154
	Rural	10	6.8	46	31.1	
	No	13	8.8	96	64.9	
BMI	Underweight	2	1.4	5	3.4	0.009
	Normal	16	10.8	72	48.6	
	Overweight and Obesity	1	0.7	52	3.51	

There was no significant difference in the nutritional status of patients with uncontrolled diabetes type 2 compared to the age ($p > 0.05$), the gender ($p > 0.05$). The level of education was divided into 2 groups: “Did not go to school/Primary school/Secondary school” and High school College/ University/ Postgraduate with a nutritional status ($p < 0.05$), there was a statistically significant association between nutritional status and level of education. There was a statistically significant difference between nutritional status and body mass index ($p < 0.05$). There was no significant difference in the nutritional status of patients compared to smoking ($p > 0.05$), drinking alcohol ($p > 0.05$).

Table 4. Association between the nutritional status by geriatric characteristics in the older patients (n = 148)

Characteristics		Nutritional status				OR- p
		Malnutrition (12.8%)		No Malnutrition (87.2%)		
		n	%	n	%	
Polypharmacy	< 5	4	2.7	31	20.9	1.18 - 0.78
	≥ 5	15	10.1	98	66.2	
Physical activity daily living (ADLs)	Dependent	15	10.1	69	46.6	3.2 - 0.036
	Independent	4	2.7	60	40.5	
Comorbidity	1 disease	0	0	2	1.4	0.77
	≥ 2 diseases	19	2.0	127	85.9	

Characteristics		Nutritional status				OR- p
		Malnutrition (12.8%)		No Malnutrition (87.2%)		
		n	%	n	%	
Frailty Syndrome (Frailty scale)	Non-frail	10	6.8	88	59.5	1.93 - 0.33
	Frail	9	6.1	41	27.7	
Diabetes complications	Yes (≥ 1)	12	8.1	78	52.7	1.12 - 0.046
	No	7	4.7	51	34.5	
Diabetes knowledge	Low	16	10.8	67	38.5	3.7-0.03
	Good	3	2.0	62	41.9	

The results show that depression was significantly associated with the nutritional status ($p < 0.05$). There is no significant difference between Polypharmacy, Comorbidity, and Nutritional status in Table 4. The results also show that daily physical activity was significantly associated with nutritional status ($p < 0.05$).

IV. DISCUSSION

This study was conducted on 148 elderly individuals between the ages of 60 and 93 years old. The majority of participants, 53.4%, were over 75 years old. The mean age of the group was 76 ± 7.47, which was higher than the mean age reported in the studies conducted by Assaf Buch (2022) (mean age SD = 71.4 ± 5.3 years) and Vahid Rashedi (2011) (mean age SD= 68.93 ± 7.27 years).[19,20] These findings are consistent with other studies, such as the one conducted by Mary R. Rooney, Olive Tang, James S. Pankow, and Elizabeth Selvin, which found a mean age of 76 years among their 5636 participants.[21] The variation in results may be attributed to differences in sample size among the studies.

Among the 148 participants, the average BMI was 22.35 with a standard deviation of 2.42. A majority of the patients (59.5%) had a normal BMI, while 4.7% were underweight and the remaining 36.3% were classified as overweight or obese. The study mean was lower than that of Qianping Zhao et al. (2017) 24.69 ± 3.59 kg/m286 but similar to that of Shiro Tanaka et al. (2014) 23.3 ± 3.2 kg/m^2.[22] According to a study by Natallia Gray et al. in 2015, there is a correlation between the rate of type 2 diabetes and body mass index. The study suggests that a higher BMI is a significant pathogenic factor closely associated with the development of type 2 diabetes.[23] Based on our research, which primarily involves subjects with normal BMI, we can see that our results are consistent with most patients with type 2 diabetes.

Half of the patients in the survey reported that they were newly diagnosed with diabetes ≥ 5 years (84.51%), followed by those who were diagnosed with diabetes between 1 and 4 years (10.1%). According to Daniel Nogueira Cortez's research, most people diagnosed with diabetes are diagnosed over five years (71.8%).[24]

Our study revealed that out of the individuals with diabetes, 42.6% have faced complications associated with the disease, while 57.4% have not reported any issues. On the other hand, a study conducted by Si Thu Win Tin discovered

a high incidence of diabetes complications, which was 71% in the Solomon Islands.[25] The differences in sample sizes and the study location may have contributed to this variation.

The nutritional status of older persons was assessed using the Mini Nutritional Assessment – Short Form (MNASF). A standardized questionnaire recorded malnutrition-related factors: food and appetite, lifestyle, psychological characteristics, physical characteristics, oral health, and social factors.[26]

The Mini Nutritional Assessment-Short Form (MNA-SF) is a tool used to detect malnutrition in elderly medical patients. If the MNA-SF identifies malnutrition, it can increase in-hospital mortality, trigger a higher discharge rate to nursing homes, and a longer length of stay.[27]

The research found an association between depression and nutritional status ($p < 0.05$). In other study, depression had a significant effect on the nutritional status in uncontrolled type 2 diabetes patients. The causal relationship between depression and nutritional status is still unclear. Several studies indicate that depression is a significant factor contributing to weight loss in the elderly.[28]

The research found an association between physical function and nutritional status. Moreover, the prevalence of ADL showed that the dependence ratio was a higher quality of life than independence. The proportion of the dependent group (65.2%) is higher than that of the dependent group (34.8%). According to the study by Anh Trung Nguyen, Tam Ngoc Nguyen, Huyen Thi Thanh Vu, The results showed an association between malnutrional status and low physical activity ($p < 0.05$).[29]

Limitations

This study was only a cross-sectional study thus it could not access the risk factors of malnutrition in uncontrolled type 2 diabetic older patients. Furthermore, the sample size only from National Geriatric Hospital thus it could not representative for all Vietnamese population.

V. CONLCUSION

The prevalence of malnutrition and risk of malnutrition were respectively high. Uncontrolled type 2 diabtes older people with dependenced in physical activity daily living, poor knowledge about diabetes and diabetes complication should be screened for nutritional status.

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